From Cataloguers to Designers: Paul Otlet, Social Impact and a More Proactive Role for Knowledge Organisation Professionals†

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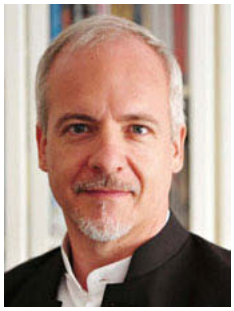

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Abstract: In the early 20th century, Paul Otlet carved out a role for bibliography and documentation as a force for positive social change. While his ideals appeared to be utopian to many of his contemporaries, his activism and vision foreshadowed the potential of the World Wide Web. This paper discusses the role that KO professionals could play in enhancing the positive social impact of the web of knowledge, and how our roles are shifting from the more passive role of descriptive cataloguers, to proactive designers of positive and productive knowledge environments.

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1.0 Introduction

I should clarify my intent in this paper with some working definitions. By "cataloguer" I mean a person who makes a systematic list of items, often of the same type. The cataloguer may add descriptive detail to enrich the list, such as various characteristics and attributes of the items in the list, or relationships with other items within the same list or in other lists. Essentially the task of a cataloguer is a descriptive one. The cataloguer describes the world as it is. By "designer" I mean a person who plans the look or workings of something prior to it being made. These plans may also be enriched by descriptive detail, but the task of the designer is a future-oriented task, describing the world as it could be. In this sense the work of the designer can be prescriptive and future-shaping in a way that the work of the cataloguer is not.

Those of us who entered the profession of knowledge organisation from library-and-information-science are formed in the descriptive disciplines of cataloguing. Even when we are tasked with designing, let us say, a taxonomy for a given purpose, our orientation is still a descriptive one. We gather the evidence and warrant for how the domain we are covering should be modeled based on current practice and need; we apply standards or we negotiate standards against the current variation of language and structure. Much of what we do (Lambe 2007) is focused on identifying the seeds of order and consis-

tency in the domains we supervise, and on stabilising and projecting or amplifying that order. We do not typically see ourselves (Robinson and Bawden 2012) as inventers of order but as its discoverers and protectors, or as Brian Vickery would have it, problem-solvers around the flow of information and provision of knowledge in society. In a less expansive frame, Vickery (2008) claimed that the descriptive work of the information profession should maintain a rigid separation from the active work of knowledge creation and organisation, represented by scholars and encyclopaedists. Lambe (2012, 262) disagreed.

A designer's orientation tends more towards invention. A designer begins with a need or a desired outcome. There are discovery techniques (Alexander 1964; Gregory 1966; Simon 1969) to be sure in finding the most fruitful pathway towards the desired goal, but designers see the present not as a source of order to be stabilised and amplified, but as a collection of resources, affordances and constraints to be exploited or overcome. As Bucolo and Matthews (2011, 354) put it, "Design brings a different way of thinking, doing things and tackling problems to generate novel solutions."

The theme of the ISKO UK 2015 conference is "Knowledge Organization–Making a Difference: the impact of knowledge organization on society, scholarship and progress." The world we live in is complex and messy, and the domain we work in—knowledge organisation—is itself growing in complexity. In this context I want to argue that in order to make a difference and have an impact in the world as the conference title suggests, it would be highly advantageous to knowledge organisation professionals to adopt more of a designer's orientation and to acquire design skills and competencies. This will be challenging, because we are not typically formed professionally as designers, and because the world still needs, and constantly reinforces the need for the cataloguing orientation.

2.0 Can cataloguing and design orientations coexist? The case of Paul Otlet

The cataloguing orientation and the design orientation appear to be in tension with each other, but they are not incommensurate. We routinely manage past, present and future orientations in our personal lives. While we may have biases in these orientations, we resolve them in the everyday decisions we take in governing our lives. This mechanism is less obvious in our professional lives, which are often functionally partitioned, either by accident or design.

An outstanding example of the marriage of a cataloguing perspective with a future-oriented activist perspective is that of the Belgian Paul Otlet (1868-1944), one of the fathers of information science. He is outstanding for his vision and prescience as well as for his uncharacteristically activist stance for our profession. Otlet's life work (Rayward 2003; van den Heuvel 2009; Wright 2014) was devoted to the design of a new world order, and he worked at every level of granularity, from the collection of documentation and cultural artefacts, to the development of cataloguing standards and classification schemes, to cooperative cataloguing networks, to institutional reform and international institution-building. Otlet saw cataloguing as fundamental to design, and he saw the work of the cataloguer and the work of the designer as not merely congruent but inseparable.

However, Otlet was a positivist in the school of Auguste Comte. As eloquently summarised by Otlet's great evangeliser W. Boyd Rayward (1975, 25-6):

> The essence of Positivism as developed in the middle of the nineteenth century by Auguste Comte, lay in the Law of Three Stages and the Classification of the Sciences. The Law of the Three Stages asserted that as the mind developed, it passed through a stage of theological explanation of the world, to a stage of metaphysical explanation, to the final positive stage where all could be explained in terms of scientific truth. As the mind progressed through these stages, it did so in a definite order of disciplines which became increasingly interdependent and complex. At the first level stood mathematics, followed by physics and chemistry, then came biology, and everything that came before culminated in psychology and sociology. Sociology, the queen of sciences, was viewed as a "unifying" science. What was of primary importance for the positivist philosopher was the formation of a "subjective synthesis" of positive knowledge as a way of envisaging and directing the development of society.

Otlet, along with many *fin de siècle* Europeans, shared this view of the natural progression of humankind through the growth and integration of knowledge. In the Comtian view, the work of knowledge organisation and integration was integral to supporting the progress of humanity towards its higher destiny. Indeed, Otlet found in this vision the motivation for most of his foundational ideas in information science, and he held to them notwithstanding the terrible counter-evidence provided by the brutality of the First World War. As a Belgian, Otlet saw the war at first hand, and lost his younger son to it. In fact, in the aftermath of the war (Wright 2014, 147) he became more than ever convinced of the power of knowledge integration to overcome what he saw as the self-interested diplomatic squabbling of governments.

In this sense, Otlet's activism and future orientation was not consistent with the modern view of design as an activity that creates a desired future. It was much more about uncovering the desired future, from an intrinsic capability that was already implicitly present. In the positivist worldview, the design in question is a natural design built into the structure of knowledge and of human society, and the cataloguer does not so much create the future as enable it. The work of cataloguing, collection development, institution building, and envisioning of world cities and transnational governments, were all part of a hierarchy of activities geared towards uncovering an order that was already implicit in the present. This explains why the work of cataloguing could be framed as radically future-oriented, in a way that now seems quite foreign.

Otlet's activism and future orientation was an idealist one and not a pragmatic, purely inventive one. However, his positivist worldview provided a strong connection between the cataloguing role of the knowledge organization professional and an activist, future-creating design role. In our time, in the absence of a positivist worldview, we need another mechanism to make this connection.

3.0 What is the role of ethics in knowledge organisation?

Alex Wright begins his biography of Paul Otlet with a troubling vignette. He describes a meeting in December 1940 between Otlet and Hugo Andres Krüss, Director General of the Prussian State Library, and member of the Reichsleiter Rosenberg Taskforce—the body appointed by the Nazis to appropriate cultural property from Nazi-occupied territories. Krüss was responsible for the bibliographic arm of the Taskforce's operations, and he was meeting Otlet as a prelude to the removal of Otlet's 15-million-item catalogue, the Universal Bibliography, and a selection of documents and ephemera of interest to the Taskforce. In the process (Wright 2014, 3-11; Rayward 1975, 361), the Nazis discarded and destroyed sixty-three tons of material that they considered "rubbish."

Hugo Krüss was no gangster. He was a distinguished librarian (Schochow 1995). He had played a leading role in the founding of IFLA in 1927 (De Vries 1976, 8), oversaw the production of the German Union Catalogue in 1931 (Bohrmann 1989), and was active in the committees of the League of Nations, and in international bibliographic congresses. He had last met (Wright 2014, 3) Otlet in October 1937 at a Documentation Congress in Paris. Krüss had also been actively involved in supporting the Nazi agenda (Haase 2000, 87), had vocally supported the Nazi book-burnings of February 1933, and in 1934 spoke out against the "Library of burnt books" (Deutsche Freiheitsbibliothek) established in Paris as a haven for the books banned and burnt by the Nazis. This library would eventually be destroyed by German troops on the occupation of Paris in 1940.

We have in fact a long history of professional complicity in the destruction of, or restriction of, access to knowledge. The Chinese emperors, beginning with Qin Shihuangde (Stille 2002, 52; Polastron 2007), routinely eradicated the libraries and the scholarship of the preceding dynasty, and established their own, to be echoed in Mao's Cultural Revolution. The eradication of knowledge as a form of cultural or ideological control is a characteristic of totalitarian regimes. While there are many instances of library professionals (and citizens) subverting the *auto da fé* through preservation in secret, it is difficult to see how the cleansing regimes could have performed their tasks so thoroughly without professional help, from those such as Hugo Krüss.

Let us take an example closer to home. POPLINE is the world's biggest database on reproductive health, with about a third of a million articles. It is funded by the federal agency USAID, and managed by the Johns Hopkins School of Public Health. If you do a search in its database today under "abortion" you'll find over 7,800 articles. Between February and April 2008, you wouldn't have found any articles.

In February 2008, staff at USAID (which at that time had a reputation for enforcing the conservative anti-abortion views of the Bush administration) contacted POPLINE administrators to express concern about two articles they had found on the database which were about abortion advocacy. POPLINE reviewed the articles, decided they didn't fit with the database's collection policy, and removed them. But it seems the database and taxonomy administrators didn't want to be caught out like that again. So they then took a decision of their own, to make "abortion" a stop-word. A stop word is a word that a search engine decides doesn't exist. They were introduced to help search engines ignore non-meaningful terms like "and," "the," "of." In the case of POPLINE, the stop word tactic was used to make a concept disappear. The rest of the knowledgebase on abortion was still there, but undiscoverable using the term "abortion" in the search box.

The library and research community took some time to react. It was only at the end of March 2008 that medical librarian listservs started discussing the mystery. One of them shared how one of their researchers had written to POPLINE to ask about the mysterious disappearance and got the following reply:

> Yes we did make a change in POPLINE. We recently made all abortion terms stop words. As a federally funded project, we decided this was best for now. In addition to the terms you're already us-

> ing, you could try using 'Fertility Control, Postconception'. This is the broader term to our 'Abortion' terms and most records have both in the keyword fields. Also, adding 'unwanted w2 pregnancy' in place of aborti*. We have a keyword Pregnancy, Unwanted and there are 2517 records with aborti* & unwanted w2 pregnancy.

The library community erupted. By early April, the *New York Times* was covering the story (Pear 2008; Mai 2008; Walden 2008) and reported that the dean of the Public Health School had ordered the database folks to reintroduce "abortion" into the English language and was setting up an inquiry into how such a decision had been taken. Jens-Erik Mai (2008), a professor at the University of Toronto, stepped above the reflexive outrage of the library community and made this remark:

> This example highlight[s] a more important principle—the ethical dimension of KO. Regardless of whether one agrees with the politics behind removing the abortion category and thereby eliminating the concept from the vocabulary; one needs to ask what is wrong and what is right in this regard–and more importantly, one needs to ask, who or what determines what is wrong and right.

And this is my point: without an ethical frame, the work of knowledge organization becomes a tool of whichever ideology is powerful enough to coopt it. Without an ethical frame, there is no reference that allows us to reason in favour of compliance, protest or resistance. We are left with visceral responses and not reasoned ones. And the work of knowledge organization is far-reaching. It clearly has ethical dimensions.

At the heart of Bowker and Star's (1999) magisterial book *Sorting things out* is a study of the active role of classification in supporting and enforcing the apartheid regime in South Africa. In my book *Organising knowledge* (2007, 50-7), in the cases of Victoria Climbié and Vivian Alvarez, I explore the dreadful consequences that can ensue from failures in knowledge organization. We are implicated ethically by the work we do, whether we have an ethical stance or not.

This is not a universally accepted argument. While the literature is sparse on the ethical implications of the more technical aspects of our work (Shoemaker 2015), there is a broader literature in the library profession, where since the 1980s (Foster and Mcmenemy 2012) there has been significant progress in developing professional codes of ethics. However, even in that domain (Foskett 1962; Hauptman 1976; Hauptman 1996; Branum 2014) there is a strong tradition of so-called "ethical neutrality." In Foskett's (1962, 10) famous words, "During reference service, the librarian ought virtually to vanish as an individual person, except in so far as his personality sheds light on the working of the library. He must be the reader's alter ego, immersed in his politics, his religion, his morals."

Now Foskett's position was not in broad terms ethically neutral. His exposition of a "librarian's philosophy" is rooted in Ranganathan's Five Laws of Librarianship, and is implicitly ethical in its orientation of service to community, employers and clients, and of providing access to the collective memory. He (Foskett 1962, 13) speaks passionately of librarianship as "the very negation of the predatory society towards which we are rushing, where all the old truths have taken on a new, more terrible significance: where it is every man for himself and the devil take the hindmost, where the race does go to the strong, and the weak do go to the wall."

Nevertheless, the very fact that a debate about neutrality exists is striking. When this is combined with an ethic of responsive service as distinct from proactive anticipation of need, it is easy to see why there might be a certain ethical passivity in the profession. The activist librarian and cataloguer Sandford Berman is a very rare exception. Absent an activist, future-oriented stance, there is little motivation (Wong 2004) or indeed personal or institutional capacity to actively explicate and enforce ethical codes of practice in the knowledge and information professions.

Let us return to the theme of the ISKO UK 2015 conference, "making a difference." Hugo Krüss, Paul Otlet and the POPLINE taxonomy administrators all satisfied the technical meaning of that phrase. They all made a difference. As a profession we need an ethical frame in order to discriminate which kind of difference we want to make, and whether it should be considered beneficial or sinister. Indeed, having an ethical frame (Abbott 1988, 9-20; Mason et al. 1995) is considered foundational to the nature of a profession, and this is normally embedded in a professional code of practice. While many knowledge professionals would not disagree with this claim, my argument here is that having a generalized ethical frame is insufficient to actually have impact in the world, when that frame is essentially passive in nature. As a profession we need an orientation and a toolset that gives us the both the rationale and the capability to engage with the world to effect change.

This is why a design orientation is important to knowledge organization professionals, because a design orientation is activist, future-oriented, and geared towards desired goals. Moreover, it delivers the skills to envision and bring about a desired future state. As long as our stance is a descriptive one, oriented towards ordering and cataloguing the present, we do not as a profession develop the capacity or the skills to change the present in favour

of a desired, beneficial future. That capacity and those skills are cultivated in the discipline of design. Taking an ethical stance–if that stance is essentially passive in orientation–is meaningless without also developing the skills and practices of design.

4.0 The world wide web: Otlet vindicated?

In 1991, as Tim Berners-Lee was working in Switzerland to build the architecture of the World Wide Web, pre-eminent Otlet scholar W. Boyd Rayward gave a presentation at a conference in Finland describing a number of historical schemes to integrate and link information resources for the benefit of society, from the British John Dury in 1640s England, by way of Leibniz's *Encyclopaediae Perfectae* and Otlet's "Office of Documentation" to H.G. Well's vision of the "World Brain." The stimulus for Rayward's (1994a) three hundred year historical traverse was the new potential of the emerging hypertext and hypermedia systems to fulfill the vision of these figures, and specifically to unlock and connect the information resources locked in the professional siloes of libraries, archives and museums. And at face value (Rayward 1994b; van den Heuvel 2009; van den Heuvel 2010; Wright 2014, 268-294), Otlet's vision of interconnected information resources, comprising media of many different kinds, available world-wide through common protocols and standards, seems prescient.

Beneath the surface, however, there are also striking differences between Otlet's vision and the manifestation of the World Wide Web. As early as 1994, Rayward (Rayward 1994b, 247) was pointing out that Otlet, in sharp contrast to modern approaches to information retrieval, "displayed little or no interest in the user, other than in an extremely generalised sense. He certainly gave little or no sign of having a concept of user needs as we now understand them. His orientation was, on the face of it, completely different."

Otlet's vision of the mechanics of knowledge decomposition and recombination (Van den Heuvel 2009) depended upon a top-down system of scholarly validation that is quite different from the demotic and participative nature of the Web as we know it today. And yet at the same time, the vision for the semantic web, and the instruments of linked data and RDF triples (van den Heuvel 2009, 214) echo some of "the instruments and protocols envisioned by Otlet to enhance collaborative knowledge production." In fact, the very looseness of conceptual and vocabulary control on the Web (van den Heuvel 2009, 215) poses serious problems for scholarship.

Both Paul Otlet and Hugo Krüss, in different ways, embodied and enacted models of control that are sharply at odds with the emergent nature of the World Wide Web—for Otlet, it was bibliographic control, and for Krüss, control of the knowledge resources themselves. The Web has manifested an additional dimension, an information and knowledge infrastructure that is uncontrolled or only incompletely controlled. Lawrence Lessig has written about the dynamic tensions in cyberspace between openness and control. He (2006, 2-5) has described the initial emergence of the Web as "the unplanned displacement of a certain architecture of control" by heady visions of freedom and anarchy, only to be followed by the gradual establishment of a new and largely hidden architecture of control.

The tension between control and freedom, between order and disorder, characterize the World Wide Web in a manner unanticipated by Otlet. It is here that the task of design in knowledge organization comes into play. As cataloguers we are, as was Otlet, exponents of control. We are unversed in the landscapes of emergence and lack of control. Think of the vocabulary we use in our professional lives to describe the range of our approaches to taxonomies and classification schemes: pre-coordination and post-coordination. In both instances, we develop taxonomic structures that either predict the placement of a concept in advance, or predict the conceptual and ordering framework into which a concept or entity should fit when we encounter it. Neither instance fully accommodates a wholly or partially uncoordinated information environment where meaning emerges spontaneously from patterns of behavior (as instantiated by patterns such as "people who bought this book also bought …" or the statistical correlations uncovered by so called "Big Data" analytics).

Designers, by contrast, are versed in the art of creating meaning and function from a disordered universe. The World Wide Web has expanded our universe and we need to develop the skills to match.

5.0 The implications of the web for our work

The framework in Figure 1 attempts to express the dynamics and tensions of the information and knowledge environment that we work within. Many of us work within enclosed, organisational contexts. However, since the 1990s, the changes in those internal, mostly-controlled information environments have been driven by the dynamics of the wider environment represented by the World Wide Web. The Web drives us, and the challenges of design produced by the Web will drive the skills and capabilities we will need in our narrower organisational lives.

The framework shows two sets of competing polarities: on the horizontal axis, there is a polarity between "Disorder" and "Order." "Disorder" refers to the absence of centralized control, and so more properly means a domain of competing orders, while "Order" refers to a single source of active, centralized control. On the vertical axis there is a polarity between "Sequestration" and

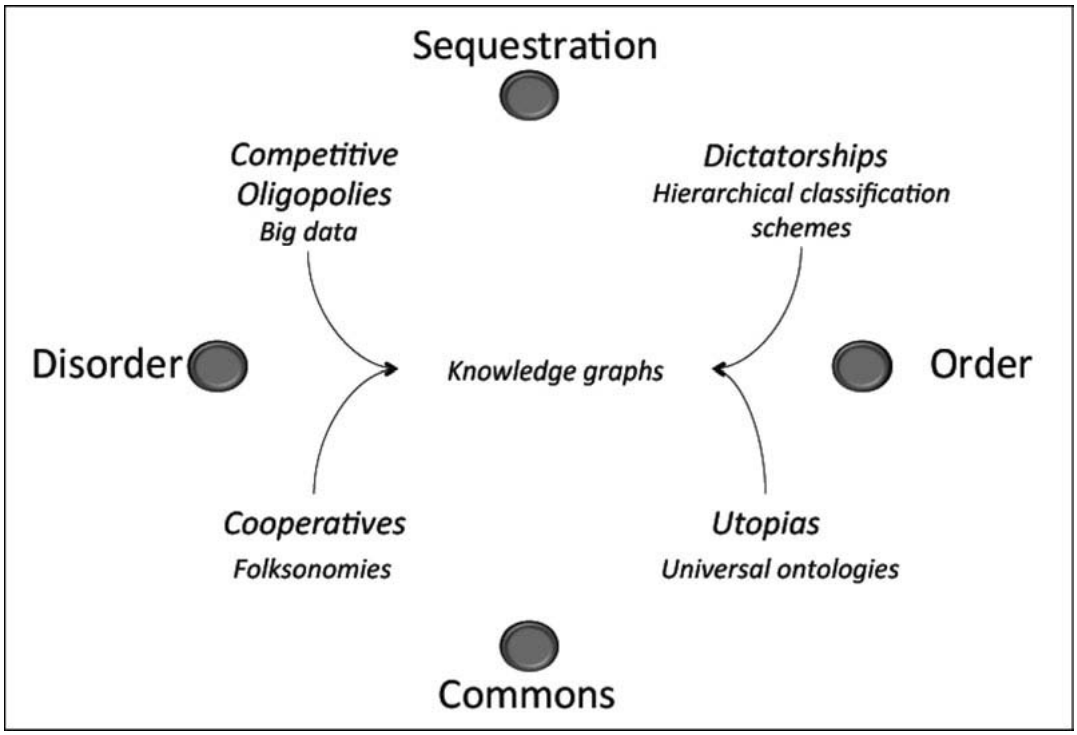

Figure 1. A framework for thinking about the role of KO professionals

the "Commons." "Sequestration" refers to the enclosure of resources for the purposes of control and economic exploitation. The "Commons" refers to the idea that certain goods are held in common and should be accessible to all. The relevance of having an ethical stance should be clear from this vertical polarity.

Let us begin in the region with which we are most familiar, the right hand side, the domain of "Order." As knowledge organization professionals we are formed in, and work mainly in an ordered domain, or in a domain that we presume should be ordered. There are varieties of activity here, depending on the ends to which our labours are put, and we have developed instruments that, deliberately or not, enable either "Sequestration" or the "Commons."

5.1 Dictatorships

Dictatorships are a social phenomenon characteristic of sequestration and order. They sequester resources for the exploitation of the ruling elite, and they impose instruments of order and control to those ends. In knowledge organization terms, single-hierarchy pre-coordinated classification schemes are the instruments of choice in this domain, because they are particularly amenable to the expression of a single, privileged perspective on the knowledge domain. Knowledge organization professionals also serve in this domain, and we might take Hugo Krüss as an extreme exemplar.

5.2 Utopias

Utopias are a social construct expressive of organization for the general interests of the commons. That they have consistently failed to produce sustained value for their members does not diminish their attractiveness. The language of the early World Wide Web, coming as it did after the heady disintegration of the Soviet bloc in 1989, carried particularly utopian resonances. As Lessig puts it (2006, 3):

> The claim for cyberspace was not just that government would not regulate cyberspace–it was that government could not regulate cyberspace. Cyberspace was, by nature, unavoidably free. Governments could threaten, but behavior could not be controlled; laws could be passed, but they would have no real effect. There was no choice about what kind of government to install—none could reign. Cyberspace would be a society of a very different sort. There would be definition and direction, but built from the bottom-up. The society of this space would be a fully self-ordering entity, cleansed of governors and free from political hacks.

Paul Otlet belongs firmly in the utopian space, and it is no accident that he laid the foundations for post-coordination in classification schemes. The 1990s enthusiasm for universal ontology-building also belongs to this domain. Ontolo-

gies, and their less sophisticated relatives, faceted taxonomies, are instruments that explicitly enable the taking of multiple perspectives on the same domain, disabling the dominance of a single, privileged perspective.

"Utopian" is also often understood as a synonym for "unrealistic." Historically, property held in common has always been subjected to the pressures of sequestration, because communities are not typically very efficient in their exploitation of common resources, a phenomenon known as "the tragedy of the commons" (Hardin 1968). But enclosure of resources for the purposes of economic exploitation often poses strong ethical dilemmas. For example, the enclosure of common land by big landowners in Scotland in the eighteenth century was on the one hand seen as a necessity for enhancing the overall economic productivity and prosperity of society, but on the other hand resulted in ruinous hardship for dispossessed tenants and labourers. The arguments for sequestration are that it is necessary for the requisite levels of control and investment, and the arguments against are that left uncontrolled, sequestration results in permanent marginalization, dispossession and alienation of a portion of the community.

In the field of knowledge organization, utopian schemes such as those of Paul Otlet or the universal ontology proponents are similarly disparaged for being unrepresentative of the way the world really works. Cory Doctorow (2001) itemized seven "real world" reasons why what he termed "meta-utopia" was unrealizable:

- People lie
- People are lazy
- People are stupid
- People are not good observers of their own behaviours
- Schemas are not neutral
- Metrics influence results
- There are multiple ways of describing the same thing.

If we move to the left hand side of the framework in Figure 1, we begin to explore the domains for which we are less well prepared.

5.3 Cooperatives

At the bottom left, cooperatives are a social form that, if not exactly disordered, express a preference for the community without hierarchical systems of order and control. The orientation of people in this space is that of participative knowledge sharing, and the knowledge organization form most characteristic of this domain is the mid 2000s enthusiasm for the folksonomy, an approach to participative tagging using uncontrolled, user-contributed keywords or tags (Smith 2008). Socially exposing these tags on very large, diverse collections of media can enable rich serendipity, but as a mechanism for enabling precision and recall in more focused information seeking activities, they are severely problematic. They (Lambe 2007, 240-4) work not at all on small, constrained content collections.

As knowledge organization professionals (Lambe 2007, 245-9), we encounter this form most productively as a source of potential vocabulary (along with search analytics reports on search query strings) for our controlled vocabularies and taxonomies. They give us evidence of how our users think about the knowledge space, to be factored into our considerations of order and control. We give scant attention to the characteristics of the environment in which they are produced, and in particular the learning and design opportunities afforded by distinctive patterns of emergent behavior.

5.4 Competitive oligopolies

At the top left the forces of sequestration are in full play. A social form characteristic of this domain is the competitive oligopoly, huge businesses whose income exceeds the GDP of many countries. In the context of cyberspace, these are companies such as Google, Facebook, Amazon and Apple. They have made it their business to sequester data about human activity, whether it be behaviours around search, social interaction, geographical mobility, purchases, software services or media consumption; having enclosed it, they apply sophisticated data analytics algorithms for their further economic benefit. In order to attract the activity into their enclosed platforms, these companies initially offer services that are free, fast, cheap or superbly designed.

These oligopolies exist in other sectors too, and the pattern is the same–to establish an enclosed infrastructure where an economic benefit can be derived from collecting and analyzing user behaviours within that space, quite apart from the first-order economic transactions that may take place. Pharmaceutical companies establish data enclaves to justify their investment in R&D. Manufacturing companies such as GE are investing in the "Internet of Things" in order to understand and exploit the behaviours of their machinery on a vast scale. Retail chains such as Target are analyzing shopping behaviours in order to enhance the effectiveness of highly segmented selling and promotions. Publishers establish content subscription services, research tools and collaboration platforms so as to observe and further exploit the activities of their users around their controlled content.

All of these oligopolies depend on achieving a vast scale of activity, because it is scale of activity that drives the detection of significant and exploitable patterns in

the data. This has two consequences. The first is that they are fiercely competitive, because they need to grow fast; and this drives secrecy about their methods of data analysis and exploitation. The second (Lessig 2002, viii) is that they crowd out competition by securing economic advantage, the implication being that diversity, and the creativity and innovation that the Web initially inspired, are gradually becoming eroded.

This is the domain of Big Data, which is driven by a need with which we are familiar: the need to resolve variant vocabularies to the same base set of concepts and establish salient relationships for the purposes of aggregation and analysis. However, while superficially reliant on the same knowledge organization tools as in the domain of order, the algorithms and tools by which these analytics are conducted are opaque and resistant to external validation. That is the meaning of data sequestration, and it is the reason why we are largely inexperienced in its methods, except for the breathless examples expounded in the popular big data literature. And opacity (Wachter 2015, 127-65; National Transportation Safety Board 2014, 127), combined with overweening faith in technology, can cause life-threatening errors when combined with scenarios such as in healthcare and air travel.

5.5 Finding our place

It is important to understand that what we are describing in this framework is a dynamic space in which the tensions between polarities are being played out. An element of sequestration is necessary for a market economy to thrive and for productivity and innovation to be enhanced. But if sequestration results in severe erosion of the commons and marginalization of significant sectors of society, it is as unhealthy as a utopian and unsustainable commune.

Similarly, our rhetoric of order through cataloguing and control must be understood as only one pole of a dynamic that contains a capacity for uncontrolled resources, because that is the space in which emergence, learning and innovation happen. Clay Shirky (2005) was correct in his claim that "ontology is overrated" but he and his fellow traveller David Weinberger (2007) are wrong in their belief that, as Alex Wright (2014, 279) puts it, "the hive mind of the collective will sort everything out." The World Wide Web contains the dynamics of order (embodied in the initiatives of the semantic web and linked data) as well as openness and disorder. They coexist, and they coexist for a good reason. Our job, as knowledge organization professionals, is to find our place in the midst of that dynamic, not at one of its poles. And because we are also in a dynamic between benefits to the many (the commons) and benefits to the few (sequestration) we are also in a dynamic with strong ethical implications. The orientation and discipline of design is not a choice for us, it is a necessity.

6.0 Examples of a design orientation in knowledge organization

6.1 Knowledge graphs

At the centre of the framework in Figure 1, I have placed a knowledge organization form that is relatively new: the knowledge graph. Technically and reductively speaking, a knowledge graph is a representation of relationships between concepts within a knowledge domain.

In their relatively recent application by Google to enhance the quality and richness of search results, knowledge graphs have become a fascinating artefact of design, tracing relationships beyond the constraints of the conceptual schemas familiar to taxonomists and ontologists. They connect concepts with data, with media and with curated information content. The knowledge graph as represented by Google is a designed graph of salient relationships supporting identified user needs. Relationships are no longer in-schema pathways between concepts–they transgress their schema's own boundaries and become a means of connecting anything with anything.

How does this work? The Google knowledge graph powers an "index card" that appears at the top right of a search results page when the search is for a known entity in the graph–known entities include people, organizations and locations. The index card for Carl Linnaeus contains images representing him drawn from anywhere on the Web; it contains biographical data drawn from Wikipedia, and links to saved searches on geographical locations and persons of significance in his life; it contains links to his books, and it gives you suggestions for people searches often associated with a search for Linnaeus. Behind this index card there is the standard taxonomist's disambiguation of alternative forms of his name. The index card for University College London contains a link to the Google maps database, a profile drawn from Wikipedia, contact details and enrolment numbers, a link to its profile and recent posts on Google Plus, links to searches on notable alumni and frequently associated searches. It also allows you to take follow up actions, such as get directions, write a review or follow on Google Plus. The index card for London contains a link to the Google maps database, a brief profile and key data on area and date of foundation. It pulls data from a weather server and a time server to tell you the current weather and time there. It gives a list of saved searches for possible destinations, points of interest and to academic institutions.

Google knowledge graph (Simister 2012) is explicitly and avowedly a work of design. The designs of the index cards for different kinds of entities (Singhal 2012) are based on analysis of user queries associated with those entities. Statistical analysis is used to identify salient associations of information and other knowledge objects to meet common needs. A conceptual schema and rulebase in a form that we would recognize as a KOS is built to handle associations between concepts. Then the graph is extended to leapfrog the concepts wherever possible and go directly to the data that is required, whether it is public sources leveraging linked data, or proprietary data from Google itself. The presentation layer—the index card–is designed and refined based on further analysis of user behaviours around it.

Google knowledge graph (Gilchrist et al. 2013, 5-6) is a beautiful example of the marriage of the domains of rules-based order and disordered empiricism. As Gary Marcus (2012) of *The New Yorker* put it:

> Google is becoming something else, a rapprochement between nativism and empiricism, a machine that combines the great statistical power empiricists have always yearned for with an enormous built-in database of the structured categories of persons, places, and things, much as nativists might have liked.

And herein lies the clue to the potential power in occupying the centre of our framework between "Order" and "Disorder," between "Sequestration and the Commons" and in adopting a design orientation alongside our cataloguing orientation.

6.2 Search based applications

Google knowledge graph—or rather the set of index cards that it powers—is essentially a generalized search-based application. Search-based applications are software applications that apply search technology focused on retrieving specific results for specific groups of people, from specific (usually multiple) data sources for specific highly contextualized purposes and often spanning multiple devices.

Here are some examples:

- In a factory, mobile devices monitor the geolocation of their owners, and when they approach the location of a previous safety incident, the search based application calls on an incident reporting database and a lessons learnt database and sends an alert to the person.
- In a hospital, a search-based application supports a prescribing physician by calling on commercial data from pharmaceutical databases, filtered by the hospital's e-pharmacy database for generic alternatives that are in stock, the patient's medical records system to check for contraindications and insurance coverage, a lessons learnt system for local examples of adverse outcomes, and a social sharing site on side effects and lifestyle advice.
- In an inspection and compliance job involving site visits, a mobile application checks the weather forecast for the next day, the list of upcoming target sites, and uses a mapping application to map and schedule the optimal sequence of visits for the next day.

Like Google knowledge graph, the search-based application is agnostic as to the distinction between concept and content. What the designer of a search-based application cares about is enabling productive activity, and to do this, it is essential to understand the nature and the context of the activity. In the background is the knowledge organisation work with which we are familiar–the mapping and resolution of similar concepts, the mapping of relationships that are salient to the task.

There is also work with which knowledge organisation professionals are less familiar:

- the design work of understanding the goals of specific communities of users who are engaged in specific target activities, identifying contextual needs, and pathways to meet those needs
- the design work of developing intuitive interfaces
- the experimental work of developing and testing prototypes
- the knowledge organisation work of leapfrogging concepts and mapping directly to content wherever possible
- the knowledge organisation work of understanding the target data structures and how they are interrogated
- the technology work of understanding the search tools and how they work with data sources, conceptual schemas and multiple devices.

7.0 Conclusion: the ethical challenge for knowledge organisation professionals

An ethical stance cannot be actualized without a design orientation. Yet a design orientation in and of itself is not ethical, any more than a cataloguing orientation is. My proposal in this paper is that the ethical stance for knowledge organization professionals is located at the centre of the framework in Figure 1, squarely at the centre of the dynamics between "Order" and "Disorder," and mediating the interests of the "Commons" against the eco-

nomic value created by "Sequestration." We have a role to play in achieving the marriage of our traditional cataloguing orientation with an empirical, activist design orientation that is capable of exploiting emergent insights from the domain of disorder, for productive use. Beyond the technical competencies and skills that this will involve, in the spirit of Paul Otlet, we outline here a series of five structural and institutional steps that professional associations such as ISKO should adopt if we are to meet this challenge.

1. We should explicitly endorse and work to promote the movements that seek to counterbalance the sequestration of proprietary data: e.g., open data, creative commons and open source initiative;
2. We should incorporate as far as possible into our professional work the adoption of open standards that enable exchange and sharing of data and information across the World Wide Web, such as linked open data standards and Resource Description Framework, even where such standards are not immediately called for by the task at hand;
3. We should actively question any commercial sequestration of data and information that causes demonstrable social or economic harm to parts of our communities;
4. We should actively sponsor and engage in research in empirical, verifiable methods for big data analysis, and the development of open analytical and visualization tools in this area; and
5. In our professional formation, through universities, further education, and professional development activities, we should enlarge our curricula to cover the technologies, standards and skills that are implicit in a design orientation to knowledge organisation work.

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