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Citation: Bawden, D. & Robinson, L. (2018). Curating the infosphere: Luciano Floridi's Philosophy of Information as the foundation for Library and Information Science. *Journal of Documentation*, 74(1), pp. 2-17. doi: 10.1108/jd-07-2017-0096

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Link to published version: <https://doi.org/10.1108/jd-07-2017-0096>

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Editorial review

Published in Journal of Documentation, 2017, vol.73, issue 5

Curating the infosphere: Luciano Floridi's Philosophy of Information as the foundation for Library and Information Science

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1. Introduction

The purpose of this editorial review is to re-examine the prospect that Luciano Floridi's Philosophy of Information (PI), and information ethics (IE) may serve as the conceptual foundation for library and information science (LIS), and that LIS may thus be seen as applied PI. This re-examination is timely, fifteen years after this proposal was first made, in light of the development and wider acceptance of the PI concept itself, of advances in information technologies and changes in the information environment, and of the consequent, and continuing, need for LIS to re-evaluate its nature and role.

We first give a brief and selective account of the introduction and consequent reception of the idea of PI as the basis for LIS; more detailed account of the origins of PI, and its initial reception within LIS, have been given by Furner (2010), by Fyffe (2015), and by Van der Veer Martens (2015). Then we consider whether such a basis is, in fact, needed, and, if so, what the other possibilities might be, and then examine five particular aspects of the relation between LIS and PI. The conclusions, for those who do not make to the end, are that such a foundation is indeed needed, and that PI is the most appropriate basis.

2. History of PI and LIS

The basics of PI are now quite widely understood, so that we do not need give an account of them, referring the reader to Floridi (2011, 2016A) for details, and to Van der Veer Martens (2015) for a briefer account.

We will, however, remind readers that PI is a genuinely radical over-turning of much of the basis of all previous philosophy, inspired by the prevalence and significance of digital technologies to argue that everything is fundamentally information (Ess 2009). It therefore goes far beyond issues of computing and LIS, but that does not mean that it is not highly relevant to them, nor that it disregards, or is incompatible with, what has gone before. For example, the central PI concept that the ultimate ethical good is the flourishing of the infosphere echoes Wiener's idea of flourishing as the overarching goal of computer ethics (Ess 2009), while its 'levels of abstraction' formalism (Floridi 2016B) should evoke resonances of numerous LIS contexts and issues, including metadata creation, resource description, facet analysis, taxonomy and classification, and interface design. PI, while certainly novel, cannot therefore be seen as irrelevant or inimical to LIS's worldview.

The explicit idea that LIS might be seen as applied PI was introduced by Herold (2001), in a wide-ranging survey of theories and philosophies of information which might have some

relation to librarianship. He suggested that as "all things in all libraries at all times became information", information might be "the deepest common agenda" for both philosophy and librarianship, and that Floridi's PI was of particular relevance, with its arguments "bold, and innovative and well-expressed". Herold had, however, some concerns as to whether the sense of information in PI, which he associated with that used in computing, was too narrow and uniform for the library tradition.

The idea was developed by Floridi in a 2002 paper in *Social Epistemology*, and revisited two years later in a response to series of critiques in a special issue *Library Trends* (Floridi 2002A, 2004). These two papers alone have been cited more than 200 times, and we make no attempt to comment on all these instances of the reception, preferring to focus selectively on some main themes; see Van der Veer Martens (2015) for more detailed commentary.

Floridi's 2002 paper made three main points: that LIS needs a foundational philosophy; that social epistemology (SE) cannot provide a satisfactory foundation for LIS, while PI can, provided that it is understood that LIS's area of interest is information instantiated in documents; and that adopting PI as its basis, as regarding LIS as applied PI, means that LIS, in its own research is contributing the development of PI itself; an organic and synergistic relation, far from the adoption of external 'foreign' philosophies as a basis for LIS. Each of these points is discussed below.

This paper caused the first real interest in PI among the LIS community, as was reflected in a special issue of *Library Trends* (issue 3 of volume 52, 2004) devoted to PI and its relation to LIS. The editor noted that the impetus for this was provided by Floridi's 1999 monograph *Philosophy and Computing: an introduction*, and "more for what it did not say about [LIS] than otherwise" (Herold 2004, p. 373), rather than Floridi's *Social Epistemology* paper, or Herold's 2001 remarks on PI and LIS. Indeed, of the fifteen substantive papers in the issue, only a minority made explicit and substantive mention of Floridi and PI, the other addressing other philosophical issues. The two papers which offered a critique of Floridi and Herold exemplified the nature of the debate on the relevance of PI to LIS which was to follow, and which to an extent still continues. Spink and Cole (2004) supported the idea of LIS as applied PI, suggesting this to be synergistic with developing concepts of human information behaviour. Cornelius took the opposite view, arguing that the idea was "too innocent of LIS practice to be accepted without revision" (Cornelius 2004, p. 377), considering that its account of information was too limited to encompass the social contexts of LIS practice.

Floridi's 're-assessment', which closed this journal issue, aimed to clarify issues from the 2002 introduction. Four, of particular importance in that they have re-emerged at various times as objections to the LIS as applied PI proposal, may be mentioned. First, in apparent response to Cornelius, and others who considered PI not 'social enough' to serve as a theory for LIS, Floridi responds that there are three levels at which theory may be applied, for LIS as for other disciplines: the level of day to day routine practice; the level of the delineation of the discipline and its knowledge base, as given in academic courses; and the foundational, and necessarily abstract, level. PI operates at the last of these, at is unreasonable to expect it to deal with all three, though it may certainly inform the first two, and act as a basis and stimulus for theories of these levels. Second, it wrong to imagine that PI regards factual

information as the only kind, or even the most important kind, of information. Third that, although PI regards information and knowledge, and necessarily truthful, this does not ignore the fact that "libraries are full of 'false knowledge'" (Floridi 2004, p. 662). It simply means that, from the PI perspective, LIS deals with 'semantic content' recorded in documents; semantic content including information (true), misinformation (false), and disinformation (deliberately false); see Fallis (2016) for a detailed discussion, and a note on the value to LIS research on accuracy of information of the PI viewpoint). The task of LIS is the stewardship of the semantic environment. Fourth, that PI leads to a fully worked out IE, with all the informational entities of the infosphere having an intrinsic value; the improvement of the infosphere is the primary ethical duty, and one which has a strong relevance to LIS, the discipline which, perhaps more than any other, has the task of stewardship of the infosphere.

This largely specified all that was needed to clarify and justify the relationship between PI and LIS; however, it was to be over a decade before this achieved any significant degree of acceptance.

Some years later, the concepts of the 'Fourth Revolution' and the 'infosphere' became more widely known as associated with PI (Floridi 2009), enhancing its appeal to those in LIS, and were reflected in 2008-09, with two special issues of *Ethics and Information Technology* (volume 10, issue 2-3, on 'Luciano Floridi's Philosophy of Information and Information Ethics: critical reflections and the state of the art') and of *The Information Society* (volume 25, issue 3, 2009, on 'The philosophy of information, its nature, and future developments') were devoted to PI. Although not strictly within the LIS literature, these illustrated the developing reach of PI into areas of clear relevance to LIS: IE and law, and the nature of modern information-based society. In particular, Burk (2008) noted the potential of Floridi's IE for revising legal codes relating to data, information and documents in various ways, Tavani (2008) commended the theory of privacy emerging from PI as particularly relevant for the new digital environment, while Briggie and Mitcham (2009) argued that PI could be extended to encompass information culture. Capurro (2008) took a more critical view, arguing, in a somewhat similar vein to Cornelius, for a more humanistic and hermeneutic approach, and expressing a particular concern that that PI's emphasis on the intrinsic informational value of all entities undermines a concern for humans.

Over the next five years, a series of texts appeared, giving a fuller account of PI (Floridi 2010A, Floridi 2011, Floridi, 2013A, Floridi 2014). PI also made a appearance in some of the standard texts of LIS, being briefly mentioned by Davis and Shaw (2011) and by Stock and Stock (2013), and given a more detailed treatment by Bawden and Robinson (2012), who considered it the best available option for a philosophical foundation for LIS.

In a review of philosophy in LIS generally, Furner (2010, p. 171) suggested that the reasons for "the relative infrequency with which Floridi's work has been cited in the LIS literature" at that time included its perceived close association with computer science, and hence exclusively with the technical and systems aspects of LIS, and the publication of much PI material in sources unfamiliar to LIS researchers. He argued that "it would be a gross error, however, to conclude that [PI] is somehow tangential to the primary concerns of [LIS]. Such a conclusion could be drawn only from a surface reading of the relevant works" (Furner

2010, p. 171). Similarly, Van der Veer Martens noted in 2015 that there had been little discussion of the potential use of PI in LIS in more than a decade since the issue was raised by the 2002 *Social Epistemology* article, despite the publication of these texts, and that the provocative questions addressed by Floridi to LIS remained largely unanswered (Van der Veer Martens 2015, p. 320).

A special issue of *Library Trends* (number 3 of issue 63, 2015) was devoted to "Exploring philosophies of information", with a series of papers devoted to a wide variety of topics at the intersection of philosophy and LIS. Five of the fifteen substantive articles were devoted wholly or to a large extent to an analysis of aspects of PI, while five others mentioned it to a limited extent; an indication of considerable, though far from over-whelming, interest in PI as the basis for LIS. This issue featured the first detailed analysis of the value of PI from an LIS viewpoint (Van der Veer Martens 2015). Also notable as indicators of the increasing acceptance of PI as a foundation for LIS are: the paper of Dinneen and Brauner (2015), who show how entities and events central to the information sciences are better described by PI than by alternative foundational theories; and the paper of Compton, who, similarly comparing foundational bases, while not committing himself to the superiority of PI concludes that it is "another essential perspective that contributes to a more accurate and comprehensive understanding of what the diverse field of LIS is" (Compton 2015, p. 557).

There has been little overt criticism of the idea that PI may be a good foundation for LIS, dissenters perhaps preferring to remain quiet. The most direct criticism has come from Cornelius, who repeated and extended his 2004 critique in a later paper, arguing that "I do not think he [Floridi] has developed the term [information] in a way that usefully builds an information science ... whatever else he may achieve... He imposes restrictions on himself that LIS cannot meet, and whatever insights his work offers, they do not allow the construction of a concept of information that LIS practitioners could relate to" (Cornelius 2014, p. 201). Cornelius objects to Floridi's deriving his idea of information from data, and that to something objective in the world, preferring to regard information for LIS as subjective and socially constructed, with no explicit link to data. Similar sentiments have been expressed by Capurro (2008) and others. As will be made clear later, this is not an objection which we find compelling.

Fyffe (2015), in the first article giving specific and detailed, though critical, support from an LIS perspective for PI as the basis for LIS, focuses on Floridi's ideas of librarianship as stewardship of the semantic environment, seeing this as a more appropriate basis than SE. Specifically he considers a stewardship based on the IE concept of 'ontic trust' by which all objects with some informational nature are worthy of respect. He sees this as offering support, in particular, for activities around preservation of information objects in a networked, digital environment. Fyffe recognises the danger that "placing stewardship at the centre of LIS risks suggesting that librarianship's business is primarily with 'stuff' rather than research, learning, and the users of library and information services, an old-fashioned view" (p. 269). He counters this by arguing for an emphasis on the information user's role in managing their own information environment, making clear, and original, links to information behaviour and information literacy, core aspects of LIS. [Floridi (2017) has also drawn attention to ways in which the information foraging concept of Pirolli and Card (Pirolli 2007) is relevant to information behaviour in the infosphere.] Van der Veer Martens

(2017) supports and builds on the idea of the relevance of ontic trust for the practice of LIS, relating it to ideas of document theory which extends the range of what may be considered, for the purposes of LIS, an information-bearing object, and invoking Floridi's infosphere as the domain within LIS's stewardship role should be exercised. Since then, Bawden and Robinson (2016C) have proposed that PI might be applied to questions of knowledge and understanding relevant to LIS, and a study at City, University of London is examining information privacy through the lens of PI (Pedley 2017).

PI has therefore now been accepted to a considerable extent, but far from universally, as a basis for LIS, and the first studies showing how this may be beneficial are being carried out. We set out below why we believe there should be a more general acceptance, beginning with a consideration of whether LIS needs such a basis at all.

3. Does LIS need a philosophy

There has not been a consensus that LIS needs a foundational philosophy. For example, Zwaldo (1997), noting that, in their respective literatures, librarians rarely discussed philosophy and philosophers never discussed library science, suggested that it was unnecessary, and rather self-defeating, to seek for a single philosophy, or indeed, apparently, any philosophy of LIS. And, indeed, most LIS practitioners, and indeed most LIS academics, have given little thought to the philosophical underpinnings of what they do. However, as Radford and Budd (1997) pointed out in their response to Zwaldo, the lack of philosophical discussion in the theory and practice of LIS does not mean that philosophy was absent; rather that philosophical positions, typically rather simplistic, have been, and are, assumed and taken for granted. Further, the idea that LIS has not been interested in philosophical issues is far from the truth; as Fallis and Whitcomb (2009, p.176) write, with numerous examples, "quite a lot of applied epistemology has been done by information scientists". Nitecki (1995) reviews a large body of literature relating LIS and philosophy up to 1994.

Floridi (2002A) argued that LIS does indeed need a foundational philosophy, and that the discipline's identity crisis, originating in the 1930s, has been due to a search for such a foundation, although no satisfactory one existed before PI. LIS and philosophy are actually closely associated, because of the topics in which they are interested, and the level and scope of their research. Topics of central interest to LIS, including issues of ontology, epistemology and ethics, have been studied within philosophy for hundreds of years (Floridi 2002A, Fallis 2004, Warburton 2015).

Others who have argued for the need for studies of the philosophical foundations of LIS from various perspectives are Compton (2015), Furner (2014), Robinson and Bawden (2014), Furner (2010), Burton (2009), Carlin (2009) and Labaree and Scimeca (2008); the last give several reasons for the importance of philosophy for LIS, including the generation of self-understanding about the purpose and guiding principles of the discipline and profession, and the provision of a basis for ethical decision making in practice.

We suggest that these arguments in favour of the need for a foundational philosophy of LIS are compelling, and that PI is a candidate for this. In the next section, we consider what the alternatives might be.

4. Alternatives to PI

"[LIS] researchers" wrote Floridi (2002A, p. 47), "have been lured by a variety of friendly but pre-established philosophies instead of fighting for their own place in the philosophical field". Brian Vickery (1997, p.458) had earlier expressed this tendency as "examining the ideas of a ... philosopher, extracting principles and offering them as presuppositions upon which information science may be based", while Zwaldo (1997, p. 105) considered that "[for LIS] obtaining a philosophy is something like borrowing a book ... [but] the borrowed philosophies do not really belong to us, always seem to need to be renewed, and we end up returning them, only to borrow others". Frohmann (1992) noted that "high-flying LIS researchers swoop indiscriminately down upon the theoretical terrain, colonising Popperian worlds, or cannibalizing hermeneutics, phenomenology, general systems theory, symbolic interactionism, decision theory, existentialism, structural-functionalism, cognitive science, or philosophy of language, to name just a few of the theoretical models on current exhibit in LIS research literature." [Here, as elsewhere in the LIS literature, the terms philosophy, theory and model are used essentially interchangeably.]

The recommendation of particular philosophers and philosophies as a basis for LIS is still in evidence, though usually focusing at one part or aspect of the discipline: as a recent example we may take Buschman's (2016) advocacy of Dewey's pragmatism for the librarianship aspect of LIS. Ideas of a basis for the whole discipline are, and have always been, thin on the ground, although there have been, and are, a number of 'general' or 'unified' theories of information, based variously on probability, semiotics, hermeneutics, angeletics, general systems theory, and other foundations; some are outlined in the contributions in the volumes edited by Ibekwe-SanJuan and Dousa (2014) and by Kelly and Bielby (2016). But none has gained general acceptance, and, crucially for our purposes, none has been seen as directly applicable to the concerns of LIS.

Prior to PI, there have been only two suggestions for a philosophy which might provide a foundation for all of LIS, Popper 'three worlds' and SE, although the former was seen as oriented towards the 'I' of LIS, and the latter toward the 'L'.

Popper's three world ontology (Popper 1992, Notturmo 2002), and particularly his World 3 of objective, communicable knowledge, was famously heralded by Brookes (1980) as the philosophical foundation for information science. However, its impact has been limited: although it has been popular as a pedagogical model in LIS, and some writers have made more detailed use of it in an LIS context - see, for example, Bawden (2002), Abbott (2004), and Spink and Cole (2004) - it has not generated much in the way of either detailed conceptual insight or practical guidance, being silent on crucial issues such as information ethics and information quality (Bawden and Robinson 2016). It is interesting to note that Floridi (2002A, 2002B) regards Popper's conception of a third world as an example of the evolution of PI prior to the digital revolution, and that he himself was influenced by Popper ideas of knowledge (Warburton 2015). So, while Popper's conception cannot in itself provide a basis for LIS, it may be an early pre-cursor of such a foundation.

The other alternative basis suggested for LIS has been SE, not least because its originators, Shera and Egan, were librarians. It is the only case to date of the LIS discipline influencing mainstream philosophy, although it has to be said that the influence has been somewhat limited, and that SE has taken on a distinctly different character, through the influence of philosophers such as Goldman and Fuller; for fuller discussion, see, for example, Furner (2002), Zandonade (2004), Fallis (2006) and Fuller (2016). The strength and nature of the relation between SE and LIS has always been far from clear, however. Shera himself expressed different ideas within the same book, as Floridi (2002A) noted: rather vaguely, there is "a very important affinity between [SE] and librarianship" (Shera 1970, p. 88) and more definitely "[SE] can give librarianship its intellectual foundation for which we have been searching for so long" (Shera 1970, p. 108).

As noted above, Floridi (2002A) argued that SE could not be an appropriate basis for LIS, since SE has as its basis the study of knowledge in order to discover truth. Not only does LIS have to deal with a much wider range of sources than those which provide 'true knowledge', but its remit is not knowledge itself, but the sources of knowledge, of all kinds. SE and LIS are certainly related, but both in need of a common foundation, which Floridi identifies as PI. Furner (2015) makes the same point: that Egan and Shera saw LIS as, in essence, "knowledge studies", but that field would be far wider than any LIS could reasonably encompass, and Fyffe (2015) supports Floridi's arguments against SE as a basis for LIS.

As with Popper's three worlds, several decades of debate have failed to show that SE can be fruitful for LIS as a whole (although Fallis (2006) points out examples within LIS where it is of considerable value), and on these grounds alone we agree with Floridi that it is an unsuitable foundation. Fallis (2006) suggests that, even if we accept PI as the foundation for LIS, SE may be valuable as a framework for some LIS activities, those focused on knowledge acquisition, and this seems a helpful viewpoint.

There seems, therefore, to be no real alternative to PI, as a single philosophical basis for LIS. We now turn to look, more positively, at why, and how, it can form such a basis.

5. PI as basis: why and how

"Insofar as PI satisfies the role of a theoretical foundation of LIS", Floridi (2002A, pp. 47-48) wrote fifteen years ago, "it provides a systematic understanding of the basic concepts related to [LIS], by studying the nature, values and goals of practices in librarianship. The philosophy of librarianship has often been looking for some external source of theoretical support, outside its real scope. By contributing to the development of PI, LIS can carry on the task of developing its own theoretical foundation from within. This is a good sign that we might finally have taken the right approach."

The broad scope of PI makes it an attractive candidate as a basis for LIS, since it suggests that it should be able to deal with any and all future developments. As Furner (2010) points out, PI is firmly within the mainstream of philosophy *per se*, and addresses issues both of philosophy of LIS (what should the discipline be) and philosophical issues within LIS (typically issues of ontology, epistemology and ethics). Merely because the scope of PI

extends well beyond that of LIS does not imply a lack of relevance. PI also fits well into the general development of philosophical ideas within LIS, as Morán-Reyes (2015, p. 587) points out: "the philosophy of information is congruent with library tradition. From Bliss and Danton's discussion in the 1930s, though Egan (without Shera), Nitecki, and Floridi, there stands a very definite genealogical line."

Because it combines both Eastern and Western philosophical traditions, being part of a wider environmental ethics movement away from various anthropocentric philosophies, PI offers the possibility of a global and multicultural approach to IE (Ess 2009, Floridi 2008); very much in line with LIS's concern to address its issues in this way (see, for example, Aytac et al. 2016, and references therein). For Eastern perspectives on PI, see Gang (2007) and He (2017).

5.1 Scope of LIS

Floridi (2002A) suggested that LIS as applied PI may be defined as "the discipline concerned with documents, their life cycles and the procedures, techniques and devices by which these are implemented, managed and regulated. LIS applies the fundamental principles and general techniques of PI to solve definite, practical problems and deal with specific, concrete phenomena. In turn it conducts empirical research for practical service-oriented purposes (e.g. conservation, valorization, education, research, communication and co-operation), thus contributing to the development of basic research in PI)".

This is very close to many definitions of LIS proposed from within that discipline, typified by that of Bawden and Robinson (2016B): "Library and information science is the discipline which studies the information communication chain: all aspects of the creation, organization, management, communication and use of recorded information. It supports the professional activities of the collection disciplines, including information management, librarianship, archiving and records management."

Further, as Furner (2010) points out, the list of topics in the information life cycle given by Floridi in a discussion of PI and information dynamics (2002B, p. 138), including authoring, collecting, classifying, retrieving, accessing, and using, are very similar to those typically taken as the concerns of LIS specialists. Indeed, that are similar to those proposed by Robinson (2009) as the core of LIS. This shows such a close relation between PI and LIS, that, together with the similarity in definition, it seems almost perverse to argue that the two cannot enrich each other.

There are other examples of this similarity. For example, Floridi's (2013B) analysis of what constitutes a philosophical question in terms of the information resources required to answer them has interesting resonances with LIS's understanding of the difference between open questions (research) and closed questions (reference).

Floridi (2002A) argues that a test for a good philosophical foundation for LIS would be whether it allowed philosophy learn from LIS, and we believe that this is indeed the case, if LIS is regarded as applied PI.

One feature of PI, attractive to our minds is that it encompasses, and links, the various information-like entities of concern to LIS, captured in the popular, if simplistic, data-information-knowledge-wisdom model. Data is, of course, at the foundation of PI, and its importance in the philosophy of information has been discussed by Furner and by Leonelli (2016). Furner (2017) further argues for the importance of a philosophy of data, as distinct from treating data within PI, where all information is data of some kind, but we are not entirely convinced by Furner's arguments, and think it more helpful to regard information and data as very closely connected, as in PI, with attention shifted where necessary from information-centric to data-centric (Floridi and Taddeo 2016). We consider, unlike others, for example Cornelius (2014), that the inclusion of data within PI makes it more, rather than less suitable, as a basis for LIS, if only on the pragmatic grounds that data handling is becoming ever more important for LIS specialists (Robinson and Bawden 2017). It helps us avoid what Floridi has identified as an undesirable new dualism of approaches: one which emphasises data, pattern, syntax, and quantitative methodology, and one which favours information, meaning, semantics, and qualitative methods (Bawden 2016). If we are to integrate the two, as seems essential, then PI seems the best candidate to achieve this.

Although PI has hitherto concentrated on data and information, it may also be extended to considerations of knowledge and of understanding; see Bawden and Robinson (2016C) for a provisional approach to this.

Dinneen and Brauner (2015) consider the relevance of PI to LIS by examining its treatment of materials and processes of relevance to LIS, and conclude that the definition of information within PI is more appropriate than that in numerous other theories of information; see also Pleshkevich (2016) for a perspective based in the Russian literature.. Dinnen and Brauner raise one problem which had caused problems for the acceptance of PI within LIS; its insistence on the truthfulness of information. While this may be readily avoided by suggesting, as Floridi does, that what LIS deals with is meaningful data / semantic content, this has posed an apparently psychological problem to some LIS specialists, who dislike the idea that what they deal with is not information. However, Dinneen and Brauner argue that this is not a significant problem in accepting the PI definitions for LIS, as does Fyffe (2015). Semantic content includes fiction and other forms of material of relevance to LIS (Van der Veer Martens 2015). And in general LIS has never been concerned with the truth of information *per se*, but with the quality of semantic content, specifically with the accuracy, authority, and completeness of testimony (Fallis 2004, 2016), clearly within the remit of PI (Floridi 2014B, Floridi and Illari 2014).

So we conclude that PI is indeed able to deal with all the forms of information and documents with which LIS is concerned. Indeed, Van der Veer Martens (2015) suggests that this may be one of the ways in which LIS may contribute to PI: the variety of types of documents dealt with by LIS may lead to a helpful revision an extension of the ontology of information within PI.

5.2 Information in the wider world

At its most fundamental level, PI addresses the nature of reality itself, arguing that it is informational, consisting at root of a kind of fundamental data: 'dedomena', "mind-independent points of lack of uniformity in the fabric of Being", whose inter-relations

account for all structured entities in the world. This is the philosophy of 'informational structural realism' (Floridi 2011, Ward Bynum 2016), which holds that there is an observer-independent reality, whose ultimate nature is neither physical or mental, but informational, and defined by the interactions between informational entities.

PI can also be related to the idea of information as a fundamental constituent of the physical world, through, for example, the idea of quantum informational structural realism (Ward Byman 2013). Floridi (2010B) notes the physicist Frank Wilczek's (2008) idea that matter is a function of the 'Grid', what we perceive as empty space, but is actually a highly structured entity, to be a physical counterpart of the infosphere. There are numerous other ways in which information may enter physical considerations (Bawden and Robinson 2013A, Harshman 2016), and while these may not have a bearing on day-to-day LIS activities, they enable a pleasing linkage, if not unification, of the different usages of the information concept (Robinson and Bawden 2014). PI, rooted in the idea of data as a discernible difference in the world, is well placed to aid such a linkage.

It is worth emphasising, as does Floridi (2016C) that PI is not intended to provide a single, unified theory of information in all domains. Rather it provides a formal framework for linking and relating the various aspects and manifestations of information, and hence for integrating, though not in a reductionist way, the information-centred disciplines, including LIS. This seems to us to be a very attractive feature of PI for LIS, which has always been concerned about its place in the intellectual world (Dillon 2007, Bawden 2015).

5.3 Information ethics and information society

That PI should begin with an ontological analysis of information *per se*, and lead directly into a system of ethics based on this, is one of its most remarkable features (Ess 2008), and one which makes it compelling as a basis for LIS. No alternative philosophical foundation yet proposed has attempted such a broad scope.

Furner (2010, p. 172) points out that PI is embedded in social theory, and that "Floridi's conception of the infosphere is in itself an original contribution to our understanding of the development of the information society". He also notes that PI's ethical dimension is important in claiming relevance for LIS. When combined with the possible extension of PI beyond IE to law, economics and politics (Floridi 2015), it seems clear to us that those who have claimed that PI lacks a full social dimension are seriously mistaken.

There was an early concern about IE, based on the misunderstanding that its insistence on the intrinsic information value of all entities leads necessarily to an 'egalitarianism' in all things; that "a work of Shakespeare is as valuable as a piece of pulp fiction, and a human being as valuable as a vat of toxic waste" (Brey 2008, p. 112). Such criticisms unfortunately persist, as in the suggestion that following a Floridean ethic would lead us to allow HIV to persist and cause the death of people, and that we would conclude that, since all political ideas have some informational value, the more Nazis there are the better (Fuchs 2016), as well as more nuanced criticisms such as those of Capurro (2008). Floridi has, we believe, convincingly answered such criticisms in various places (see, for example, Floridi 2008; see also Taddeo 2016) to the effect that because every entity is assigned some moral (informational) value to begin with, does not imply that they will continue to have the same

value after any thought has been applied: "the point at stake is not some daft idea about the intrinsic value of Shakespeare versus Dan Brown" (Floridi 2008, p. 193).

We would also add that we believe that anyone who reads Floridi's 'On human dignity as a foundation for the right to privacy' (2016D), with its evocation of human exceptionalism as "each of us, as a beautiful glitch, is a fragile and very pliable entity whose life is essentially made of information", will find it hard to argue that PI lacks a humanistic perspective.

It was recognised a decade ago that Floridi's IE was able to address issues of direct concern to LIS, such as the laws governing privacy and intellectual property (Burk 2008, Ess 2008, Ess 2009). Even so, IE has been criticised at various times as being too abstract, and not giving help in specific situations (see, for example, Mathieson 2004, and Stahl 2008). Floridi sees this as arguably a virtue, since what is provided is a common framework within which may be made detailed ethical and legal proscriptions for particular topics (Floridi 2008, Ess 2009). This is an example of where LIS may not only benefit from, but also contribute to, PI, as in the City University studies of informational privacy (Pedley 2017).

5.4 The information environment and the fourth revolution

Floridi's concepts of the fourth revolution, the infosphere, and onlife, all directly drawn from PI, give us a new perspective for understanding the radical, rapidly-developing, and often confusing, changes in the information environment which cause continual reassessment of the nature and purpose of LIS.

The four revolutions are Copernican, Darwinian, Freudian and Informational; revolutions in that they radically change humanity's view of itself, and its place in the world. It is worth noting that Floridi's fourth, Information, revolution is not, as is often imagined, to be equated with the advent of the digital computer, or the internet; it did not begin with Shannon or von Neumann, with Turing or Berners Lee. It is much older, stemming from the origins of recorded information; but it has now come to the fore because digital information and communication has come to have such a dramatic impact (Floridi 2014A, 2017). This is surely a perspective very appropriate for LIS. There are, however, other interpretations of the information revolution which are also consistent with PI. Giardino (2016) prefers to think of Floridi's fourth revolution as a second information revolution, encompassing the stages from cultural transmission to online communication, and preceded by a first, and essentially biological, information revolution, from encoding in DNA to cultural transmission. From a history of technology perspective, perhaps more familiar to those in LIS, Beavers (2012) proposes a sequence of four information revolutions: writing, printing, multimedia and digital information. Floridi (2016E) agrees that both of these are also fruitful ways of viewing the fourth revolution as the context for PI.

This evokes another reason for accepting PI as a foundation for LIS; it is able to guide us through the very rapid and far-reaching changes in the practice of LIS, resulting from the changing information environment of the fourth revolution. Floridi had actually drawn attention to the consequences for libraries at a very early stage, although, as Van der Veer Martens (2015) points out, it went largely unnoticed by anyone in LIS: ".. the library itself may disappear, as we move from the holding and lending library, which stores knowledge physically recorded on paper, to the consulting library, which provides access to electronic

information on the network ... finally from the library as a building to the library as a gate node in the virtual space of the digital encyclopedia" (Floridi 1995, p. 264). [Floridi (2010) tells us that he came upon the idea of PI on the banks of the Cherwell in Oxford in the summer of 1998; it seems that his thoughts on libraries may have played some part in its formulation.] And so our final section considers what PI implies for the developing practice of LIS.

5.5 Curators of the infosphere

The significance of PI for the practice of LIS is cogently summed up by Floridi: "The library and information community ... are experiencing a profound evolution of their role from keepers to curators of the infosphere" (CILIP 2017). Building on the ideas of Fyffe and Van der Veer Martens that ontic stewardship is a logical development of PI, this shows that LIS can indeed fruitfully be regarded as applied PI. The active role of curation, first explicitly stated for LIS by Fyffe (2015), is crucial, and not only in directing the preservation of the human record. It should also help in LIS's search for its remit in helping to overcome some of the perceived problems of the current information environment: fake news, post-truth, alternative facts, filter bubbles, and the rest (Bawden 2017).

6 Conclusions

Dineen (2017, p. 1) writes "It has become easy to make a case for the relevance, richness, and importance of philosophical thinking for information research and practice" This is a rather new, and pleasing, situation, and we feel that the advent of PI has played a large part in its achievement. It is salutary to note how much the arguments in Floridi's 2002 and 2004 articles have stood the test of time, and how long it has taken for them to be accepted.

Van der Veer Martens (2015, p. 348) suggests that "... LIS may just be as important to PI as PI is to LIS in terms of deepening our mutual understanding of information ontologies, the dynamics of informational domains, and the variety of evolving relationships among information organisms and information objects". This is certainly ambitious, but not, we think, unrealistic.

Tom Wilson (2016), reviewing *The fourth revolution* wrote that "information science, if it is to continue to exist, [must] become holistic, rather than focussed narrowly on such matters as information retrieval; this could be a foundation text for such a field". We believe that the same is true for PI in general, forming the foundation for a broad LIS. It is certainly more attractive, and fruitful for developments in both research and practice, than the pre-PI concept that Popper's philosophy might be the basis for information science, and SE the basis for a wholly separate library science.

We suggest that the time may be right for a research programme, building on the initiatives noted above, to investigate the relations between PI and LIS. This should offer reciprocal advantages, as each topic enriches the other. Three main strands within LIS seem appropriate for investigation in this way:

1. Information and documents within LIS, using PI to investigate the ontology and epistemology of the section of the infosphere of particular relevance to LIS, and affecting

particularly document theory and knowledge organisation. Revisiting the traditional LIS data-information-knowledge framework, this is timely in view of the new forms of document with which LIS will have to deal (immersive), and the increasing involvement of LIS in big data issues.

2. Information dynamics, applying PI on the one hand to the information user (information behaviour and practices, digital literacy) and on the other to LIS activities such as preservation and archival selection.

3. LIS ethics, applying PI to issues such as privacy, intellectual property, information access, and the ethical duties of information providers

Jonathan Furner (2010, p, 173) writes: "It is to be hoped that projects in which PI is applied to topics in Floridi's broad categories of information dynamics continue to attract willing volunteers. There is much to be done." We could not agree more.

Acknowledgements

We thank Luciano Floridi and Betsy Van de Veer Martens for supportive comments and helpful suggestions.

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