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Embedded, Added, Co-created: Re-visiting the Value of Information in an Age of Data

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Abstract

This paper proposes that the value of information is a topic worth re-visiting in the contemporary era. While the topic has been of perennial interest to information professionals and others, since at the least the early 1980s, we believe that it is timely to re-revisit this question in the context of a more connected and networked environment of data, information, and knowledge. The principal argument is that existing models of information exchange and use do not sufficiently take account of the multiplicity of networked users as a source of value, e.g. their implicit and explicit interactions with other users, and with the information system. We briefly review existing kinds of value that have been theorised, operationalized, and measured in the information science literature. Principally, these are the notions of information as embedded value; and information and information systems as adding value. To these notions we add the further notion of connected or co-created value. We conclude our opinion paper with a set of questions intended to orient future research into the question of the value of information in the contemporary era.

Introduction

The value of information, and of the services involved in its delivery, has been a topic of perennial interest to information providers, their users, and others across a range of sectors (e.g. business, health) (Taylor, 1982, 1986; Saracevic and Kantor, 1997a, 1997b; Choo, 2002; Scholl, Eisenberg, Dirks and Carlson, 2011; Matthews, 2016). In this opinion paper, we propose that the recent data explosion (Kitchin, 2014), along with new technological conditions of information production (Benkler, 2005) invite a re-appraisal of the value and valuation of information in the contemporary era.

The structure of the opinion paper is as follows. It begins by addressing why the value of information is a question worth re-visiting. This justification is followed by a brief review of how the concept of value has been defined in the information literature; how existing models have theorized and operationalized value, and how the value of information has been measured. The main gap identified is that existing value concepts and models pay insufficient attention to the connected networked environment of data and information, devices and users that exists beyond the organised professional context of information provision. While the individual user has been theorized and researched, the multiplicity of networked users as a source of value, e.g. their implicit and explicit interactions with other users, and with the information system has tended to receive less attention in existing models

of information use. The article concludes with questions for orienting research into the value of information in today's world.

Why re-visit the question of the value of information?

A number of reasons can be offered as to why re-visiting the question of the value of information is timely and necessary. The reasons can be broadly grouped into those related to the input into the information system, its transformation process, and to its output.

The data explosion and its emergence as a resource and economic asset has vastly increased the available pool of information on which analyses are conducted, and decisions taken (Foster, 2016; Gandomi and Haider, 2015; OECD, 2015; McCallum and Gleason, 2013; Cukier and Mayer-Schonberger, 2013). Data are now a routine input into both primary data-driven goods and services e.g. vehicle navigation, travel information, financial information services, and restaurant bookings; and secondary goods and services, e.g. deciding on the most effective treatments, making resource allocation decisions, and conducting population analyses in health. In sum, data have become a new source of value as a primary resource in their own right, but also as a secondary resource in support of the delivery of other primary goods and services. While data are captured on a largely involuntary and automatic basis, networked technological conditions have also given rise to the voluntary and explicit contributions of the public and consumers to the production of networked information products (Benkler, 2006). Data-driven services also enable the automatic capture, algorithmic processing, and analysis of data about the actions and interactions both prior, and subsequent to, accessing an information service. In terms of output a data-driven environment may also create value in the form of personalized content and services. While risks to the informational value being created remain (e.g., bias, trust, incompleteness and inaccuracies), these more costly aspects of creating value in a data-driven environment do not detract from the benefits of data and data analytics in contributing to, and augmenting, the organised professional context of information provision.

In sum, how the connected data environment, and forms of networked information production are of value in their own right, how they form a networked information value chain, and how they feed into the development and provision of traditional information products and services are under-researched questions in terms of existing information value concepts and models.

Value

Value can be defined as “The worth of something compared to the price paid or asked for it” or “The regard that something is held to deserve; the importance, worth, or usefulness of something” (Oxford English Dictionary, 2017). An immediate distinction can be drawn between the ‘exchange value’ of information, and the ‘use value’ of information. Therefore, we begin our exploration of value with the notion of information as an asset, and value as embedded in information. This is a notion typically associated with an economic perspective, and of the value of the information exchanged between information provider and user. A review of approaches that focus on the use value of information then follows. In focusing on the use value of information we principally examine Taylor’s value-added model of information and information systems, which is the origin for the approach, within the information science literature. We complete our brief review of value concepts and models, by focusing on how a networked data and information environment gives rise to notions of connected and co-created value. This is a concept of value we suggest needs to be accommodated by current information value concepts and models that are principally concerned with the distinction between exchange value and use value. A concept that needs to be taken into account, i.e. theorized, operationalized and measured, when evaluating the worth of information and of information systems.

Embedded value

The connection between the value of information and the economy has been a consistent theme since the early 1970s (Bell, 1973; Porat, 1977; Benkler, 2006; Foster, 2013; Foster, 2016). Of particular relevance in the current context is the notion of information as an economic asset (Hawley Committee, 1995; Horne, 1995; Oppenheim, Stenson, and Wilson, 2003a, b, 2004; Wilson and Stenson, 2008). In a pre-Internet era there was a tendency for the functions of production, distribution and consumption of information goods (e.g., news, music and search) to be performed under the exclusive control of independent information providers. To some extent this situation contributed to the idea that the value of information was embedded in the goods themselves. For example, information goods such as music, film, search, news, and software can be differentiated in their digital form from other goods by virtue of the information they contain (Foster, 2013). If the digital content is intended to reach the consumer via the market, a price is then placed on the goods, which reflects the exchange value of those goods. A value determined by the costs of production, the market competition, and the consumers’ ability and willingness to pay. This is an exchange value that is typically

measured in monetary terms. The idea of information as an economic asset is concerned not only with its direct value, but also with its indirect contribution, understood in economic terms, to organizational goals (Oppenheim, Stenson, and Wilson, 2003a, b; 2004).

Taylor's value-added model of information systems and services

An alternative to the economic approach of information as an asset, and valuing information directly or indirectly in economic terms, is to the notion of the use value of information or the value of information in use (Taylor, 1986). In other words, rather than taking data and information as objects or things, whether as assets or not, Taylor's approach is to take the notions of use, user, and user environment as his starting-point. More particularly he makes a distinction between data, information, and knowledge on the one hand and the resources and services that aid in making that data, information and knowledge more useful. The value of information and information systems resides not in the information itself, but how useful information and information systems are as determined by user-defined criteria.

In a series of articles and a monograph, Robert Taylor initiated and expounded an interest in the value of information, and of the information resources, e.g. services, technologies and systems, that exist to add value to the transfer of information from system to user. His general premise was that the value of information resides not in information itself, but in the context of its use. From this premise we can infer that the task of designing information systems and services should begin with a description of the environment where information will be used, that information is only of potential value, and that information resources exist to "provide mechanisms that (a) can signal this potential, and/or (b) can relate the potential to a specific problem in a specific environment" (Taylor, 1986: 17). In other words, rather than beginning with either information or systems, the task of designing begins with the user, and the information use environment, and "that environment essentially (a) establishes the conditions of information flows into, within, and out of any particular entity; and (b) determines the criteria by which the value of information messages will be judged" (Taylor, 1986: 3). Taylor also viewed his tripartite model of (i) information use environment (ii) interface or negotiating space (iii) system environment, as a system: "if we take a systemic view of the information process from the point of generation of new data to the point of actual use of that data, then there is a total cost (time, energy, money, know-how, equipment, etc.) attached to that information" (Taylor, 1986: 5). Viewed systemically, the use value of information, along with its benefits and effects, can be viewed as being interdependent with the individual and total costs involved in resourcing the production,

distribution, and consumption of the information. For Taylor, however, this economic interpretation of value, in which the costs of each of the value-adding activities involved in converting data into usable knowledge, is accounted for in determining the final price of the information system or service, represents a secondary concern. His primary concern is with a number of other interpretations of value, which relate to the usefulness of the information provided. These include (i) *value-adding processes* i.e. “What characteristics or attributes are added to the data and information items being processed that make them more useful (i.e., valuable, beneficial) to users, clients, customers, than they were at the start of the process”? In addressing this question, Taylor was mainly concerned with how a system, and interface, adds value according to user criteria of ease of use, noise reduction, quality, adaptability, time-saving and cost-saving (ii) the *apparent* value of information, and the costs, e.g. time, effort, attention, that a user is willing to spend in searching for the information, and (iii) the benefits and effects, for the user or for the organization, of using the information, e.g. sense-making, informed decision-making, performance effects or risk mitigation (Taylor, 1986: 19-20). In summary, Taylor’s model provides a use and user-driven perspective on information, systems and services; and provides a set of criteria for assessing the value of information, the resources consumed, and the processes involved in transferring information from system to user.

Extensions of Taylor’s model

Since its initial exposition, Taylor’s framework has developed in principally two directions: the description of the Information Use Environment or IUE (Taylor, 1991); and the extension and testing of value-adding processes. A number of information use environments have been explored, including those of caregivers (Kazmer, Glueckauf, Ma, and Burnett, 2013), managers (Simard and Rice, 2011), medical practitioners (Olatokun and Ajagbe, 2010), abused and neglected children (Hersberger, Murray, and Sokoloff, 2006), the home environment (Rieh, 2004), and inner-city gatekeepers (Agada, 1999). Saracevic and Kantor (1997a, 1997b) develop the notions of value of information, and value of information services in use in the direction of the relationship between value and relevance. Choo (2002) incorporates value-adding activities into the role of information professionals; while Scholl, Eisenberg, Dirks, and Carlson (2011) modifies and extends Taylor’s framework by incorporating the additional user criterion of affection, by re-labelling the cost savings criterion to a performance criterion, and by adding further values to each of the existing criteria. The websites of professional sports teams (Scholl and Carlson, 2012) have also been evaluated by drawing on Taylor’s notion of value-added criteria. Matthews (2016) extends

the notion of added value to that of a value proposition, as part of a changing business-oriented model for libraries, archives, and museums.

Co-created value

Notions of exchange value, use value, and value added have largely been developed in the organizational and professional context of information systems and information services. However, a connected networked environment provides the opportunity to theorize, operationalize and measure the co-created value that users can also contribute to information provision, and the delivery of information systems. We suggest a number of directions that studying this notion of value might take.

First, what Taylor could not have foreseen are a number of factors that radically change the context of information use, and the environments and resources involved in the production, distribution, and consumption of information. These include the widespread diffusion of Internet, web, and mobile technologies that provide a platform for the value-added distribution of information; the democratization of the tools of information production that enable not only information professionals but also users and members of the public to be involved in the total information production system; the emergence of active rather than passive users; the development of new practices of commons-based production; the implementation of sensors and the emergence of an Internet of (Every)Thing(s); and the contribution of each of these factors leading to an explosion in data and information. Altogether these factors necessitate revisiting questions of value, value-adding processes, and use. The implications of this include: an extension of the information use environment, and the data-information-knowledge-chain (Taylor, 1986) into the networked environment. This extended reach and scope has implications for all elements of the chain, e.g. the value of big data, of peer information production, along with the total the exchange value and cost of accessing information, and turning data, via information, into informative and productive knowledge etc. Taylor's model also remains wedded to the perspective of professional information provision, and of adding value via user-provider interactions and the interface; this needs to be supplemented by an exploration of user-user interactions. While in a networked data and information environment, there is increased scope for the joint development and co-creation of the value of a service e.g. recommendation and personalisation.

Second, while data are captured on a largely involuntary and automatic basis, networked technological conditions have also given rise to the voluntary and explicit contributions of the public and consumers to the production of networked information

products (Benkler, 2006). These contributions can be either aggregated, into search and recommender systems for example, or can form the basis for the joint production of information products such as wikis, and open source software (Sunstein, 2006). The value of these processes variously resides in their ability to access and aggregate across many minds, their deliberative rather than hierarchical approach to the process of value creation, and their production of information goods that exist in a peer produced space that invites further contribution. Such notions of networked information production can usefully extend existing models of information use.

Third, exploring concepts of co-created value that draw on the capacity of networked technology to both personalise the experience of interaction and outcomes for the user. In other words, the shift from the user as largely independent of information, to the user being actively involved in the value-creation process, and participating in the co-creation of value. Interactions rather than information are the locus of experience and value: “We are moving toward a world in which value is the result of an implicit negotiation between the individual consumer and the firm” (Prahalad and Ramaswamy, 2004: 7). The most obvious venue for such co-created experiences and the co-creation of value currently being social media (e.g. Facebook, Twitter). Despite its focus on the user, Taylor’s model remains information provision-centric: “...companies must escape the firm-centric view of the past and seek to co-create value with customers through an obsessive focus on personalized interactions between the consumer and the company. Further, doing so will require managers to escape their product-centered thinking and instead focus on the experiences that customers will seek to co-create” (Prahalad and Ramaswamy, 2004: 7). While Vargo and Lusch (2004) point to the act of service itself as the reciprocal “application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself” (Vargo & Lusch, 2004: 2) as a source of value. In such a context the value of personal data and the perceived trade-off between privacy and service provision (Spiekermann, Böhme, Acquisti, and Hui, 2015; Spiekermann, Acquisti, Böhme, and Hui, 2015) are also pertinent topics.

Conclusion: Revisiting Questions of Value

In our concluding section we present a set of questions intended to orient future research addressing the question of the value of information in the contemporary era:

a) The emergence of data as well as information as a source of value mandates revisiting the ‘value-added spectrum’ of data-information-knowledge-action that forms a value cycle and a rationale for the application and use of costly resources. How can this be accomplished?

b) Viewed systemically, and anchored in information use and information use environments, Taylor’s value-added model distributes value across its different elements. Does this distribution change when information is peer produced in environments external to an information service?

c) The information use environment is now spatially and temporally extended beyond the organizational boundaries of the information use environments that Taylor was referring to. Information flows are more multi-directional than linear. Does this change the users’ criteria for judging the value of information, search and information services?

d) The emergence of an active user means that value is not only value-added but also co-created. What does this mean for a value-added model of information systems and services? And what methods can be used to underpin the co-production and co-creation of value in search, information services etc.?

e) What are the effects of co-creating value on the value of information? How do we measure, and quantify, value in pervasive information use environments?

f) What are the effects of co-creating value on the user? Do we move from search and information services to search and information experiences? And how can these be evaluated?

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