

Paper: Ecological Systems Modelling of Information Behaviour: Theory to Increase Research Impact

Abstract: This paper reviews ecological models and approaches within LIS research, asserting that Information Behaviour researchers should activate our potential to impact public policy by applying Bronfenbrenner's Ecological Systems Theory (EST). Two case studies of information behaviour studies remodelled according to EST are presented as examples.

Résumé: Cette communication examine les modèles et les approches écologiques dans la recherche en BSI, argumentant que les chercheurs en comportement informationnel devraient activer notre potentiel à avoir un effet sur les politiques publiques, en appliquant la théorie des systèmes écologiques de Bronfenbrenner. Deux études de cas de comportements informationnels remodelés selon cette théorie sont présentées en exemple.

1. Introduction

Information behaviour (IB) research carries the potential to inform information-related policies and processes in society. Yet, IB research commonly limits conclusions to understanding behavioural processes on an individual or small group level. Action recommendations arising from IB research tend to be aimed at libraries and information systems. Rarely do we see an article make recommendations for political or social changes, despite the fact that we live in an era in which our politicians are increasingly called upon to make information policy without sufficient background knowledge of information systems, structures, or behaviours.

We know that policy makers face challenges incorporating research into practice (Berryman and Sydney 2006; Greyson, Cunningham, and Morgan 2011; Levin 1991; Nilsen 1998; Webber 1987). In order to increase the impact of IB research on public policy, IB researchers might follow the lead of other disciplines studying human behaviour within complex systems, by applying ecological systems approaches in order to generate findings tailored toward informing policy.¹

2. Ecological Systems Theory

Behavioural psychologist Urie Bronfenbrenner encouraged researchers to be both policy-relevant and policy-informed, noting that "basic science needs public policy even more than public policy needs basic science" (Bronfenbrenner 1979, 8). Bronfenbrenner's ecological systems theory (EST) aims to understand the influence of environment on "human nature" by modelling nested, interconnected systems that manifest "overarching patterns of ideology and organization of the social institutions common to a particular culture or subculture" (ibid.).

Ecological systems models are typically portrayed via concentric circles, with the individual, and individual-level characteristics, at centre. This core is nested within a *microsystem*, comprising activities, roles and personal relationships in which the individual engages. Elements of the microsystem interact with each other in the *mesosystem*. The next layer out is the *exosystem*, containing settings that influence the individual, but with which the individual does not directly interact. The outer layer in Bronfenbrenner's original theory is the *macrosystem*: subculture- or cultural-level systems that shape the environments and relationships in which the individual engages.

3. Beyond Describing Context

The novelty in EST is not the identification of environmental influences, but rather the interactions among the influencing entities and their impact on the individual. Ecological systems models reach beyond describing context to systematically mapping the hierarchical structures of relationships that influence human behaviour in context.

There has been a shift over the past 30 years from a focus on information systems to a focus on the information user in (what we now refer to as) IB research (Case 2006; Courtright 2007; Nahl and Bilal 2007; Spink and Cole 2006), and context has emerged as a key element of user-centred investigations. In her review of "Context in information behavior research," Courtright (2007) delineates two major ontological understandings of context, that of "context as container," in which context is the setting within which behaviour occurs, and that of "context as constructed meaning," in which a series of enabling and/or constraining factors act to influence behaviour. This latter, constructivist conception most closely resembles EST.

4. Use of "Ecology" in LIS Research

"Ecological" approaches and the term "ecology" are not foreign to the field of LIS, or even the sub-field of IB research. Some research has applied derivations of ecological systems modelling to information behaviour research, while others have eschewed the social science tradition regarding the use of "ecology" in favour of drawing direct analogies to biological environmental systems and settings. Yet others have drawn inspiration from the same ecological psychology upon which Bronfenbrenner built. These uses are challenging to disentangle, and span multiple information sub-disciplines.

4.1 Williamson's Ecological Model

The major LIS researcher to adopt and adapt Bronfenbrenner's EST is Kirsty Williamson. In her dissertation on the information seeking of older adults in Australia, Williamson was influenced by aging researchers who advocated use of EST. In subsequent articles, Williamson has generated models that resemble those often used to depict Bronfenbrenner's EST in that they are based on a series of concentric circles with the user at centre (Williamson 1998; Williamson and McGregor 2006, Williamson in Fisher, Erdelez and McKechnie 2005, 128–132).

While Williamson's ecological model/theory originated with an adaptation of Bronfenbrenner's EST, it has since evolved to differ in key ways. Rather than depicting nested, interconnected systems and relationships in order to illuminate the influence of social factors on human behaviour, Williamson's ecological models portray the interactions between an individual and various information sources, rather than conceptually-nested and interacting themes and categories among the levels.

4.2 Nardi and O'Day's Information Ecologies

In contrast to Williamson's adaptation of EST, anthropologists Bonnie Nardi and Vicki O'Day (1999) employ "ecology" as a biological metaphor to explore the integration of information technology within society. Nardi and O'Day describe "an ecology" as an organizational setting in which information practices take place, inhabited by individuals including "keystone species" such as librarians. These "ecologies" are complex but of limited breadth, containing only individuals with which one might personally relate (1999, 50). This exclusion of large-scale social processes and policies, as well as millieux that do not personally include an individual, suggest that Nardi and O'Day's information ecology would be restricted to the microsystem level of an EST-style model.

4.3 Use of Ecological Psychology in LIS

Other recent uses of "ecology" or "ecological" in LIS research reference the 1950s-originated "ecological psychology" that first acknowledged and scientifically investigated the impact of environment upon human development. Examples of this include Ecological Interface Design within Cognitive Work Analysis, championed by scholars Raya Fidel and Annelise Mark Pejtersen, and some of Lisa Given's IB research (Given in Nahl and Bilal 2007, 166; Sadler and Given 2007).

5. A Proposal for Incorporation of Classical Ecological Systems Modelling in IB

IB scholars who desire to improve information policy and increase equity in access to information should attempt to apply ecological systems models that facilitate identification of policy implications -- such as Bronfenbrenner's EST -- in order to improve the policy-relevance of our findings, and increase the impact of our research beyond libraries. Bronfenbrenner's 1979 critique of the "hypertrophy of theory and research focusing on the properties of the person and only the most rudimentary conception and characterization of the environment in which the person is found" (16) could easily be levelled against IB research today.

Adopting ecological systems modelling as a strategy does not preclude use of existing IB models and frameworks, as several are quite congruent with EST. Examples include Information Grounds (Fisher, Durrance, and Hinton 2004) and Life in the Round (Chatman 1999), as well as theories advanced by Wilson (2006), Sonnenwald (2006) and Savolainen (2002).

5.1 Case Studies

As an example of how one might apply an EST approach to a typical IB article, I re-model the findings presented in two recent articles examining information behaviour in context, casting the

results within an EST framework. The first of these case studies is Williamson and McGregor's (2006) aforementioned study of secondary students' plagiarism practices, followed by a recent article reporting on the information behaviour of Canadian pharmaceutical policy makers (Greyson, Cunningham, and Morgan 2011). This exercise illustrates application of an EST-informed ecological systems model to an IB study in order to develop additional themes and identify possible mechanisms for influencing information behaviour.

5.2 What Does EST Modelling Contribute to IB Research?

Ecological systems modelling—much like any other form of data analysis or presentation—has limitations. Mapping relationships and environments de-prioritizes the listing of information sources and seeking actions that are typically at the forefront in IB literature. Ecological systems models complement such traditional IB findings, adding meaning and allowing us to better understand *why* an individual engages in given behaviours or consults given sources. EST also aids in development of interventions for change: for instance, if one wished to decrease the level of plagiarism among the students in Williamson and McGregor's study, one would now be able to examine the influences and develop interventions that act on multiple levels to reinforce each other and support change in behaviour.

6. Conclusion

While elements of EST are occasionally applied in IB research, it is time for greater uptake. Researchers in other disciplines, ranging from health (Patrick et al. 2005) to education (Johnson and Puplampu 2008) are increasingly using EST to analyse information issues, as it becomes evident that information permeates life activities and processes. As information experts, LIS scholars' perspectives should be part of these conversations, but if we do not engage on the same theoretical terms we risk irrelevance. If we wish IB research to have broad societal impact, we must reach beyond "the individual in context," to a fuller ecological understanding of the multiple nested layers of socio-environmental structures, relationships and policies that influence the behaviour of the individual in context.

References

- Berryman, Jennifer. 2006. "What defines 'enough' information? How policy workers make judgements and decisions during information seeking: preliminary results from an exploratory study." *Information Research* 11, no. 4. <http://informationr.net/ir/11-4/paper266.html>
- Bronfenbrenner, Urie. 1979. *The ecology of human development: experiments by nature and design*. Cambridge, MA: Harvard University Press.

- Case, Donald O. 2006. *Looking for information: A survey of research on information seeking, needs, and behavior*. New York, NY: Academic Press. Second edition.
- Chatman, Elfreda A. 1999. "A theory of life in the round." *Journal of the American Society for Information Science* 50, no.3: 207-17.
- Courtright, Christina. 2007. "Context in information behavior research." *Annual Review of Information Science and Technology* 41, no.1: 273-306. doi:10.1002/aris.2007.1440410113
- Fisher, Karen E., Durrance, Joan C., and Marion Bouch Hinton. 2004. "Information grounds and the use of need-based services by immigrants in Queens, New York: A context-based, outcome evaluation approach." *Journal of the American Society for Information Science and Technology* 55, no. 8: 754-766. doi:10.1002/asi.20019
- Greyson, Devon L., Cunningham, Colleen, and Steve Morgan. 2012. "Information behaviour of Canadian pharmaceutical policy makers." *Health Information & Libraries Journal*, 29, no. 1:16-27. doi:10.1111/j.1471-1842.2011.00969.x
- Johnson, Genevieve Marie, and Korbla P. Puplampu, 2008. "Internet use during childhood and the ecological techno-subsystem." *Canadian Journal of Learning and Technology / La revue canadienne de l'apprentissage et de la technologie* 34, no.1. Accessed December 4, 2011. <http://www.cjlt.ca/index.php/cjlt/article/viewArticle/172>
- Levin, Marc A. 1991. "The information-seeking behavior of local government officials." *American Review of Public Administration* 21, no. 4: 271-286.
- Nahl, Diane, and Dania Bilal. 2007. *Information and emotion: the emergent affective paradigm in information behavior research and theory*. Medford, NJ: Information Today.
- Nardi, Bonnie A, and Vicky O'Day. 1999. *Information ecologies: Using technology with heart*. Cambridge, MA: MIT Press.

- Nilsen, Kirsty. (1998). "Social science research in Canada and government information policy: The Statistics Canada example." *Library & Information Science Research* 20, no.3: 211-234.
doi:10.1016/S0740-8188(98)90041-X
- Patrick, Kevin, Intille, Stephen S., and Marion F. Zabinski. 2005. "An ecological framework for cancer communication: Implications for research." *Journal of Medical Internet Research* 7, no 3. doi:10.2196/jmir.7.3.e23
- Sadler, Elizabeth and Lisa M. Given. 2007. "Affordance theory: a framework for graduate students' information behavior." *Journal of Documentation* 63, no.1: 115-141.
doi:10.1108/00220410710723911
- Savolainen, Reijo. 2002. "Network competence and information seeking on the Internet; from definitions towards a social cognitive model." *Journal of Documentation*, 58(2), 211-226. doi: 10.1108/00220410210425467
- Sonnenwald, Diane H. 1999. "Evolving perspectives of human information behavior: Contexts, situations, social networks and information horizons." In *Exploring the Contexts of Information Behavior: Proceedings of the Second International Conference in Information Needs*, edited by Tom D. Wilson and David K. Allen, 176-190. London: Taylor Graham
<http://arizona.openrepository.com/arizona/handle/10150/105189>
- Spink, Amanda, and Charles Cole. 2006. "Human information behavior: Integrating diverse approaches and information use." *Journal of the American Society for Information Science and Technology* 57, no. 1: 25-35. doi:10.1002/asi.20249
- Webber, David J. 1987. "Legislators' use of policy information." *The American Behavioral Scientist* 30, no. 6: 612-631.

Williamson, Kirsty. 1998. "Discovered by chance: The role of incidental information acquisition in an ecological model of information use." *Library & Information Science Research* 20, no. 1: 23-40. doi:10.1016/S0740-8188(98)90004-4

Williamson, Kirsty. 2005. "Ecological theory of human information behavior." In *Theories of information behavior*, edited by Karen E. Fisher, Sandra Erdelez, and Lynne McKechnie, 128-132. Medford, NJ: Information Today.

Williamson, Kirsty and Joy McGregor. 2006. "Information use and secondary school students: a model for understanding plagiarism." *Information Research* 12, no.1.
<http://informationr.net/ir/12-1/paper288.html>

Wilson, Tom D. 2005. "Evolution in information behavior modeling: Wilson's model." In *Theories of information behavior*, edited by Karen E. Fisher, Sandra Erdelez, and Lynne McKechnie, 31-36. Medford, NJ: Information Today.

¹ For the purposes of clarity amongst multiple uses of the terms "ecological" and "ecological model," in this paper I will refer to ecological models/theories/approaches in the spirit of Bronfenbrenner's Ecological Systems Theory as "ecological systems" models. It should be noted, however, that in most literature this type of work is typically referred to as "ecological," with no "systems" qualifier attached.