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CNI: Compelled Nonuse of Information

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ABSTRACT

Purpose: The study reported in this paper reviewed the literatures of information science, psychology, sociology, political science, education, and communication science to analyze *Compelled* Nonuse of Information (CNI). This study of a behavior defined by its absence (i.e., the *not* using of information) involved the development of a methodology consisting of an iterative performance of a nine-step heuristic leading to a retroductive recognition of absence, here termed RRA.

Principal results: The study concluded with a hierarchical taxonomy of the mechanisms that compel a person not to use information. The six primary mechanisms are:

1. Intrinsic somatic (bodily) conditions
2. Socio-environmental barriers
3. Authoritarian controls
4. Threshold knowledge shortfall
5. Attention shortfall
6. Information filtering.

Major conclusions: The resultant taxonomy of CNI appears here as a comprehensive checklist with which information workers such as the teacher, librarian, advertiser, politician, or health care professional can respond efficiently and effectively to situations of nonuse of information. For example, a teacher might ask: "Why are students not responding to what I present?" Further, the social implications of any *compelled* behavior touch the very basis of the social contract, and this paper presents a first step toward understanding the compelled aspects of CNI.

1. Introduction and principal results

"*The strongest human instinct is to impart information. The second strongest is to resist it.*"
Widely attributed to Scottish author Kenneth Grahame [1859–1932].

Information science, since its inception, has studied information *use*, as demonstrated by a survey of the literature of information science and related disciplines. For example, the *Annual Review of Information Science and Technology* (ARIST) published Allen's review of information needs (1969, p. 3). Prior reviews had focused on information use via information *systems* such as index card files, catalogs, and classification systems, but Allen's review centered on the *user*. In 1986, ARIST published a review by Dervin and Nilan (1986) of studies between 1978 and 1986 that followed this emphasis on

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information *use* and *user*, an emphasis called by some a "user turn." Dervin and Nilan (1986), Westbrook (1993), Westbrook (1995), Bates (1999), Wilson (1994, 1981, p. 3, 1997, 1999a, 1999b, 2000), Case (2002), and Fisher, Erdelez, and McKechnie (2005) comprise a very small sample of this "user" literature.

Over the last 60 years, however, less than 1% of the literature of information science has addressed information *nonuse*, whether from a systems or a user viewpoint (Houston, 2009). Notable reviews of nonuse appear in Zipf (1949), Dervin (1973), Wurman (1989, 2001), Wilson (1997), Case (2002), and Houston (2009). No review other than Houston (2009) has studied the subset of nonuse of information termed *Compelled* Nonuse of Information (CNI).

In this paper, I treat nonuse of information as the absence of a behavior, specifically, the absence of *use* of information. The study reported in this paper established the characteristics and boundaries of CNI and related the elements of CNI, one to another, in the hierarchical taxonomy of Fig. 1. Full explanations and examples of each element of the taxonomy appear in Houston (2009).

I believe that the publication of this taxonomy will provide information workers with a comprehensive checklist that will facilitate their management of situations involving CNI. For example, the educator could use the checklist to determine possible reasons that a student does not learn. The advertiser could use the checklist to evaluate why the public appears to be unaware of the advertiser's message. The social worker could consider various reasons that a client remains in a societally disadvantaged position. The psychiatrist could use the checklist to weigh the risks and benefits of intervention in cases where a patient's nonuse of information permitted the patient to cope with intolerable thoughts or memories. Having a comprehensive checklist and, therefore, access to more options, these information workers would be better prepared to make the most efficient and effective response.

Figure 1, Part 1: SOMATIC (BODILY) BARRIERS to information use
(paracognitive factors working *on* the individual)

1 Intrinsic somatic conditions
- 1.1 Congenital abnormalities and subsequent trauma leading to somatic impairments
  - 1.1.1 Toxic influences in pregnancy, such as alcohol
  - 1.1.2 Maternal psychological disturbance, such as stress
  - 1.1.3 Perinatal risk factors, such as low birth weight
  - 1.1.4 Toxic chemicals from the environment, such as lead and mercury
  - 1.1.5 Infectious causes, such as Lyme disease
  - 1.1.6 Selective deficiencies, such as iodine deficiency
  - 1.1.7 Head injury
  - 1.1.8 Neglect or broad-spectrum malnutrition
- 1.2 Trauma that leads to psychological predispositions
  - 1.2.1 Dissociation (traumatic disruption of cognition or perception)
  - 1.2.2 Homeostasis (maintenance of the body's internal environment)
  - 1.2.3 Neuro-chemical mandates (psychotropic drugs or alcohol)
  - 1.2.4 Advanced age
- 1.3 Intrinsic psychological predisposition mismatching a specific situation
  - 1.3.1 Gardner's theory of multiple intelligences
  - 1.3.2 Miller Behavioral Style Scale
  - 1.3.3 Avoidant coping style
  - 1.3.4 Sex differences
  - 1.3.5 Limits of short-term memory, or eidetic v. symbolic imagery
- 1.4 Intrinsic somatic conditions of uncertain origin, such as those listed in the American Psychiatric Association's *Diagnostic and Statistical Manual* (DSM)

2 Socio-environmental barriers
- 2.1 Geographical or temporal isolation
- 2.2 Inadequate or malfunctioning information systems
- 2.3 Lack of capital, relative to the information source
  - 2.3.1 Lack of economic capital (too poor to access information)
  - 2.3.2 Lack of cultural capital (too uneducated to access information)
  - 2.3.3 Lack of social capital (social status prevents access to information)

3 Authoritarian controls, listed from greatest to least intentionality
- 3.1 Censorship (including restrictive information systems)
- 3.2 Disinformation (deliberate provision of incorrect information)
- 3.3 Reward or punishment
- 3.4 Explicit approval or disapproval
- 3.5 Tacit approval or disapproval
- 3.6 Misinformation (accidental provision of incorrect information)
- 3.7 Bureaucratic inertia
- 3.8 Mistakes

Fig. 1. The taxonomy of conditions leading to CNI.

Figure 1, Part 2: COGNITIVE BARRIERS to information use
(cognitive involvement *by* the individual)

4 Threshold knowledge shortfall
- 4.1 Illiteracy and other unfamiliar encoding systems
- 4.2 Mutually unintelligible languages
- 4.3 Special vocabularies
- 4.4 Lack of sufficient command of a language
- 4.5 Euphemistic language
- 4.6 Extra-lexical information (body language, vocal emphasis)
- 4.7 Lack of awareness of the availability of information

5 Attention shortfall
- 5.1 Engrossment (also termed flow, involvement, presence, or rumination)
- 5.2 Distraction (non-traumatic disruption of cognition or perception)
- 5.3 Affect (emotion and mood)
  - 5.3.1 Threat to life
  - 5.3.2 Threat to health
  - 5.3.3 Threat to self-image or ego
    - 5.3.3.1 Threat to *self*-image, negative face, or positive face
    - 5.3.3.2 Threat to one's image as held by *others*
    - 5.3.3.3 Attribution theory (attributing behavior so as to bolster self-image)
  - 5.3.4 Fear of the unknown
  - 5.3.5 Factors that mitigate emotion and mood
    - 5.3.5.1 Perceived lack of self-efficacy
    - 5.3.5.2 Pre-existing affective state
    - 5.3.5.3 Proximity of a threat to the self
- 5.4 Priming
  - 5.4.1 Lexical (based on word frequency) and semantic (meaning) priming
  - 5.4.2 Priming with respect to the source of the information (mistrust of source)
  - 5.4.3 Priming via naïve conceptions (a preponderance of misconceptions)

6 Information filtering
- 6.1 Least effort
  - 6.1.1 Avoidance of cognitive overload
  - 6.1.2 Resignation (indiscriminate avoidance of information)
  - 6.1.3 Avoidance of information where cost exceeds benefit (including "optimal foraging" and satisficing)
  - 6.1.4 Avoidance of activity involving "the life of the mind"
- 6.2 Least conflict (seeking "fit," or avoidance of apperception)
  - 6.2.1 Avoidance of irrelevant or "wrong" information
  - 6.2.2 Avoidance of cognitive dissonance (maintenance of self-image)
  - 6.2.3 Principle of the best (unrealistic optimism / the Pollyanna Principle)
  - 6.2.4 Deference to cognitive authority (based on content more than source)

Fig. 1 (*continued*)

Information science already describes many elements of CNI, but information science does so through *thousands* of highly scattered articles discussing *hundreds* of unrelated models of individual information behaviors. This paper presents in Fig. 1 a taxonomy of the six primary mechanisms and 28 secondary mechanisms. The taxonomy adds value to and organizes the hundreds of discrete models of information behavior.

As with statistics, this taxonomy allows the information worker to "see through the noise" of the hundreds of models, to identify underlying patterns, to ignore the effects of random but important variability, to place order on the chaos of data points of individual behavior, and to reduce the hundreds of models to a quantity more easily remembered. For example, Chatman proposed 23 models or theories of information behavior, and these 23 resolve to the six mechanisms of the taxonomy (Houston, 2009, p. 41).

The taxonomy of Fig. 1 serves as one kind of definition of CNI, but a definition too long for convenient use. As a more concise definition, I have formulated the following:

> CNI describes behaviors beyond the control of a person, behaviors that do not allow a difference to make a difference.

This definition of CNI rests on Bateson's definition of "information" as "a difference which makes a difference" (1972, p. 453). Although some scholars may not accept Bateson's assertion, others do, in the fields of education (e.g., Davis & Sumara, 2007, p. 55; Erickson, 2004, p. 492; Mathiasen, 2004, p. 275), information science (e.g., Brier, 2004, pp. 643 and 646; Jacob, 2004, p. 515), psychology (Cowan & Presbury, 2000), and Marxist scholarship applied to education (McClaren, 2006, p. 92). In formulating his definition, Bateson was trying to quantify information (cf. Harmon, 1984, 1986), to develop a calculus of information, using the mathematical concept of "change," frequently expressed as the Greek symbol for *delta*, Δ or ∂. He expressed this concept of information as "a change that makes a change." Bateson later substituted "difference" for "change" to present the definition commonly recognized as his, as diagrammed in Fig. 2.

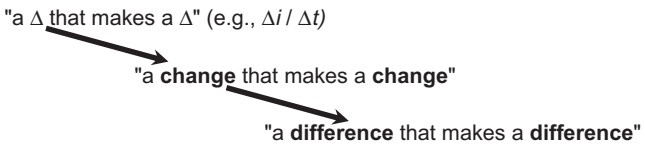

Fig. 2. The evolution of Bateson's definition of information.

The study reported here continues in two respects Bateson's quest for a calculus of information. *First*, conditions leading to CNI appear in Fig. 1 in an ordinal scale, ordered from least to most involvement of conscious cognitive processes. This presentation of an ordinal scale is a step toward the development of interval and ratio scales, which then might facilitate the development of a calculus of information. This is not to say that creating an interval or ratio scale for CNI is possible or desirable. The ordinal scale merely takes information science a step further toward determining whether CNI *can* be quantified. *Second*, the elements in the present taxonomy of conditions leading to CNI appear to conform to the fundamental laws of modern physics, specifically, the conservation laws of classical mechanics: conservation of mass, conservation of energy, conservation of momentum, and the like. I summarize these fundamental laws very crudely and anthropomorphically by the expression: "Things do not like to change." The elements in this taxonomy appear to represent, each in its own way, maintenance of *status quo* and a concordance to the classical mechanics of modern physics. Whether the analogy proves to be valid or false, it can be tested, which is one step further than Bateson got. The study reported here explored the universe of information as defined by Bateson and investigated CNI within that universe.

2. The methodology of the study of CNI

The study of this previously unexamined absence of behavior (i.e., NOT using information) involved the development of a new methodology, an iterative recognition of absence, called here Retroductive Recognition of Absence (RRA). "Absence," in this sense, resembles tangentially the "the problem of non-specifiability of information need" addressed by Belkin's Anomalous States of Knowledge model (Belkin, 1980, p. 137). RRA rests on *retroduction*, the method of philosophical inquiry proposed by Charles Sanders Peirce (1839–1914) and earlier termed *abduction* by Peirce. RRA involves the iterative performance of a nine-step heuristic:

1. Perceive a phenomenon leading to surprise
2. Perform the fundamental and primary retroduction
3. Synthesize the phenomenon into a judgment, hypothesis, or retroductive suggestion
4. Bracket intuitive prejudices
5. Immerse in the data
6. Conceptualize
7. Hypothesize
8. Select the hypothesis most efficient to entertain, interrogate, or test
9. Entertain, interrogate, or test the hypothesis.

The iterations continue until the researcher reaches a hypothesis testable by inductive or deductive methods.

RRA shares many characteristics with grounded theory (cf. Corbin & Strauss, 2008, 1967). This study used a methodology based on retroductive reasoning instead of grounded theory for several interrelated reasons, many of which Rennie (1998) has expressed. As further explained below, retroductive reasoning lends itself to the study of newly identified phenomena, while methods such as grounded theory have been used effectively in areas with established vocabularies or previous studies. Retroductive reasoning "forgives" the lack of a starting point, and that lack of a starting point characterizes newly recognized phenomena. Conversely, the prescribed procedures of grounded theory apply to studies that build on pre-existing investigations. CNI had no pre-existing vocabulary or coherent body of literature, a fact that recommended the use of a retroductive methodology such as RRA to investigate CNI.

People develop ideas by inductive reasoning, deductive reasoning, and retroductive reasoning. As used here, induction is "reasoning from observations to theories" (Honderich, 1995, p. 405), while deduction is reasoning from theories to

observations, or, "inference where from a given set of premisses [*sic*] the conclusion must follow" (p. 181). In the initiation of exploratory studies, however, where neither prior systematic observations nor theories exist, the researcher will find both inductive and deductive reasoning inapplicable. Thus: "All the ideas of science come to it by the way of Abduction [Retroduction]." (Peirce, 1931–1958, pp. 144–145, from Peirce's "Harvard Lectures on Pragmatism"). Peirce, the primary theorizer of retroduction during his long, prolific, and largely unpublished writing career, equated retroduction with terms such as "intuition," "hunch," "guess," "presumption," "apagögé," "extremely fallible insight," "explanatory hypothesis," "problematic theory," "probational adoption of the hypothesis," and "inference to the best explanation leading to a scientific hypothesis" (after Bergman & Paavola, 2001). According to Peirce, retroductive reasoning might lead to a higher proportion of false starts than would reliance on deductive or inductive reasoning, but the exploration of a new idea would permit of no other method of reasoning:

> Abduction [retroduction] is no more nor less than guessing, a faculty attributed to Yankees. (—) Such validity as this has consists in the generalization that no new truth is ever otherwise reached while some new truths are thus reached. (1976, pp. 319–320, from Peirce's 1902 "Prolegmena").

Possibly because of Peirce's extensive training in the physical sciences, he and his followers considered retroduction applicable to initial studies of natural and social scientific phenomena. The application here of retroduction to a study of literature, therefore, found justification in the fact that the phenomena that were the subject of this study appeared in the cited literatures, and I studied those phenomena, rather than the literature, itself. To invoke an analogy, I studied the passengers, not the train.

Neither Peirce nor his followers ever presented a complete heuristic for a retroductive methodology such as RRA, but Rennie (1998, p. 111) articulated Steps 3–5, Peirce (1976, pp. 319–320) suggested other steps in his various writings, and Bergman and Paavola (2001) added nuances that clarified the process. The "meta-methodology" by which I created the RRA methodology resembled nothing so much as assembling archeological potsherds. I collected the steps from the writings of Peirce, Rennie, and Bergman and Paavola, noted which steps appeared to be congruent and which steps required the prior completion of other steps, assembled the steps into a heuristic, and examined the heuristic for gaps. The resultant RRA methodology consisted of an iterative performance of the nine-step heuristic, with each iteration narrowing the scope of the surprising absence while increasing the depth of examination.

2.1. Step 1. Perceive a phenomenon, leading to surprise

The surprise that led to the formulation of the RRA methodology and to a model of *Compelled* Nonuse of Information (CNI) resulted from a contemplation of the anti-intellectualism described by Hofstadter (1963) and other behavior involving nonuse of information. Additional aspects of nonuse quickly came to mind, such as information avoidance, ignorance, intentional irrationality, a facility for eidetic imagery rather than symbolic imagery, and mismatches between information and the multiple intelligences proposed by Gardner (1983). The number of discrete aspects surprised me. Further, those who study or work with information usually deplore nonuses of information such as censorship, propaganda, anti-intellectualism, and prejudice. Some of these aspects of nonuse, however, were less clearly "good" or "bad" nonuses of information, and the size of this ambiguity also surprised me.

2.2. Step 2. Perform a fundamental and primary retroduction

A search of electronic and print databases for examples of the aspects mentioned above of nonuse of information produced no comprehensive treatments of nonuse of information. The examples of nonuse that appeared were well defined but extremely limited in application and interpretation. The examples bore relationships, one to another, although no such relationships appeared explicitly in the works discussing the examples. For example, Chatman (1985, p. 277) found that the poor demonstrated "a heavy use of television for escape and for surveillance" of their environments. Yet, no one appeared to have linked her work with "avoidance of stimuli that inform rather than entertain" (e.g., Graber, 1989, p. 148; McLuhan & Fiore, 1967, p. 22) or with the scholarship of propaganda (e.g., Lasswell, 1927, 1949). The study of nonuse began to appear to be a worthwhile addition to information science, in part because it seemed such a common behavior and in part because information researchers largely had ignored it. I retroduced (looked back to the originating surprise in light of the data) that a study of nonuse of information could identify, define, and connect such examples; and that such a study would be feasible, understandable, and worth the effort to conduct. Such an intuitive leap is the hallmark of the retroductive process.

2.3. Step 3. Synthesize the new phenomenon into a judgment, hypothesis, or retroductive suggestion, based on fallible insight

In the study reported here, patterns of information behavior began to emerge from the examples of *nonuse*. These patterns were far less numerous than the hundreds of models of information *use* that have appeared in the literature of information science. These patterns, when organized into a classification scheme, presented a taxonomy with internal consistency, that is, each element bore a relationship to the elements next to it, while each of the hundreds of models of information *use* stood largely in isolation. This taxonomic classification of nonuse appeared to have great potential as an explanatory model of conditions that could lead to nonuse of information, a model for employment by information professionals. This realization led

to the retroductive suggestion that an explanatory model of *nonuse* could organize and facilitate the study of information behavior, a field currently focused largely on information *use*. With such a retroduction verbalized, the groundwork was ready for Step 4.

2.4. Step 4. Bracket intuitive prejudices about the phenomenon

Many people hold intuitive prejudices about nonuse of information, that it somehow is morally "bad," ubiquitous, virtually invincible, invisible to most, and seductive, rather like a Christian devil or Arabian genie. This intuitive prejudice prevails in the literature of information science (e.g., Harris, 1984), education (e.g., Alexander, Entwisle, & Horsey, 1997), and law (e.g., Baarsma, 2002). I kept this intuitive prejudice in mind and began to collect examples of nonuse of information. Among those examples, cases appeared in which nonuse of information *benefited* the nonuser. For example, psychodynamic defense mechanisms permit a person to survive, to remain sane, or to function in the presence of unpleasant information (e.g., Freyd, 2006, pp. 518–519). In other words, nonuse, as such, seems neither helpful nor harmful to the potential nonuser, and the nonuser is neither morally good nor bad by not using information. Significantly, what also appeared in the examples was an indication of the difference between *volitional* nonuse of information and *compelled* nonuse of information. This realization allowed the identification and labeling of examples as compelled rather than volitional nonuse of information, a difference that was to prove extremely important in subsequent steps.

Another apparently common intuitive prejudice about nonuse of information involves the nature of authoritarianism and its employment of mechanisms of nonuse of information to control others. Many people view authoritarianism and its mechanisms of control with suspicion or alarm, because such control lends itself to abuse as controllers seek self-aggrandizement or perpetuation of their control at the expense of the controlled. Some amount of authoritarian control and manipulation of information, however, can benefit the controlled. For example, against the threat of species extinction by means of an environmental "tragedy of the commons" or "commons dilemma model" (Schmuck & Vlek, 2003), many (e.g., Hardin, 1968) assert that only a measure of authoritarian control can regulate the use of the commons in a far-sighted manner. The regulation may be by physical force or by manipulation of information, tactics discussed by Servan (1767, p. 35), quoted by Foucault, (1977, p. 102):

> A stupid despot may constrain his slaves with iron chains; but a true politician binds them even more strongly by the chain of their own ideas; it is at the stable point of reason that he secures the end of the chain; this link is all the stronger in that we do not know of what it is made and we believe it to be our own work.

The sources of the most powerful of "their own ideas" are, almost by definition, hidden, and the implantation of such ideas constitutes a Compulsion of Nonuse of Information (CNI): "The very efficacy of inviolate rules depends on their being abstracted from any social context or set of conventions–they just *are*." (Burbules, 1986/2002, p. 342) In other words, viewing rules as "they just *are*" precludes the very thought that reasons for the rules might exist and therefore compels nonuse of information about the merits of the rules.

Any act of selection involves omission of the phenomena not selected. The limits of human cognition vary from individual to individual, but all individuals appear to have cognitive limits. Thus, in Servan's example, the cognitive *selection* of ideas involves the cognitive *omission* of the ideas not selected. For this reason, the control of "slaves" (to use Servan's word) by "their own ideas" comprises a form of CNI in which their "own" ideas (ideas fostered by an authority to increase authoritarian control) preclude other ideas (ideas that weaken the authoritarian control). If these other, unselected ideas had resulted in a weakening of authoritarian control, they would have constituted Bateson's "difference that makes a difference." These unselected ideas thereby qualify as nonused information. Having bracketed prejudices such as those mentioned above (nonuse is bad; authoritarian control is bad), I was ready to employ Step 5.

2.5. Step 5. Immerse in the data

In this study of nonuse of information, published examples of nonuse became data, using a technique similar to evaluative bibliometrics. Specifically, the characteristics of the examples of nonuse of information in published works and the relationship of the examples to other examples of nonuse of information determined whether the examples comprised *use* or *nonuse* of information, that is, whether the examples became data for this study.

An informal pilot study began with Step 5 and involved a search of specific databases of the literature of information science and related disciplines for articles containing examples of nonuse of information. The search term phrases consisted of combinations of the keywords: "information," "knowledge," "nonuse," "non-use," "rejection," and "avoidance." The data-bases searched included:

- Academic Search Premier (1965 to date),
- Web of Science (ISI Web of Knowledge, 1975 to date),
- Library and Information Science Abstracts (LISA, 1969 to date),
- Dissertation Abstracts International (1861 to date),
- Library Chronicle Index (1970–1989), and

- the printed annual indexes found in volumes 1 through 40 (1966–2006) of the *Annual Review of Information Science and Technology* (*ARIST*).

The search also included an examination of the Library of Congress Subject Headings (LCSH) for terms that might make the database search more comprehensive. The LCSH contained 26 headings that included the term "information," with 11 pertaining to *nonuse* of information and 15 to *use* of information. *None* of the search term phrases used in the informal pilot study appeared in the LCSH, indicating a possible gap in the LCSH classification of literature about nonuse of information.

2.5.1. Results of the first immersion

This search identified approximately 400 works, each containing at least one of the search term phrases and describing at least one example of nonuse of information. For comparison, a search of the same databases for "information use" or "use of information" identified approximately 43,000 works. A second search, this one of the database *Expanded Academic ASAP*, restricted search terms to the title, citation, and abstract fields. Both studies yielded a ratio of studies about *nonuse* to studies about *use* of slightly less than 1%.

During the course of the study, no literature appeared that discussed the size of the disparity between the number of articles mentioning use (>99%) and the number of articles mentioning nonuse (<1%). This apparent lack of discussion has many reasons, two of which appear here because of their relevance to Step 4 (bracketing intuitive prejudices): a prejudice against nonuse of information, and the concept of System Justification Theory.

As mentioned before, writers in the literature of information science (e.g., Harris, 1984), education (e.g., Alexander et al., 1997), and law (e.g., Baarsma, 2002) have tended to portray nonuse of information in a negative light. The articles describing nonuse of information generally discuss scholarship designed to mitigate or prevent nonuse. By implication, this portrayal of nonuse as something to be avoided may have compelled writers to study information behavior in terms of use, rather than nonuse.

System Justification Theory (SJT) (Jost & Hunyady, 2005, p. 260) states that system-justifying ideologies defend and justify the *status quo*, resulting in reduced negative affect and less support for social change and redistribution of resources. When applied to the dearth of articles about nonuse of information, SJT would manifest itself as: "If I write articles like articles that already have been published, in other words, if I do not 'challenge the system', then my articles, too, will be published."

Regardless of the reason for the preponderance of articles about information *use*, I expect the development of theory and practice about *nonuse* to decrease the disparity between the number of research papers about use and nonuse of information.

2.5.2. Analysis of the results of the first immersion

A rudimentary form of content analysis determined the characteristics of nonuse of information present in each article. In this analysis, my re-coding the corpus of articles to determine a measure of the reliability of the coding (intra-coder reliability) proved unnecessary because the purpose of this pilot study was to develop concepts rather than to generate data. Initially, the coding themes consisted of the themes of nonuse of information developed in the early phases of the study. When the occurrences of "nonuse" in the corpus did not appear to match previously established themes, new themes appeared and joined the original themes.

2.5.3. Comparison of the taxonomy with models of information behavior

The next phase of the informal pilot study consisted of a merging of the preliminary version of the taxonomy of conditions leading to CNI with the models of information behavior. This merging consisted of noting the explanatory power of each element of the taxonomy for each model of information behavior. "Explanatory" means that the elements of the taxonomy might present an analytical framework that would provide a more comprehensive understanding of the information behavior. In addition, "explanatory" refers to the concept that the relatively few elements of the taxonomy would be easier to conceptualize than would be the hundreds of models of information behavior. For example, Alienation Theory (Chatman, 1990) postulates that information and most life-events are meaningless to the alienated due to powerlessness, futility of jobs, physical isolation, lack of trust of others, self-estrangement, and lack of "fit" (normlessness). Did the taxonomy's "isolation" help to describe Chatman's Alienation Theory? Yes, in Chatman's example, work schedules caused social, physical, and temporal isolation of night-working janitors that prevented their interaction with society and contributed to a concise description of Alienation Theory. Three elements of the taxonomy: environmental barriers (physical, temporal, and social), resignation, and least conflict describe the behavior of Chatman's Alienation Theory. Chatman's 23 separate models or theories of information behavior resolve to the six related mechanisms of the taxonomy (Houston, 2009, p. 41), indicating a more efficient explanatory power of the taxonomy. In an example from Nahl (2004), the taxonomy's "affect" mechanism described Nahl's Affective Load Theory. When applied to the 118 models of information behavior collected for this study, the taxonomy described 55 of these 118 behaviors through the six mechanisms. The other 63 models described information *use* (e.g., berrypicking by Bates (1989)) rather than nonuse, or information behaviors unconnected to use and nonuse (e.g., Cognitive Work Analysis by Rasmussen, Pejtersen, and Goodstein (1994)). Establishing correspondences between the taxonomy and the information behaviors revealed overlapping definitions among the elements of the taxonomy. Resolving these overlaps led to refining the taxonomy by defining the nuances of its elements, and this refining occurred in Step 6.

2.6. Step 6. Form new conceptions bearing some degree of ordering

The examples of nonuse of information discovered during the informal pilot study clustered into six themes (intrinsic somatic/bodily conditions, socio-environmental barriers, authoritarian controls, threshold knowledge shortfall, attention shortfall, and information filtering), with each theme suggesting a condition or information behavior that might lead to nonuse of information. These conditions suggested ordinal continua along which they might fall:

- intensity – the amount of additional information required to overcome the nonuse,
- obversibility – the likelihood of an opposing theme appearing,
- repeatability – how many times a theme could affect the same person in the same situation,
- effect on soma – how strongly the theme affected the body, rather than mental processes,
- class – how the theme might affect people of different socio-economic status,
- thought – degree of cognition required by the nonuse,
- timing – the point in the cognitive process at which the theme would occur,
- source – degree of originating internally or externally to the person,
- compulsion – status as either volitional or compelled,

and other continua now discarded and forgotten. Each continuum, when organized as a taxonomy, produced taxa that contained themes that occurred in other taxa. In other words, each continuum contained overlapping taxa, except for the last continuum, "status as either volitional or compelled" nonuse of information. The realization of this volitional–compelled dichotomy led to the next step, Step 7 (hypothesize for the surprising phenomenon).

2.7. Step 7. Hypothesize for the surprising phenomenon

The themes of nonuse of information displayed properties, one of which was personal autonomy, or the amount of volition exercised by someone not using information. This property manifested as the degree of control over the nonuse by the person not using the information. An ordering along a volitional–compelled continuum of the conditions and information behaviors that led to nonuse of information quickly developed into a volitional–compelled dichotomy. In other words, one example did not display slightly more control than another, but displayed either control (volitional nonuse) or no control (compelled nonuse). Many of the examples had only *compelled* elements, and *volitional* elements usually had *compelled* counterparts. The terms "volitional" and "compelled" and the distinction between them did *not* appear explicitly in the literature examined for the pilot study of nonuse of information, yet this bifurcation between volitional and compelled permitted a visualization of the universe of nonuse of information clearly enough to identify the portion of particular interest to me. Because my academic interests gravitate to the topic of societal injustice (e.g., Houston & Erdelez, 2004), and because the "compelled" portion of the universe of nonuse of information appeared to be associated with and underlie examples of societal injustice, I narrowed the scope of research from nonuse in general to *Compelled* Nonuse of Information (CNI). This more narrow scope and the selection of a term and its acronym (CNI) required a definition of CNI. That definition, stated above, is: "behaviors beyond the control of a person, behaviors that do not allow a difference to make a difference." This definition allowed me to formulate hypotheses in the form of various models of ordinal taxonomies of conditions that lead to CNI. The verbalization of this definition and these models led to Step 8.

2.8. Step 8. Select the most efficient hypothesis

The preliminary Steps 1–7 generated several interrelated hypotheses: that an explanatory model of CNI (rather than the more general nonuse of information) *could* exist; that I could develop a model of CNI; and that the model would prove useful in understanding the empirical examples of information behavior that occur in the literature of information science and related fields and in the practice of information professionals. Various models emerged from Step 7 as hypotheses (an example of another model appears in Houston, 2009, Appendix 5), and I chose the model depicted in Fig. 1 above as the most economical to verify in Step 9.

2.9. Step 9. Inductively verify the hypothesis against the data as a whole

The term "retroduction" implies a returning, and, in this sense, the hypothesis of Step 8 is both the outcome of retroduction and the font of new retroductions, returning or looking back to a prior step in the retroductive process. Specifically, I looked back to the last point at which I had perceived a phenomenon leading to a surprise. That point followed the pilot study, with the realization that nonuse of information consisted of CNI and VNI, and that this study should focus on CNI. Therefore, the retroduction cycle started again at Step 3: synthesizing the new phenomenon into a hypothesis. That hypothesis took the form of a preliminary version of the taxonomy depicted in Fig. 1 above. I reflected on Step 4, bracketing intuitive prejudices, and began Step 5, immersion in the data, with the "Formal Study," reported in the next section.

3. The second iteration and formulation of a final taxonomy

The second iteration of the RRA heuristic, the "formal study," consisted of reentering the heuristic briefly at Step 3 (synthesize) and a reminder that nonuse of information is not good or bad in and of itself (Step 4). The next step, Step 5, consisted of a search of 13 print and electronic databases for the search terms listed in Fig. 3 below. These search terms included the terms used during the pilot study and terms thought of later, such as "barrier":

The results of this search generated no completely new conditions or information behaviors leading to CNI, but they did suggest sharper definitions of the existing conditions and a reorganization of parts of the taxonomy.

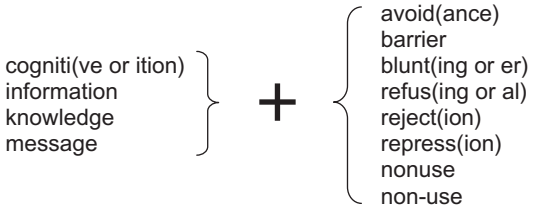

Fig. 3. The formal study's search for examples of nonuse of information via keyword searches.

The search resulted in approximately 1400 articles that contained some form of the search terms. Many of these articles contained chance juxtapositions of the search terms; many contained examples of information *use*, rather than *nonuse*; and many did not contain sufficient information to determine whether the described nonuse was compelled or volitional. From the approximately 1400 articles, 114 presented examples of CNI.

4. The third iteration and formulation of a final taxonomy

The second iteration of the CNI study produced a taxonomy that had changed very little and therefore demonstrated stability. The volume of material, however, exceeded the human attention span, and I decided to re-code the articles based on insights derived from working with the taxonomy. In other words, by the time I had coded the last article and entered it into the taxonomy, I felt that my conceptions of the themes of CNI might have altered. The third iteration of the RRA heuristic, therefore, consisted of reentering the heuristic at Step 5 (immerse in the data). This immersion consisted of re-coding the examples of nonuse of information found in the corpus of articles, using the taxonomy that resulted from the second iteration. Minor re-wording of the terms in the taxonomy resulted. The final taxonomy appeared to be so stable that I felt that the study of CNI was ready for inductive and deductive inquiry.

5. A summary of the retroductive procedure employed in this study

In any investigation involving retroduction, the outcome of an iteration of the retroduction heuristic determines the next iteration of the investigation. If the iteration has produced a hypothesis testable by inductive or deductive methods, the investigation progresses *beyond* retroduction to those methods. If the iteration has produced a completely unexpected hypothesis, the investigation *returns* to Step 1 of the retroduction heuristic and again proceeds through Step 9. If the iteration produces neither a complete surprise nor a testable hypothesis, the investigation returns to Step 3 or Step 5 and again proceeds through Step 9. This third possibility occurred twice during the study of CNI, as diagrammed in Fig. 4 below. In the first iteration, the pilot study consisted of a database search for terms derived from brainstorming and led to a preliminary taxonomy (Steps 1–9). The results of the first iteration did not produce a hypothesis testable by inductive or deductive methods, and it did not produce a surprise that would justify starting again at Step 1. Therefore, the study returned to Step 3, commencing a formal study. The formal study consisted of a database search for terms derived from interrogation of the preliminary taxonomy, and the results of this second iteration consisted of a refinement of the taxonomy depicted in Fig. 1 above. The third iteration consisted of a repeat of the formal study, but this time using the taxonomy to re-code the corpus instead of using the corpus to refine the taxonomy. Fig. 4 demonstrates graphically the progression of the study through the nine steps of retroduction across three iterations.

The adjustments to the taxonomy became smaller following each iteration of the heuristic, and I concluded after the third iteration that further iterations would not produce important additional changes. In other words, CNI was ready for inductive or deductive, rather than retroductive, research.

6. Recommendations for further study

This paper introduces a new subdivision of information science, CNI. If CNI is to become a useful concept for the information worker, its investigation should involve inductive and deductive methodologies and the investigation of corollary topics. This study of CNI suggested to me two corollary topics: (a) a model of *covert compelled use* of information (CCUI), and (b) a model of *volitional nonuse* of information (VNI). These two topics, with CNI, comprise a substantial portion of the field of information behavior established during the study of CNI, as diagrammed in Fig. 5 below.

Retroductive step:	Iteration 1: →	Iteration 2: →	Iteration 3:
1. Surprise	Brainstorming		
2. Retroduce	"nonuse exists"		
3. Synthesize	"nonuse explains"	first taxonomy	
4. Bracket	"not bad; not good"	"not bad; not good"	
5. Immerse	pilot study (database search) for nonuse and IBs	formal study (database search) for CNI, rather than nonuse	re-coding the corpus with respect to the taxonomy
6. Conceptualize	preliminary taxonomies	classifying the examples	inspection of the taxonomy for conceptual gaps
7. Hypothesize	nonuse → CNI	augmenting and re-wording the taxonomy	evaluation of the taxonomy as a model of CNI
8. Select	selection of first draft of the taxonomy	evaluation of the taxonomy	acceptance of the taxonomy
9. Interrogate	A small surprise: "I am interested in CNI, rather than nonuse in general."	A small surprise: "This model is almost testable by induction or deduction, but I should conduct intra-coder verification."	No surprise: "This model is testable by inductive or deductive methods."

Fig. 4. A summary of the RRA methodology employed in the study of CNI.

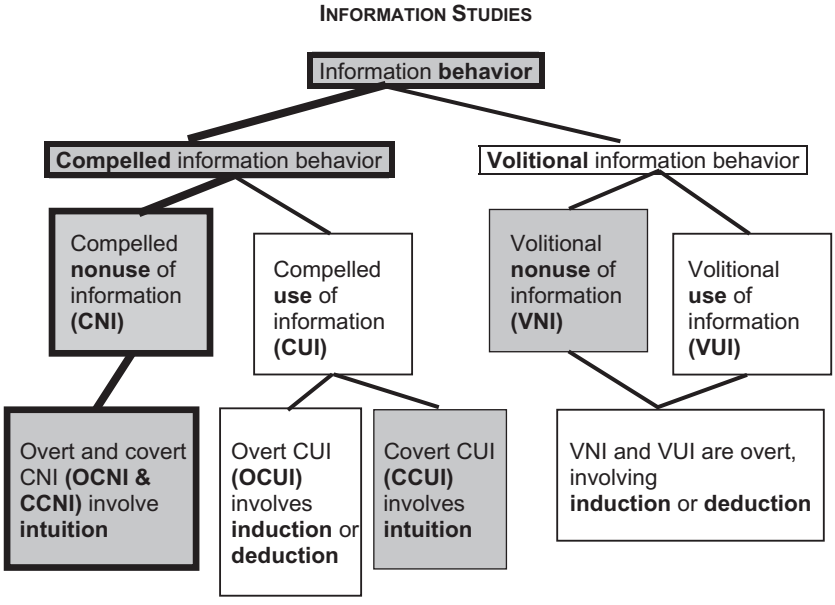

Fig. 5. The scope of the CNI study within a diagram of the field of information studies. The results of the study of CNI occupy the boldfaced shaded boxes, and the two suggested studies occupy the shaded boxes.

6.1. Compelled use of information (CUI)

Compelled *use* of information (CUI) is a behavior that results from compulsions that either become obvious to, or remain hidden from, the person performing the behavior. I label the obvious compulsions *overt* CUI and the hidden compulsions *covert* CUI. For example, a student forced to read a book in order to pass a course has experienced *overt* CUI. In other words, the student will think inductively or deductively about reading the book and then decide whether to read the book. Such behavior would not be *covert* CUI because it would not be intuitive.

In *covert* CUI, the person performing the behavior remains unaware of the compulsion and has no chance to think about the compulsion inductively or deductively. The thought process leading to the behavior, therefore, must be *intuitive*, rather than inductive or deductive. Because of the intuitive nature of its thought process, covert CUI lends itself to initial study with the RRA methodology, just as did the study of CNI reported in this paper. Examples of covert CUI include the "nudge," defined as "any noncoercive alteration in the context in which people make decisions" (Goldstein, 2008, p. B8; citing Thaler & Sunstein, 2008). Goldstein reported several examples of nudges. For example, the city of Chicago painted lines across Lakeshore Boulevard and spaced the lines increasingly closer together before dangerous curves in the road. Drivers slowed down before the curves because (according to Thaler & Sunstein, 2008) they intuitively perceived the increasing number of lines as evidence that they were traveling faster than they really were. In another example, a school installed mirrors in the cafeteria, mirrors that made children appear somewhat heavier than they are. Children ate less because (according to Thaler & Sunstein, 2008) they perceived their mirrored selves as unflatteringly heavy. In these examples, the nudge apparently worked without the drivers consciously thinking about their speed or the children consciously thinking about their weight. Thaler and Sunstein drew these conclusions from the reported successes of the nudges when compared to the failures of overt and obvious behavior modification messages such as "dangerous curve ahead" signs and public service obesity messages. Rather than defining nudge as "any noncoercive alteration in the context in which people make decisions" (Goldstein, 2008, p. B8; citing Thaler & Sunstein, 2008), I would define nudge to more closely parallel the terms used in this paper: "any *intuitive* alteration in the context in which people modify their behavior." In other words, Thaler and Sunstein's "noncoercion" could imply noncoercion via deductive, inductive, or intuitive cognition, where I believe that they mean intuitive, only.

6.2. Volitional nonuse of information (VNI)

In addition to CUI, another study of information behavior suggested by this study of CNI would be the completion of a taxonomy of *volitional* nonuse of information (VNI). Such a taxonomy would help to classify, evaluate, and apply to practice thousands of the reports now subsumed under the heading of "user studies" and contribute significantly to the theoretical base of the field of information studies. As with this study of CNI, a study of VNI would involve the absence of a behavior (i.e., the absence of *use* of information), and the RRA methodology would be an especially appropriate method of *conducting* such a study and possibly the only method of *commencing* such a study.

7. Summary

This paper has presented a study of *Compelled* Nonuse of Information (CNI) culminating in a taxonomy of the six primary mechanisms of CNI:

1. Intrinsic somatic (bodily) conditions
2. Socio-environmental barriers
3. Authoritarian controls
4. Threshold knowledge shortfall
5. Attention shortfall
6. Information filtering.

The CNI study reported in this paper presented an unusual degree of initial complexity, a steep "learning curve," primarily because the methodology to commence the study did not exist and because the literatures of information science, psychology, sociology, political science, education, and communication science did not contain papers about *compelled* nonuse of information, in and of itself. Thus, every stage of this endeavor ventured into unplumbed depths. The taxonomy undoubtedly has limitations yet to be discovered, but it should be sufficient to facilitate further investigation of CNI and to provide a new tool to analyze information behavior and a new way of thinking about the relationships among the information scientist, information, the information practitioner, and the potential user of information.

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