Substance and Style:

Understanding Personal Style's Influence on Information Behaviour and the Provision of Subject-Specific Information Services

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Introduction

This essay will explore the impact personal style has on information behaviour, with particular reference to information seeking and subsequent information searching, and to what extent personal style is related to academic subject choice. Through this exploration, this essay will suggest the provision of adaptive tools, customised user interfaces, tailored support, and style-dependent search systems to maximise results in subject-specific information services.

While the concept of information behaviour is much explored in library and information science, and indeed across many disciplines, it evades a concrete definition. As such, in this essay, information behaviour can be understood as the entire process in which one interacts with information: from the determination of the information they require, to which methods and functions they use in the pursuit of it, to how they interact with their results and decide what is relevant and appropriate in reference to their initial query. This interpretation is modelled on Wilson's nested model of information behaviour, in which it is suggested that information behaviour is an umbrella term that encapsulates information-seeking behaviour – that being how an individual employs methods to aid the discovery of information – and within that, information searching behaviour, which is to say how an individual uses, broadly, an information retrieval system, and specifically, the provided search tools (Wilson, 1999).

Personal style is a term used by Riding and Rayner (2013, p. 7) to describe the unique way in which an individual "habitually approaches or responds to [a] learning task". It encapsulates the concepts of cognitive style: the way an individual thinks, and learning strategy: the techniques used in pursuit of the task. They identify that cognitive style is a measure of an individual's approach to information that remains stable throughout a lifetime, which "influences a person's general attainment or achievement in learning situations." (Ibid, p.7)

In terms of measuring cognitive style, this essay considers two theories: the wholist/analytic dimensions from Riding's Cognitive Style Analysis (CSA) test (Riding and Cheema, 1991), and the field-independent/field-dependent dimensions developed in Witkin et. al's Embedded Figures test (Witkin et. al, 1971). Generally, these theories consider cognitive styles to be a binary of those who approach information analytically, in detail and independently (analytic, field-independent), and those who approach information holistically, creatively, and prefer aided direction (wholist, field-dependent).

Study into exploratory search systems has been undertaken in cultural heritage archives to combat the traditional navigation of collections via keyword-based search. Narrative searching encourages exploration, promotes serendipitous discovery, and offers aided guidance through the collection with suggested keywords, themes, and linked records. Such narrative search systems could be useful for soft subject academic repositories and databases, considering the relationship between personal style, academic discipline choice, and information behaviour. The understanding of the intersection between these three topics can lead to the provision of effective information services, and tailored tools across specialised databases, to achieve efficient information discovery for the individual.

Literature Review

It is imperative to study information behaviour as without it, "provision of effective services can be based only on guesswork and prejudice." (Bawden and Robinson, 2012, p. 187). Common users of an information service may be united by some elements of the self – age, occupation, interests – but are still very much uniquely autonomous, and will therefore approach information in varying ways. Information services can apply this idea through functions such as flexible information training and education (Ibid, p. 204); personalised user

profiles (Salarian, Ibrahim and Nemati, 2012, p. 464); and custom-based search tools (Ford, 2015, p.232). The latter is explored in narrative search systems that promote aided and serendipitous navigation and discovery, as opposed to the traditional keyword-based search.

The benefits of adaptive information services are widely recognised and have been researched in the field for over 60 years. Their outcomes have been largely explored in the realm of learning, and in more recent years, e-learning. Simuth and Sarmany-Schuller (2014) identified that students of their equivalent of field-independent/analytic cognitive styles would benefit from structured and pre-planned work and asynchronous material; whereas the field-dependent/wholist students would benefit from creative work and would enjoy more social and interactive feedback. Chen and Liu (2011) found that students have preferences for how their courses are taught, and this can be reflected with WBI (Web Based Instruction) dependent on their cognitive style, where field-dependents were suited to an overview perspective of a topic, and field-independents were suited to shortcuts. Jovanovic et. al (2012) used data mining to identify students' cognitive types, to determine which students would be most likely to excel on any given course, distinguishing that the judging style (field-independent/analytics) performed better at logical, mathematical tasks, but the perceiving style (field-dependent/wholists) might find it easier to approach this type of learning through interactive material that encourages their creativity.

Many factors contribute to an individual's information behaviour: personality (Heinström, 2000), search experience (Yuan, 1997), task type (Reisoğlu, Çebi and Bahçekapılı, 2019), and more. However, cognitive style appears to be the most appropriate factor to research as it remains consistent through time and varying environments, where search experience, task type, and indeed, personality, are subject to change (Dufresne and Turcotte, 1997, p. 1).

Furthermore, personalisation – "the process of customizing an information system's

functionality, interface, and contents to a user's demands." (Park, 2014, p. 465) – can improve user satisfaction and increase use of the service. However, this customisation of content would not be appropriate in certain information services, as IFLA states, "Libraries shall acquire, organize and disseminate information freely and oppose any form of censorship." (IFLA, 2020). While censorship is not synonymous with customised content, such a technique could enforce echo chambers reminiscent of omniscient social media algorithms, which could be argued to defy library values by inhibiting access to information.

Fundamentally, information services that cater to their users' differing personal styles will increase inclusivity, user enjoyment and subsequent trust in and return to the service, and provide more effective learning support to develop information intelligence. In our digital world, these systems should "compensate as far as possible for the frailties of human abilities" (Ford, 2015, p. 218), that draw on an individual's strengths, and offset an individual's weaknesses (Ibid, p. 131).

Cognitive Style and Search Behaviour: PATHS system

Goodale et. al (2014) used the PATHS (Personalised Access To cultural Heritage Spaces, CORDIS, 2019) system, a narrative search tool, to measure the efficacy of aided search within a cultural heritage repository in relation to cognitive style, and found it to be particularly helpful for those with the wholist style. Wholists characteristically approach information broadly, and are more dependent than their analytic equals. The PATHS system provides users with 'pathways' through the collection, compiling information in themes to serve as a foundation for searching. Users can choose to follow a theme instead of beginning their search with typical keyword entry. In this study, cognitive style was determined by Riding's CSA test, and evaluation of information-seeking behaviour was measured by

observation during the undertaking of searching tasks, user feedback questionnaires and "a think-after interview for qualitative reflections." (Goodale et. al, 2014, p. 981)

Participants were asked to complete simple tasks in which they were required to find a specific answer, and a longer, creative path creation task, in which they were required to build their own collection of relevant information surrounding a provided theme. The simple tasks represented the traditional searching technique of keyword input, while the path creation task was an exploration of the unique narrative searching tool. Results showed that wholists were more likely to exceed their time limit in the simple tasks, but took less time to complete the path creation task, despite adding more items to their paths than analytics, thus demonstrating dependency, broad information searching, and perhaps a more simplistic approach to information acquisition (Ibid, p. 983). Conversely, analytics had less items in their paths, and spent more time reviewing and editing, suggesting they found it "difficult to create a path that matches their exacting standards" (Ibid, p. 984). While results confirmed the hypothesis that cognitive styles have an impact on information-seeking behaviour, with analytics exhibiting a detailed approach towards information, a "careful selection of items" (Ibid, p. 989) and "greater degree of precision" (Ibid, p. 984), and wholists performing "serial browsing" (Ibid, p.984), making "more general queries" (Ibid, p. 989) and "establishing a clear overview" (Ibid, p. 989), the users' ratings relating to their enjoyment of the tasks is conceivably more telling. The results of the questionnaire showed a positive correlation between perceived task easiness and enjoyment, in other words, "independent of cognitive style, if tasks are found to [be] easier, they are found to be more enjoyable." (Ibid, p. 983) It was inferred that wholists enjoyed the path creation task more than the fact-find task, as it required a comprehensive search and interpretive collation, whereas analytics enjoyed the simple fact-find task more than the path creation task, as it allowed them to exercise their confidence in examining information analytically, and producing precise answers.

It is apparent in information behaviour research that information seeking results are largely reflective of Zipf's law of least effort (Zipf, 2016), meaning information-seekers will often opt for the easiest route to information acquisition, even if it means compromising on the value of the information (Bawden and Robinson, 2012, p. 204). Greenberg and Bar-Ilan (2017) found that Google Scholar was more popular than a university's library website for finding resources accessible through the university library catalogue. The fact that the simplicity of a single search text box is used more readily than the library's extensive search tool that allows specific, and arguably more accurate, searches reflects the prevalence of Zipf's law of least effort. By creating systems that facilitate personal styles, the individual's experience of searching becomes easier, more enjoyable, and subsequently more likely to be referred to again.

The Intersection of Cognitive Style, Subject Preference, and Information Behaviour

Madden et. al (2017), studied how a student's subject preference reflected their information behaviour. Here, subject preference, or academic discipline, can be linked to personal style, as the study considers the prevalence of certain cognitive types in the four epistemological classifications of academic discipline, a theory proposed by Biglan (1973) and adapted by Becher and Trowler (2001). The categories consist of hard/soft and pure/applied, referencing the kind of thinking required from its students, and the way the discipline approaches information. Hard pure subjects include physics, where knowledge and learning are based in linear logic; hard applied subjects include engineering, which is also concerned with hard, factual knowledge, but applies it to physical contexts; soft pure subjects include philosophy

and literature, which are concerned with interpretation and expression; soft applied subjects include art, which employs knowledge from other disciplines to action social and/or personal impact (Madden et. al, 2017, p. 698; Goel, 2010).

In Madden et. al's results (2017), 'maths/ICT' can be understood as 'hard pure subjects/hard applied subjects'. It was discovered that "students who expressed a liking for maths/ICT were significantly more likely to prefer subjects with clear right and wrong answers" (Madden et. al, 2017. p. 706), which mirrors the analytic cognitive style dimension from Riding's CSA test, and the findings of Goodale et. al's (2014) study. It might be suggested that those with the analytic cognitive style prefer hard subjects over soft, as hard subjects offer higher rates of objectivity, and require students to approach information evaluatively, applying fact to practice. From this, it is possible to comprehend that information services that cater to hard subjects, such as medical databases or hospital libraries, would benefit from a traditional keyword-based search tool. However, information services catering to soft subjects, which are more concerned with interpretation and creativity, mirroring the wholist cognitive style, might benefit from a narrative-type search tool, as exemplified by PATHS.

Damiano (2019) studies the efficacy of the exploratory search system Labyrinth to navigate a cultural heritage archive, and argues traditional keyword-based search is too complex to search a repository holding documents concerned with cultural and history studies, both of which are soft subjects. Physical collections of cultural heritage are often presented by theme or period, and therefore link similar entities to one another, creating a kind of path, and to translate this into digital collections would be more helpful and appropriate for the subject material than relying on traditional keyword-based search (Madden et. al, 2017, p. 971). This further exemplifies that narrative searching is beneficial both for the individual with the wholist cognitive style, and appropriate for navigating

collections specialising in the soft subjects which wholists favour.

Concerns

The validity of measuring psychological dimensions is scrutinised across many disciplines, and indeed the reliability of Riding's CSA test is challenged in the literature. It is argued that the CSA test is not a strong enough measure of the verbal/imagery dimensions of cognitive style on its own, and must be combined with other tests to accurately determine an individual's personal style (Peterson, Deary and Austin, 2003); the test has low level test-retest results when assessed on the same sample, calling into question its reliability (Parkinson, Mullally and Redmond, 2004); and the presentation order of subsets within the test has a significant influence on the wholist/analytic dimension, causing "inflated ratios" and an increased chance of "appear[ing] more analytic" (Davies and Graff, 2006, p. 995). However, it is still largely used in research of this kind, which may simply be testament to the fact that no other suitable test has since been developed, and adopting the same measure allows ease of comparability and interoperability between studies. Nevertheless, Riding's CSA Test, despite attracting criticism, is still widely used in the literature.

Reisoğlu, Çebi and Bahçekapili (2019) explored the effect of cognitive style and information search experience on university students' completion of searching tasks. While they found a correlation between information behaviour and cognitive style, field-independents demonstrating information searching behaviour related to, "problem-solving, purposeful thinking, and selecting main ideas strategies" (Reisoğlu, Çebi and Bahçekapili, 2019, p. 13), and field-dependents demonstrating need for guidance and broader search scope (Ibid, p. 13), they also discovered that in complex tasks, "experience causes significant differences in online information searching behaviours associated with behavioural,

procedural, and metacognitive domains" (Ibid, p. 11). This means that in similar studies concerned with evaluating the relationship between cognitive style and information seeking behaviour, the question of other variables impacting the results should be considered. If a participant exhibits field-independent behaviour, equating to Riding's analytic dimension, for example, "formulat[ing] and test[ing] hypotheses" (Ibid, p. 4) this could be less of a reflection of their personal style towards interacting with information, and more a result of experience and subsequent confidence in doing so.

Although through the aforementioned studies it has been determined that cognitive styles have an impact on information behaviour, it must be understood that people will still differ within cognitive styles. Information services that cater to cognitive styles, for example, soft-subject databases that employ narrative search tools, might be suggested to promote exclusivity rather than cater to its users. Homogeneity in information services and digital interfaces is precisely what prompted the research into personal styles, as there is no one-size-fits-all for information consumption. Therefore, personalisation must be flexible and optional (Park, 2014, p. 473), as it may never be possible to completely separate all factors of the self that have an impact on information behaviour, as such factors build on and inform the others, all contributing to our own personal style.

Perhaps the main concern of adaptive information services dependent on personal style is the methods of how to determine an individual's cognitive style. Frias-Martinez, Chen and Liu (2007, p. 237) used questionnaires to identify cognitive style in order to provide personalised user models in digital libraries, but found it to be "a time-consuming activity that not all users of a personalized system would be willing to undertake." Chen and Liu (2011) identified students' cognitive styles through data mining and clustering algorithms based on their previous studies, but concluded that further research using different methods was required to ensure the integrity of automatic classification. Information services could

adopt personalisation methods popular on social media sites, perhaps tracking a user's on-site behaviour to produce a personalised interface but this strays from the aforementioned ideals of IFLA (2020), raising privacy and regulation issues. Raptis, Fidas and Katsini (2019, p. 12) state that, "the elicitation of cognitive characteristics is an explicit and time-consuming activity which often requires human intervention" but recognise that data analysis of a user's web activities holds potential. Therefore, deployment of information services tailored to personal style is still a work in progress, but the ever-development of machine learning tools may lead to new and rapid methods of identifying cognitive style in the near future.

Conclusion

While aforementioned studies found a parallel between information behaviour and cognitive style, they propose a need for further research on the topic (Goodale et al., 2014; Greenberg and Bar-Ilan, 2017; Madden et. al, 2017; Damiano, 2019). Equally, identifying cognitive style requires development to avoid time-consuming and sometimes laborious methods, likely with the effort of automatic classification, meaning ultimately, the provision of information repositories that adapt to cognitive style is not currently applicable, but can be expected to be in the near future. As these automatic methods of extracting cognitive style from information behaviour are developing, it is important that creators work with the library's inherent value of freedom of information access in mind.

Information tools that reflect cognitive style determined by academic choice are currently implemented in cultural heritage sites, but could become more widespread through the adoption by subject-specific information services. Such tools may increase the efficiency of a user's interaction with information, perhaps aiding them to discover documents they might not have, had they searched with the traditional keyword-based search. The narrative

tool system that guides the user through the collection, such as PATHS or Labyrinth, may be particularly helpful for those with a wholist cognitive style, as these individuals are likely to consume information broadly, creatively, and have higher levels of dependency than analytics. Soft subjects such as the humanities require their associates to approach information alternatively to the students of hard subjects such as the sciences. As wholists' information behaviour more accurately matches that required of the soft subject student, it would be beneficial to implement a narrative search tool in systems that cater to these subjects.

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