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Thematic analysis of the value of Kuhlthau's work for the investigation of information behaviour in creative workspaces in academic libraries

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Introduction. *Studies of information behaviour can inform the design of information systems, services and creative workspaces. Creative workspaces are associated with access to tools, expertise, guidance, innovation and constructivist learning. The work of Kuhlthau on information seeking, the information search process (ISP) model, zones of intervention, and later with third space(s) might hold value for the exploitation of creative workspaces in academic libraries.*

Method. A thematic analysis of a selection of key publications of Kuhlthau is presented focusing on the value for creative workspaces.

Analysis. Publications were analysed according to key characteristics of creative workspaces using makerspaces as an example: applicability to diverse contexts; provision of access to tools, expertise, and skills; the provision of safe spaces; providing an open environment for expression; space to support a hands-on learning environment for guided and constructivist learning; and providing a space to cultivate character traits important to collective creativity. These were compared with information behaviour themes noted in the work of Kuhlthau.

Results. Various issues in the work of Kuhlthau hold potential for creative workspaces; acknowledgement of uncertainty, complexity of tasks, the need for sense-making, and affective and cognitive experiences throughout information searching, seeking and other information activities encompassed by information behaviour.

Conclusion. Kuhlthau's work can inform information behaviour studies that guide the development of creative workspaces in academic libraries. Specifically, with reference to the phases of creation, information seeking, information searches, thoughts, feelings, the development of zones of intervention, and third spaces.

Introduction

Creativity has been gaining increasing interest in academic contexts as well as with regard to library services and information literacy ([Chang and Hsu, 2015](#); [Hensley, 2004](#); [Plemmons, 2014](#)). Makerspace(s) is a current buzzword in library and information services, educational institutions and many other contexts, which is especially associated with creativity and creative workspaces. It is widely implemented in various spheres including libraries of all types – academic, school, and public libraries – even in hospitals, museums and industry ([Abram, 2013](#); [Kelly, 2013](#); [Moorefield-Lang, 2014](#)). Makerspaces offer access to tools, expertise, guidance and valuable skills for individuals (also titled makers) to safely collaborate, think, construct and create things in an innovative manner ([Abram, 2013](#); [Barniskis, 2014](#); [Fisher, 2012](#); [Hatch, 2014](#); [Kelly, 2013](#)). It is ‘a place where individuals meet to access materials, tools, and technologies that allow for hands-on exploration’ ([Fisher, 2012](#)). It is a place for creation, tinkering and innovation, where ‘a mindful maker is to be aware of one’s own feelings and how a maker project draws from and shapes our emotions’ ([Bowler and Champagne, 2015, p. 2](#)). Makerspaces also go by names such as co-working spaces, content-creation spaces, creative spaces, creativity labs, drop-in spaces, fab labs, hacklabs, idea labs, learning labs, makelabs, makerhoods, makery, medialabs, tech workshops, and tinkering spaces ([Davee, Regalla and Chang, 2015](#); [De Boer, 2015](#); [Koh and Abbas, 2015](#)).

A makerspace can offer an open environment to cultivate an innovative mind-set and creative self-expression which could lead to emotions and feelings of satisfaction, accomplishment and freedom ([Bowler and Champagne, 2015](#); [Preddy, 2013](#)). It can build character traits such as creativity, curiosity, open-mindedness, persistence, critical thinking, social responsibility, and teamwork ([Maker Media, 2013](#)), and it supports various learning styles ([Hatch, 2014](#); [Loertscher, Preddy and Derry, 2013](#); [Preddy, 2013](#)). Makerspaces are associated with constructivist learning, which is the philosophy underlying hands-on learning ([Kurti, Kurti and Fleming, 2014](#)). These things also apply to other creative workspaces where people design, compose, draw and solve problems ([Chang and Hsu, 2015](#); [Lavranos, Kostagiolas, Martzoukou and Papadatos, 2015](#); [Lee, Theng and Hoe-Lian Goh, 2005](#); [Medaille, 2010](#); [O'Connor, 1988](#); [Small, Laura and Meredith, 2014](#)).

The current interest in makerspaces – a good example is a 2015 *Library Hi Tech* issue dedicated to makerspaces ([De Boer, 2015](#); [Fourie and Meyer, 2015](#); [Moorefield-Lang, 2015](#)) – stimulated this paper. The fact that makerspaces are built upon the basis of constructivist learning, which also features in Kuhlthau’s work on zone(s) of intervention (influenced by the work of Vygotsky) stimulated our interest to explore how the work of Kuhlthau can inform information behaviour studies of creative workspaces, using makerspaces as example. Kuhlthau is a widely cited scholar in the library and information science literature ([Case, 2012](#)). Her information search process (ISP) model acknowledging the importance of thoughts, feelings and actions (e.g., [Kuhlthau, 1999a, 1999b](#)), and subsequent research on information seeking (e.g., [Kuhlthau and McNally, 2001](#); [Kuhlthau and Tama, 2001](#)), zones of intervention and third spaces ([Kuhlthau, Maniotes and Caspari 2007, 2012, 2015](#)) might inform the design of creative workspaces if approached from an information behaviour perspective.

We are interpreting information behaviour as an umbrella concept encompassing information searching, information seeking and other information activities that feature when people are involved in acts of creativity. Creativity studies mostly focus on information seeking ([Lavranos, Kostagiolas, Martzoukou and Papadatos, 2015](#); [Makri and Warwick, 2010](#); [Medaille, 2010](#); [O'Connor, 1988](#)). Makri and Warwick (2010) do, however, also touch on information behaviour, and so does Kuhlthau (2008) in her discussion of 21st century challenges:

‘Increased uncertainty creates a zone of intervention for intermediaries and system designers that support users in their quest for seeking meaning from information. Innovative approaches to interaction between people and information are needed to bridge the divide between information behavior, information literacy and impact of information in order to address issues of the twenty-first century’ (p. 66).

The purpose of this exploratory paper is to assess if, and how, Kuhlthau’s work can inform information behaviour studies on creative workspaces and thus support the design and use of such spaces. Considering trends noted in the subject literature ([Abram, 2013](#); [Colegrove, 2013](#)), our focus will be on academic libraries (as an example of a specific context) and makerspaces (as an example of a creative workspace). The paper covers the clarification of concepts, background on makerspaces and their characteristics as creative workspaces, rationales

to focus on the research, specifically the information search process model of Kuhlthau, findings from the analysis, recommendations, and conclusions.

Problem statement

Uncertainty features strongly in creative workspaces ([Lewis, 2015](#); [Plemmons, 2014](#)). Task complexity, uncertainty, and the need to establish links between information behaviour, information impact, and information literacy, feature strongly in the work of Kuhlthau ([2008](#)). This and the fact that her information seeking process model and subsequent work might hold special value for cultivating deeper understanding of complex tasks and how these tasks can be supported through guided inquiry, sense-making and the role of interventions and skills transfer from a variety of information sources in a third space ([Kuhlthau, Maniotes and Caspari, 2007, 2012, 2015](#)) showed promise for exploring the following research question:

How can the work of Carol Kuhlthau inform studies of information behaviour in spaces of creation and creativity – i.e. creative spaces?

Sub-questions to be answered included:

- What has been reported in the literature on makerspaces and other creative spaces regarding information behaviour, information seeking, information needs, information interventions and the design of information systems?
- Which characteristics of makerspaces (as an example of a creative space) can be aligned with information activities?
- What can be noted from the work of Kuhlthau that can inform information behaviour studies regarding creative spaces?

Based on findings for the sub-problems we will offer suggestions to the research problem.

Clarification of concepts

The following main concepts are defined to reflect their interpretation for purposes of this paper:

Information behaviour

Information behaviour has often been noted as an umbrella term for information activities ([Savolainen, 2007](#); [Wilson, 2009](#)). It characterises the ways that people generally ‘deal with information’ ([Savolainen, 2007, p. 109](#)) or interact with information ([Bates, 2010, p. 2381](#)) such as in the generation, communication, and use of information, information seeking, and interactive information retrieval ([Case, 2012](#); [Ingwersen and Järvelin, 2005](#); [Kuhlthau, 2005, 2007, 2008](#); [Pettigrew, Fidel and Bruce, 2001](#); [Savolainen, 2007](#); [Wilson, 1999](#)). Information behaviour is associated with fulfilling an information need or gap and solving problems ([Ingwersen and Järvelin, 2005, p. 386](#)).

Information need

An information need can be defined as a desire brought out by cognitive, affective or physiological factors to resolve a situation or accomplish a goal ([Dervin, 1999](#); [Leckie, Pettigrew and Sylvain, 1996](#)), and it prompts people ‘to seek answers, and when information is perceived as personally relevant (affective behaviour), it is seized upon by the cognitive domain and acquired as part of one's personality structure’ ([Nahl, 2001, para. 10](#)).

Information literacy

Information behaviour and information needs are related to information literacy ([Kuhlthau, 2008](#)). It can be assumed that the use of creative spaces require information literacy skills ([Koh and Abbas, 2015, p. 124](#)). Although information literacy is defined by many standards of information literacy such as the Association of College and Research Libraries (ACRL) standard (American Library Association (ALA), www.ala.org) the explanation of Kuhlthau, Maniotes and Caspari ([2015](#)) will be accepted for purposes of this paper. They define information literacy as ‘the ability to locate, evaluate, and use information wisely in a wide range of situations’ (p. 68).

Zones of intervention

Kuhlthau ([2004](#)) defines a zone of intervention as ‘that area in which the student can do with advice and assistance what he or she cannot do alone or can do only with great difficulty’ (p. 129). In addition, Kuhlthau, Maniotes and Caspari ([2015, p. 26](#)) note that a zone of intervention is developed specifically to provide assistance and instructions to guide students to formulate their focus as a path for collecting information to complete their tasks. Kuhlthau was influenced by Vygotsky’s zone of proximal development ([Kuhlthau, 2007, p. 36](#)).

Third spaces

Ongoing research as reported by Kuhlthau, Maniotes and Caspari ([2007, 2012, 2015](#)) led to calls for a third space. A third space is defined as ‘an intersection zone between the school curriculum and the student’s knowledge and ways of knowing, creating a dynamic conception of the learning space that involves the student’s outside-the-classroom knowledge’ ([Kuhlthau and Cole, 2012, p. 1](#)). In addition, Kuhlthau, Maniotes and Caspari ([2007](#)) explain that a third space provides a particular kind of adaptable learning space where ‘students can construct new worldviews rather than having to take on the teacher’s perspective or those mandated by the curriculum or textbooks’ (p. 32). In the most recent work of Kuhlthau, Maniotes and Caspari ([2015](#)), third space is explained as a hybrid space that forms when ‘the curriculum and personal experience of students merge’ to create an authentic and dynamic learning environment’ (p. 26).

Makerspaces

Makerspaces are creative spaces. Acknowledging that there are many interpretations of makerspaces, our interpretation of makerspaces in academic contexts is influenced by the work of Burke ([2015](#)), Kelly ([2013](#)) and Maker Media ([2013](#)). A makerspace is a community-oriented space and learning environment where people gather to create, make, and learn using a variety of new and traditional tools. These individuals can include novice, experienced, and expert makers. Additionally, Benton, Mullins, Shelley and Dempsey ([2013](#)) define makerspaces as ‘places where like-minded persons gather to work on personal projects, share tools and expertise as well as learn from each other’ (p. 7). In an academic context an interconnected resource space could be established, which are equipped with tools, information resources, and technologies for hands-on learning, inventing, designing and tinkering ([Fourie and Meyer, 2015](#)). Makerspaces have been referred to as an intersection ([Gustafson, 2013; Kelly, 2013](#)), centric ([Barniskis, 2014; Lotts, 2015](#)), and in-between space ([Jónsdóttir, Gísladóttir and Guðjónsdóttir, 2015; Verbaan and Cox, 2014](#)). Creative spaces such as makerspaces could, in our opinion, provide a good fit to facilitate third spaces as envisaged by Kuhlthau, Maniotes and Caspari ([2015](#)).

Why assess the work of Kuhlthau to inform information behaviour studies of creative spaces?

Many models of information behaviour and information seeking have been reported and assessed (e.g., [Case, 2012; Fisher and Julien, 2009; Ford, 2015; Hepworth and Walton, 2009; Kuhlthau, Heinström and Todd, 2008](#)). They do not specifically focus on creativity and creative practices. The need for the construction of creative

workspaces are, however, noted in the information behaviour work of Anderson (2011), Florida, (2001), Howkins (2009), Lee, Theng and Hoe-Lian Goh (2005), and O'Connor (1988).

Prominent researchers in information literacy, information behaviour and the design of information services and systems have argued the importance of information behaviour studies to inform the design of information systems and information services (Hepworth, 2004, 2007). In Fidel's (2012) book, *Human information interaction: an ecological approach to information behavior*, she explains that studying human information interaction could provide a golden opportunity to view human information behaviour through a holistic or multidimensional approach and to enhance the design of information systems and services (Fidel, 2012, p. 255). This argument also featured in her earlier work (Fidel, Pejtersen, Cleal and Bruce, 2004). The design of spaces of learning, interaction, and creativity might benefit from such a holistic approach (Benton et al., 2013; Houston, 2013; Meyer and Fourie, 2015) incorporating affective, cognitive, and physical components.

Spaces supporting creativity are important (Benton et al., 2013; Giannakos, Divitini, Iversen and Koulouris, 2015; Kroski, 2014; Range and Schmidt, 2014) and especially spaces supporting play, curiosity, imagination, and creativity (Bowler, 2014; Plemmons, 2014; Small, 2014). An understanding of information behaviour might provide a good foundation to support the design and development of such creative workspaces to empower playfulness, curiosity, imagination, and innovation (Anderson, 2010). Anderson (2011) believes that 'information professionals and researchers have much to contribute in this regard in terms of supporting individuals and helping others develop their creative abilities' (para. 24).

From the various user-centred paradigms to information behaviour studies and the design of information systems (Case, 2012; Ford, 2015), Kuhlthau's information seeking process model is one of very few that substantially allows for thoughts, feelings, and emotion which seems central to creative practices and workspaces where uncertainty is high (Case, 2012). The model is based on her doctoral study investigating the library research process of high school students through the utilisation of Kelly's theory of constructs in association with intervention (Kuhlthau, 1983). The model does not just focus on a single dimension (either the psychological or the social approach) (Choo, Detlor and Turnbull, 2000; Talja, Keso and Pietilainen, 1999; Vakkari, 2003; Williamson, 1998). In essence it takes on a holistic view (i.e., recognising affective, cognitive, and physical factors and experiences) when studying the information seeking behaviour of individuals (Kuhlthau, 1991, 2004). The value of a holistic view to the design of information systems and services and studies related to information behaviour has also been noted by Fidel (2012), Fidel et al. (2004), Lamb and Kling (2003), Solomon (1999), and Sonnenwald (1999).

Kuhlthau's subsequent work following on the development of her information seeking process model, for example: *Seeking meaning: a process approach to library and information services* (1993c, 2004); *Guided inquiry: school libraries in the 21st century* (2010) - focus not only on information seeking, but also on the development of supportive and transferable skills for appropriate practices, zones of intervention, and guided inquiry (Hepworth and Walton, 2009; Kuhlthau, 2008, 2010; Kuhlthau and Cole, 2012; Kuhlthau and Maniotes, 2010; Kuhlthau, Maniotes and Caspari, 2007, 2012, 2015). Furthermore, Kuhlthau, Maniotes and Caspari (2007, 2012, 2015) argue for the creation of a third space as a hybrid learning environment where students can gain deeper understanding through guidance and intervention to promote information literacy skills during a student's information search process. According to Kuhlthau, Maniotes and Caspari (2015) 'creativity, innovation, communication, collaboration, critical thinking, problem solving, and decision making are seen as essential to education for today's world' (p. 66). Creative learning from a variety of information sources, systems and services through the assistance of guidance at specific intervention/decision points (i.e., zones of intervention) to develop higher-order thinking, knowledge construction and deeper understanding during the information searching process is required (Kuhlthau, Maniotes and Caspari, 2015).

Authors such as Anderson (2006, 2010, 2011), Lavranos, Kostagiolas, Martzoukou and Papadatos (2015), and Medaille (2010) note the value that studies on information behaviour and affect can offer for creativity and innovation. For the purposes of our argument, this might be extended to the design of creative spaces.

Characteristics of creative workspaces that need to be considered in studies of information behaviour: makerspaces as exemplar

Creative workspaces might have different characteristics. We decided to focus on the characteristics of makerspaces to explore the value Kuhlthau's work might hold for information behaviour studies regarding creative workspaces. For purposes of discussion we will focus only on six key characteristics: applicability to diverse contexts; provision of access to tools, expertise, and skills; the provision of safe workspaces; providing an open environment for expression; space to support a hands-on learning environment for guided and constructivist learning; and lastly, providing a space to cultivate character traits important to collective creativity. At this stage we focus on the characteristics *per se*; to avoid duplication, connections to the work of Kuhlthau will only be made later in the paper.

Applicability to diverse contexts

The implementation and use of makerspaces have been reported in a variety of contexts including academic contexts and libraries ([Abram, 2013](#)) where they can promote playful, innovative and learner-driven construction and deconstruction of tasks or problems through a do-it-yourself, learn-by-doing and learn-by-sharing mind-set to gain deeper understanding and develop thinking ([Abram, 2013](#); [Bevan, Gutwill, Petrich and Wilkinson, 2015](#); [Koh and Abbas, 2015](#)). From the perspective of information behaviour, context and specific environments are very important, that is, the context and environment where a creative workspace is situated. A change in context and especially information environment can lead to changes in information behaviour and tasks that require new knowledge construction ([Kuhlthau, Heinström and Todd, 2008](#)). For example, the information behaviour of users of makerspaces in public libraries might be different from the users in academic libraries. Kuhlthau, Heinström and Todd ([2008](#)) note the value of utilising the information seeking process model to guide users in any context (e.g., legal settings, libraries, and education) to deeper knowledge development and sense-making in a changing information environment ([Kuhlthau, 1988b, 1989](#); [Kuhlthau and McNally, 2001](#); [Kuhlthau and Tama, 2001](#)).

Provision of access to tools, expertise, and skills

Makerspaces are intended to provide access to tools, expertise, skills, guidance and facilities ([Abram, 2013](#); [Range and Schmidt, 2014](#)). This is confirmed by Burke ([2015](#)), Houston ([2013](#)) and Pisarski ([2014](#)). The typical assortment of tools includes: electronics (e.g. Raspberry Pi, circuit kits, microcontrollers and robotics), power tools (e.g. jigsaw, sewing machine, drill), mechanical tools (e.g. screwdriver, hammer, wrench, wire cutters, soldering), and media and software tools (e.g. 3D printers, podcasting equipment, digital cameras, and photo, video, and audio editing software) ([Gutsche, 2012](#); [Koh and Abbas, 2015](#); [Maker Media, 2013](#)). For makerspaces, access to technologies, materials, and fabrication edification, which may not be normally available or accessible to all library users, is important. In an academic context such as in an academic library access to information resources and spaces for collaboration should also be important, for example, databases allowing sharing of search results, reference management software allowing sharing of references, and resources supporting collaborative writing and designs. Uncertainties are often noted with the selection of tools for makerspaces ([Knibbe, Grossman and Fitzmaurice, 2015](#)); this applies to the makers as well as those responsible for the makerspaces. Information such as brochures, specifications for such tools et cetera thus becomes important.

Provision of safe spaces

A maker project initiates by an idea, then the observation and planning stages take place stimulating the stage of creation, which may involve trying new things and tinkering until the last stage of completion occurs when the new creation works well and the maker is satisfied with the creation ([Kurti, Kurti and Fleming, 2014, p. 20](#)). According to Bowler ([2014, p. 60](#)), multiple design/test stages and figuring out occurs during design thinking in makerspaces. Throughout these stages, processes, and dealing with uncertainties, makerspaces are intended to be

safe spaces supporting experimentation, design, innovation, constructivist learning, expressions of ideas and opinions, and collaboration ([Bowler and Champagne, 2015](#)). It is important to note that collaboration can include co-learning and co-inventing, and knowledge and resource sharing to enable problem solving, critical thinking, decision-making and constructive learning ([Bowler, 2014, p. 61](#)).

Providing an open environment for expression

Makerspaces should provide physical or virtual spaces where ‘makers’ can explore and express themselves. They should be places where makers can transform how they think, learn and solve problems ([Peppler and Bender, 2013, p. 23](#)). Makerspaces need to provide (safe) social spaces where fellow makers can co-exist and co-create ([Slatter and Howard, 2013, p. 279](#)), and where there is room for the expression of emotions and feelings typically associated with creativity – satisfaction, self-content and accomplishment, but also anxiety and frustration ([Anderson, 2011](#); [Burke, 2015](#); [Lavranos, Kostagiolas, Martzoukou and Papadatos, 2015](#)).

Space to support a learning environment for hands-on constructivist learning

Makerspaces are aligned with constructivist learning where the constructivist philosophy of learning enables educators to ‘act as guides for inquiry-based approaches to the development of knowledge and thinking processes’ ([Kurti, Kurti and Fleming, 2014, p. 8](#)). As a physical or virtual space in academic contexts it should support both hands-on, as well as constructivist learning. The constructivist philosophy focusses on the learning process being learner driven rather than teacher driven ([Kurti, Kurti and Fleming, 2014](#)). As a result, students will have to actively engage and collaborate to overcome challenges during their tasks, resulting in students learning and teaching new concepts to each other, while the teacher observes from the outside ([Kurti, Kurti and Fleming, 2014](#)).

Providing a space to cultivate various character traits important to collective creativity

As mentioned in the Introduction, makerspaces are heavily associated with creativity, curiosity, open-mindedness, persistence, critical thinking, social responsibility, and teamwork ([Maker Media, 2013](#)). Makerspaces should support the development and nurturing of such characteristics by means of access to tools, expertise, spaces for sharing and expression, trial, and error. More importantly, collaboration needs to be supported ([Gustafson, 2013](#)).

Much has been published on the use and implementation of makerspaces as well as typical characteristics of makerspaces. Very few authors, however, link makerspaces to the understanding of such aspects of information behaviour as information seeking, searching, information needs, and information literacy. Exceptions being Bowler ([2014](#)), Burke ([2015](#)), Fourie and Meyer ([2015](#)), Slatter and Howard ([2013](#)), and Koh and Abbas ([2015](#)).

Thematic analysis of selected key publications of Kuhlthau

Key library and information science, educational, and multi-disciplinary databases were searched for publications authored by Kuhlthau from 1983 until 2015. These include: Emerald, ERIC, Library and Information Science Abstracts (LISA), Library and Information Science Source, Library, Information Science and Technology Abstracts (LISTA), ISI Web of Science, and ScienceDirect. To be considered for inclusion in this paper, Kuhlthau’s name had to appear in the author field. The search results were filtered: literature published in English; availability of the full text, and document type (articles, books, book chapters and conference papers). A total of 56 documents were retrieved; after removing duplicates, 36 documents remained for further analysis. Since this is an exploratory study to indicate the prospective of utilising Kuhlthau’s work on information behaviour to inform studies in creative spaces such as makerspaces 36 articles were considered acceptable. (Throughout the paper there are, however, references to the literature on makerspaces, to other researchers who commented on the work of Kuhlthau, and other relevant publications).

Bearing the characteristics of makerspaces in mind we applied thematic analysis to identify themes from the work of Kuhlthau that can support studies of information behaviour regarding creative spaces such as makerspaces. From the analysis, the following themes stood out:

Acknowledgement of freedom in information seeking

In everyday life, information seeking is mostly free of restrictions. This is in contrast to assigned (also referred to as imposed ([Gross, 1995](#))) tasks and information seeking typically associated with academic assignments. Understanding such freedom of information seeking in academic contexts might impact on information literacy instruction, library orientation and the provision of information resources ([Kuhlthau, Maniotes and Caspari, 2015](#)). Although often focusing on academic contexts and assignments these should also prepare students for the freedom of information seeking in everyday life. A case in point, Kuhlthau, Maniotes and Caspari ([2015](#)) explain that this freedom to access the Internet and technology within public libraries is an, ‘honored tradition of meeting the needs of those citizens who otherwise would not have access to technology’, which can also help to address the digital divide (p. 106).

Complexity of the sense-making process

Information needs often results in uncertainty and even anxiety and frustration ([Case, 2012](#); [Kuhlthau, 1993a](#)). To address this, Dervin ([1999](#)) suggested a sense-making methodology to deepen understanding of people seeking information to bridge a gap in their knowledge. Sense-making also features in the work of Kuhlthau ([1993a](#), [1999b](#), [1999d](#), [2004](#), [2008](#)). Kuhlthau and Maniotes ([2010](#)) note ‘that when students get frustrated in the exploring stage, they need to be encouraged to take time to read and reflect, as well as guided in making sense of information and strategies’ which can be accomplished through ‘providing targeted intervention in each stage of the inquiry process’ (p. 18). In addition, interventions can promote comprehension, build skills and assist in the transfer of skills to other situations (or individuals) to satisfy an information need ([Kuhlthau, 1994](#)). Cognitive ability and affect ([Kuhlthau, 1988a](#); [Kuhlthau, Turock and Belvin, 1988](#)) can also be linked to uncertainty and sense-making.

Information seeking and sense-making can manifest over an extended period. It is not always just a once-off need to make sense of a problem. In solving problems and especially in making sense of a situation or problem it is not just about applying the typical skills such as defining a problem, selecting information sources and evaluating information stressed in information literacy skills. Considering the focus on creativity, experimentation, innovation and design that features strongly in discussions of makerspaces ([Plemmons, 2014](#)), the understanding of the complexity of sense-making and the recognition of information needs seem very important ([Kuhlthau, 1999d](#), [2008](#)). This would also apply to information activities pursued in the process of sense-making, and the challenges faced such as recognising and expressing information needs and articulating these in an appropriate manner to find information ([Kuhlthau, 2008](#); [Kuhlthau, Turock and Belvin, 1988](#)). In makerspaces people might need support in moving from an anomalous state of knowledge (ASK) (i.e. there is a gap in knowledge; not having sufficient knowledge) ([Belkin, 1980](#)) or a visceral level (vague dissatisfaction with knowledge; vague awareness that information might be needed) ([Taylor, 1968](#)) to clearly expressed information needs ([Taylor, 1968](#); [Kuhlthau, 1988a](#), [1989](#), [2003](#), [2005b](#)).

Multiple stages and processes in information seeking requiring different types of learning

Various stages of information seeking have been noted in the work of Kuhlthau ([1988b](#), [1988c](#), [1994](#), [1995](#), [1997](#), [2005a](#), [2007](#), [2013a](#)), as well as other researchers such as Ellis ([1989](#)) and Wilson’s model blending of the models of Kuhlthau and Ellis ([Ford, 2015, p. 53](#)), as well as Wilson’s revision of his 1981 model to reflect input from Ellis’ model ([Ford, 2015, p. 128](#)). In contrast with the seemingly linear nature of stages in these models, Foster ([2005](#)) argues for depicting information seeking as a non-linear process. In spaces and contexts where creativity features strongly the stages might differ from the stages found for assigned tasks ([Kuhlthau, 1990](#), [1991](#), [1999a](#); [Kuhlthau, Heinström and Todd, 2008](#); [Kuhlthau, Maniotes and Caspari, 2007](#), [2012](#), [2015](#); [Kuhlthau, Turock and Belvin, 1988](#)) or even the stages that feature in design, making, experimentation, et cetera.

Kuhlthau's (2008) information seeking process model notes six distinct stages (initiation, selection, exploration, formulation, collection and presentation) where users utilise information and interact with information resources to satisfy their information needs. The exploration and formulation stages especially fit well with a constructivist approach to learning where an individual actively pursues constructing understanding and meaning from the information encountered over a period of time. Kuhlthau (2013) identifies eight design processes, namely: open, immerse, explore, identify, gather, create, share, and evaluate, and five kinds of learning (curriculum content, information literacy, learning how to learn, literacy competence and social skills) (Kuhlthau and Maniotes, 2010).

Zones of intervention and guided inquiry are argued as means to support these stages and processes (Kuhlthau 1994, 1996, 2004, 2008; Kuhlthau 1999c, 2010; Kuhlthau, Maniotes and Caspari, 2007, 2012, 2015; Maniotes and Kuhlthau, 2014).

Constructivist approach during information seeking provides deeper understanding through guided-learning

Constructivist learning is not only key in the makerspace literature, but also features very strongly in Kuhlthau's motivations for a zone of intervention (Kuhlthau, 1994, 1996, 2004, 2008) and guided-learning (Kuhlthau, 1999c, 2010; Maniotes and Kuhlthau, 2014). Cooper and Kuhlthau (1999) reveal the importance of creativity as a 'constructive strategy for making meaning' (p. 393) due to the changing nature of the information landscape and complex contexts of information seeking. As a result, individuals will 'require extensive thinking that involves an intellectual leap which carries the user 'beyond the information to the construction of something 'new'' (Cooper and Kuhlthau, 1999, p. 393), therefore moving towards visual or mental imagery. The value of Kuhlthau's work and information seeking process model lies especially in the recognition of a phase for construction (Kuhlthau, 1993b). A stage (or probably more than one stage) of construction also features prominently in her co-authored work (Kuhlthau, Maniotes and Caspari, 2007, 2012, 2015).

Holistic experiences during information seeking that needs to be addressed in information literacy

Various emotions and feelings such as uncertainty, frustration, satisfaction, and self-content can occur during the information seeking process, any of which could require intervention and guidance (Kuhlthau, 1991, 2004, 2005). Increased uncertainty, frustration, and anxiety create a need for a zone of intervention for intermediaries and system designers to provide assistance (Kuhlthau, 2008). This can also be addressed in information literacy training. Kuhlthau (2013b) explains that

'the challenge is to begin with the premise that information literacy enables a person's deep thoughtful process of learning from a variety of sources that is essential in a dynamic information environment to solve complex tasks from out of a holistic experience (i.e. feelings (affective), thoughts (cognitive) and actions (physical)) during the six information seeking stages' (p. 92).

Thus, Kuhlthau (2013b) argues that a holistic process of learning from a variety of sources of information should apply during information seeking. This is central to an individual's information literacy capabilities (i.e., deep thinking, reflecting, constructing, innovating, and learning from complex task) (Kuhlthau, 2013b).

Discussion

In the preceding two sections we considered some typical characteristics of creative spaces, and information behaviour themes noted from the work of Kuhlthau. From the preceding two sections it is clear that the work of Kuhlthau (specifically her information search process model, and arguments for zones of intervention, guided inquiry and consideration of a third space (Kuhlthau, Maniotes and Caspari, 2007, 2012, 2015)) hold value for creative spaces. We will now consider two main issues: (1) how Kuhlthau's work can inform studies of

information behaviour in creative spaces, and (2) the application of findings from such studies for the establishment of creative spaces supported by academic library services.

Taking makerspaces as an example, the model should be applicable to study information behaviour in different makerspace contexts and different user groups, especially since the model has already been used in different contexts ranging from academic to legal. With regard to contexts of creativity, Kuhlthau's acknowledgement of uncertainty and anxiety is especially important.

Findings from information behaviour studies in creative spaces can help academic institutions and libraries to create learning environments such as makerspaces that meet with the typical characteristics of creative spaces, for example to support 'maker activities' ranging from engineering to architectural design or music contexts ([Abram, 2013](#); [Moorefield-Lang, 2015](#); [Pepler and Bender, 2013](#)). It can ensure that the provision of access to tools, expertise, and skills are aligned with stages and processes of creativity. Although Kuhlthau focuses on information seeking and the search process including initiation, other typical information activities such as reflection, use, and sharing also need to be accommodated. Such spaces must be safe spaces and provide for an open environment for expression and hands-on constructivist learning as well as opportunities to cultivate various character traits important to collective creativity. The latter might lend itself well to zones of intervention and the third space concept proposed by Kuhlthau ([1994, 2008](#)) and Kuhlthau, Maniotes and Caspari ([2007, 2012, 2015](#)).

Information needs experienced during the completion of a task stimulates searching for information or inquiring for information from experts or other peers ([Kuhlthau and Cole, 2012](#)). According to Kuhlthau ([1994, 2008](#)), a zone of intervention can be used to provide guidance to students in making sense of their information needs, transferring skills and also with regard to information provision. It can support the process of decision-making and finding solutions.

Kuhlthau, Heinström and Todd ([2008](#)) note that due to the changing nature of the information landscapes and individuals' information needs new knowledge construction is required. Makerspaces can provide the ideal intersection, in the form of a third space, to create new knowledge through combining an individual's prior knowledge and experiences with their new learned information ([Slatter and Howard, 2013](#)). Throughout the various stages of information seeking various decision points occur, which leave opportunities for zones of intervention, where individuals can do with some guidance, advice and assistance ([Kuhlthau, 1994, 2005, 2008](#)). For example, during a maker project a student might require advice regarding the most suitable tool to utilise to complete his/her project. There is thus room for guided inquiry ([Daley and Child, 2015](#); [Loertscher, Preddy and Derry, 2013](#)).

Kuhlthau ([1994, 2008, 2012, 2015](#)) mentions that intervention between the movement of project stages can be provided through the inquiry process to construct an intersection between an user's personal knowledge and curriculum, thus working from a third space ([Kuhlthau, Heinström and Todd, 2008](#)). The link between third spaces and makerspaces are noted by Slater and Howard ([2013, p. 279](#)) due to both these concepts producing an intersection or centric space through constructing a physical environment for guidance, and transfer of skills and social experience from personal knowledge and workplace/school knowledge.

Collaborative information seeking over an extensive period could occur as brief, informal expressions of mutual interest and mutual effort on a given topic for a task (i.e. micro-collaboration) ([Gazan, 2010](#)). Makerspaces can facilitate group projects, and might draw on collaborative information seeking. Intervention, such as in zones of intervention, can support mediation and facilitation in group projects ([Kuhlthau, 1994](#)). The process of constructing meaning from multiple sources of information can link to the ability of the individuals to seek, locate, evaluate and use information, and thus their information behaviour in relation to their information literacy skills becomes important ([Kuhlthau, 2008](#)). Intervention can enable individuals to progress in the accomplishment of their tasks which could result in an innovative way of doing things, which according to Kuhlthau ([2008](#)) can be supported by an approach of guided inquiry, and a third space where students can draw on different inputs such as curriculum and their own experience ([Kuhlthau, 2008](#)). Kuhlthau ([1994](#)) points out that the intervention provided needs to support mediation and facilitation in group projects – thus collaborative information seeking. Academic makerspaces thus need to provide for expertise and guidance and supporting

facilities ([Range and Schmidt, 2014](#)). It is especially important to provide for sources that are freely available, and to support free information searching.

Various emotions and feelings such as uncertainty, anxiety, and frustration could occur during the information seeking process potentially requiring intervention and guidance. Experiences of increased uncertainty, frustration and anxiety create an opportunity for intervention from intermediaries such as librarians and for system designers to design information systems that can provide assistance and accommodate such affective experiences ([Kuhlthau, 2004, 2008](#)). Indeed, Kuhlthau often stresses the opportunities for intermediaries to address such negative affective experiences ([1996, 1999, 2004, 2008](#)). In our opinion, however, guidance and support of positive affective experiences such as satisfaction and self-content can also be supported, for example, advice on how to showcase work through conference posters and papers and in social media (e.g., blogs, ResearchGate; as well as many other opportunities which are beyond the scope of this paper). Thus, in essence, Kuhlthau's work on zones of intervention can in many ways be applied to constructive processes of learning as required in creative spaces ([Kuhlthau, 1994, 2008](#)). New ideas and perspectives can be formed within creative spaces through support from library and information professionals ([Bowler, 2014, p. 60; Range and Schmidt, 2014, p. 9](#)).

With consideration to the need to develop and foster various character traits and thinking styles in creative spaces, the grounding of Kuhlthau's model in learning theory can especially inform support for different learning styles and preferences in creative spaces in academic libraries ([Kuhlthau, 1994; Kuhlthau and Cole, 2012](#)). The complexity of sense-making in design and creative processes might especially need to be investigated from an information behaviour perspective, for example, as explained by Lavranos *et al.* ([2015](#)) regarding information seeking and musical creativity. The information search process model and its focus on stages, thoughts and feelings can be a good point of departure if compared with stages that for example have been noted for activities in makerspaces. Hertz ([2012](#)) focuses on five stages of the design thinking process, namely: empathise, define, ideate, prototype and test. Research in creative spaces can be extended to determine how these stages can be supported by academic libraries.

In makerspaces construction can be aligned to creativity, for example Range and Schmidt ([2014](#)) highlight that 'a Makerspace is more than just a set of tools or a cool idea. Successful Makerspaces, particularly in educative environments, balance practicality with creativity and collaboration to serve the needs of the school community' (p. 30). Again, there is a need to explore the stages of information seeking, thoughts and feelings from an information behaviour perspective and find guidance from models such as the information search process model by Kuhlthau ([2004](#)).

The design of creative workspaces, from an information behaviour perspective, can produce a dynamic and hybrid academic environment for interaction, collaboration, experimentation and exploration if issues such as the themes we identified (e.g., the complexity of the sense-making process, the role of a zone of intervention and multiple stages in information seeking) are acknowledged.

The fact that 'Makerspaces are continuously evolving and the technologies and tools they use are rapidly changing as the information landscape changes' ([Koh and Abbas, 2015, p. 119](#)), also applies to other creative workspaces. As noted by Kuhlthau, Heinström and Todd ([2008](#)) a changing context and changing information environment can lead to changes in information behaviour, information needs, and tasks that require new knowledge construction, and thus need to be studied on an ongoing basis. Focusing on creativity, experimentation, innovation and design in creative workspaces ([Plemmons, 2014](#)), and understanding the complexity of sense-making, as well as recognising when guidance is needed to satisfy information needs is very important ([Kuhlthau, 1999d, 2008](#)). Subsequently, creative workspaces such as makerspaces within an academic context can provide a wonderful opportunity to facilitate the development of zones of intervention, third spaces, and adapting training in information literacy skills to assist in addressing individuals' information needs.

Recommendations based on the thematic analysis

We are offering only a few preliminary suggestions on a research agenda for studies of information behaviour in creative workspaces (inspired from the work of Kuhlthau), and for the implementation of such spaces in academic libraries where the focus will be on information-related support for creative workspaces.

- Holistic studies exploring all processes and information activities involved in a variety of creative tasks completed in academic creative workspaces. This should include not only information needs, information searching, information seeking and information monitoring, but also other information activities such as information sharing, information avoidance, and information dissemination (a kind of *audit* of information tasks involved). Creative tasks from different disciplines as well as the different Sciences (Natural Science, Social Science, and Humanities) should be covered to note differences. Findings should be aligned to the support and services required from academic libraries.
- Exploration of the feelings, thoughts, stages and flow of processes during the completion of different types of creative tasks, and how these can be supported by academic libraries.
- Identification of stages that can benefit from guided inquiry and zones of intervention with specific reference to the role and responsibility of intermediaries from academic libraries.
- Needs for information, information resources, support and information interventions to enable students to use the knowledge attained from their curriculum and own experiences to the generation of new knowledge as envisaged in the third space concept suggested by Kuhlthau, Maniotes and Caspari ([2007](#), [2012](#), [2015](#)).
- Tools and resources required in sense-making during creative tasks and perspectives from different types of projects and disciplines should be explored. Academic libraries need to map the tools and resources required to support sense-making during creative tasks. Consideration of free, non-restrictive searching and use of sources would especially hold value for students when moving out of academic contexts.
- An audit of the skills required in creative academic tasks and how these can be supported by information literacy training in line with suggestions from the work of Kuhlthau, and expanded as necessary.

Conclusion

The intention of this paper was to portray the value of Kuhlthau's work in informing the development of creative workspaces such as makerspaces. The construction of a dynamic, intuitive, and creative learning space can be supported by the various themes noted through a thematic analysis of Kuhlthau's work such as guided-inquiry, third spaces, sense-making, zones of intervention, constructivist learning, holistic experiences during information seeking, and the need for information literacy skills. This, however, would require a deep understanding of the nature and characteristics of creative spaces, information seeking and other information activities associated with information behaviour, how these are exploited in creative work spaces in academic contexts, as well as how to maintain the playfulness, enthusiasm, curiosity, and creativity associated with creative workspaces. 'Ultimately, the outcome of maker education and educational makerspaces leads to determination, independent and creative problem solving, and an authentic preparation for the real world by simulating real-world challenges' ([Kurti, Kurti and Fleming, 2014, p. 24](#)), and to produce creative solutions to individuals' information needs. It has been said that everyone can be a maker, as 'everything we do is an act of creation, and our use of tools to transform our environment is what distinguishes us the most from other species (usually for positive effect, one would hope!) And so some have suggested that we call our species *Homo faber*, the creative people, instead of *Homo sapiens*, the thinking people' ([Maker Media, 2013, p. 23](#)). If we interpret this as everyone can be creative, and that there is a need for creative workspaces in academic libraries, it seems worth making the effort to extend our understanding of information behaviour and creative workspaces, and to draw on the work of information behaviour researchers such as Kuhlthau who have developed models inspired from a learning perspective and who acknowledge the importance of affect in information behaviour.

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