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# Applying Maniotes' third space in guided inquiry model as a theoretical framework to understand architectural students' information behaviour: a quantitative approach

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## Abstract

*Idea generation and inspiration are important in creative tasks. This article reports on descriptive quantitative results from an exploratory study conducted in 2016 on the creative tasks and the personal information preferences of 23 third-year architecture students at a South African university. Maniotes' third space in guided inquiry model served as the theoretical framework. A profile questionnaire and individual interviews were used to collect data. Findings cover information use and preferences for information sources (e.g. books, search engines, conference papers and strangers) that can inspire idea generation during creative tasks, such as architectural design. Librarians were of less value than peers, lecturers and family members in inspiring creative ideas. Recommendations focus on the role of academic libraries.*

**Keywords:** Architecture students, creativity, guided inquiry, information resources, information use behaviour, third space, zones of intervention

## Introduction

“Creativity implies more than simply involving imagination or fancy. It signifies and brings along novel, original and valuable outcomes for the individual or society. While the imaginative person is a dreamer, the creative person moves the world forward” (Suciu 2014: 151). Creativity is considered to be one of the key desired learning outcomes for the 21st century learner (Smith, Nerantzi and Middleton 2014; Chang and Hsu 2015; Davies, Newton and Newton 2017). Therefore, academic spaces nurturing creativity, such as makerspaces, content-creation spaces, creative spaces, creativity labs, idea labs and tinkering spaces, are increasingly being viewed as the newest re-imagination of educational spaces (Davee, Regalla and Chang 2015; De Boer 2015; Koh and Abbas 2015). These spaces of creativity in academia, can particularly facilitate curiosity, deep learning, questioning, information literacy training, problem-solving, critical thinking and inquiry-based learning (Martin 2010; Range and Schmidt 2014; Meyer and Fourie 2016). In some academic disciplines, such as architecture, creativity is imperative to set one’s design apart from one’s competition (Sidawi 2013; Tzonis 2014). Alomar (2003: 12) explains that “creativity is a kind of socially recognized achievement”, acknowledging the social, psychological and contextual needs of the individuals generating creative ideas. Even more notably, Alomar (2003: 3, 6) indicates the significance of adequate access, use and sharing of information in working spaces during idea generation in architectural projects. For some academic disciplines, such as architecture, there may be less need for intervention, but a stronger need for access, process and representing of information resources (Alomar 2003: 3). From the latter, one can concur that “information is a critical element for architects to accomplish their tasks” (Shaaban, Lockley and Elkadi 2001: 43) However, even though the importance of information for architectural design has been noted by several authors (Shaaban, Lockley and Elkadi 2001; Campbell, 2017), there has been relatively little research on the connections between architecture, creativity and information behaviour, more specifically information use during design projects. Usually, studies regarding creativity in information behaviour mainly focus on information-seeking (Zach 2005; Visick, Hendrickson and Bowman 2006; Hemmig 2008, 2009; Medaille 2010) driven by inspiration, motivation (intrinsic and extrinsic) or to reach goals (Makri and Warwick 2010; Medaille 2010; Lavranos, Kostagiolas and Martzoukou 2016).

The purpose of this article is to report on the quantitative descriptive findings of a mixed methods study by Meyer (2016) on the information behaviour of architecture students during the design stages of an architectural design project, which by nature of architectural work, demands creativity. The focus is on architecture students’ preferences for working collaboratively or individually

during architecture design projects, the importance of creativity during design projects, self-reported confidence in creative abilities, and preferences for the use of formal and informal information resources. In addition, based on the findings the authors argue the use of Maniotes' (2005) third space and guided inquiry model as a theoretical framework to guide information provision and information support by academic libraries. This article does not report on the full project by Meyer (2016) which included a qualitative component and data collection from further research participants.

## Clarification of key concepts

Key concepts are clarified in this section.

### Creativity

According to Plucker, Beghetto and Dow (2004: 90), creativity can be defined as “the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context”. Kleiman (2008) similarly suggests that creativity involves originality and novelty combined with utility or value. For the purpose of this article, creativity is defined as the “act of turning new and imaginative ideas into reality” by “re-examining assumptions and re-interpreting facts, ideas and past experiences” (Goodman and Dingli 2013: 54).

### Information behaviour

Information behaviour can be considered as any activities in which students interact with information such as information seeking, information searching, information retrieval, information use and giving, information transfer and exchange, communication of information, and the acknowledgment or suppression of information needs (Wilson 1997; 1999; Pettigrew, Fidel and Bruce 2001; Case 2007; 2012; Savolainen 2007; Fisher and Julien 2009). Bates (2010: 2381) notes that information behaviour can be described as people's interaction with information. For purposes of this article, the following operational definition by Wilson (1999: 249) is accepted, namely, information behaviour is “those activities a person may engage in when identifying his or her own needs for information, searching for such information in any way and using or transferring that information”. Thus, information behaviour includes all information activities, however, this article will focus on information use.

## Guided inquiry

Guided inquiry can prepare students for learning and living in the 21st century by guiding them in the process of discovery and learning from an assortment of information resources and services (Kuhlthau, Maniotes and Caspari 2015: 3). Linked to the concept of guided inquiry is guided inquiry learning, and as this article focuses on academic institutions, learning and education, it is important also to pay attention to guided inquiry learning. Kuhlthau et al. (2015: 4) explain that guided inquiry learning highlights personally related questions that encourage students to learn further and construct distinctive methods of sharing what they have learned: “guided inquiry raises the bar even further to move students to deeper learning by incorporating the research process explicitly into their work” (Kuhlthau et al. 2015: 4). For the purpose of this article the following definition, inspired by the work of Kuhlthau et al. (2015: 4), is used, namely, guided inquiry is an approach to learning, known as guided inquiry learning, which encourages students to question and explore by finding and using an assortment of information resources and services to formulate new ideas or to increase their understanding of a particular area.

## Third space

Third space has featured in the information literacy and guided enquiry literature (Kuhlthau et al. 2007; 2012; 2015), as well as in the field of participatory human computer interaction (Muller and Druin 2012). The third space concept can be explained as a theoretical construct that combines the student’s world (first space) with the curriculum (second space) to construct a dynamic learning space, titled third space (Quigley and Hall 2014). For purposes of this article the definition by Kuhlthau and Cole (2012: 1) is accepted, namely, a third space is “an intersection zone between the school curriculum and the student’s knowledge and ways of knowing”, which creates a dynamic learning space.

The concept of “third space” served as a theoretical framework for the study on the use of information sources, and the requirements for the provision of information and related support experienced by architecture students during design projects in creative spaces.

## Literature review

Many authors (Jutraž and Zupančič 2014; Danaci 2015; Campbell 2017) have recognised architecture as an interdisciplinary field drawing inspiration from the arts, the social sciences, engineering, mathematics and science (climatology), especially with regard to architectural education, including design studios

(Kowaltowski, Bianchi and De Paiva 2010; Torun, Tekçe and Esin 2011; Musa 2013;). Campbell (2017: para. 4) explains that “while the sciences are heavily dependent on recent journal literature and the humanities are book-focused, the creative disciplines are unique”. Therefore, the architecture discipline may arouse varied, highly individualistic information needs related to research, teaching and practice. Moreover, Annemans, Van Audenhove, Vermolen and Heylighen (2014: 1628) point out that as the information needed to understand the design problem depends upon the architect's idea for solving it, collecting information and designing is a continuous iterative process throughout a building project. This highlights the importance of information needed throughout the different phases of the design process (Annemans et al 2014). These design phases include site analysis, concept design, design development, technical design, construction drawings and presentation (Annemans et al 2014; Meyer 2016). In correspondence, Shaaban, Lockley and Elkadi (2001: 43) maintain that “information is a critical element for architects to accomplish their tasks”. Nevertheless, Makri and Warwick (2010: 1745) explain that although the importance of information for architectural design has been noted by various authors (Shaaban, Lockley and Elkadi 2001; Campbell 2017), there has been relatively little research on architects’ information use and information support. Over the past decade, only three studies focused specifically on architects’ information use during design projects, namely, Annemans et al (2014), Campbell (2017), and Makri and Warwick (2010). A brief overview of these studies is provided in Table 1. The literature is arranged alphabetically by author’s surname. Table 1 portrays the scope of the study, participants and findings on information use.

The study by Annemans et al. (2014) examined how architects used information throughout the design process. The study found that the ideal sources of information for architects are the sources that are most ready-to-hand such as the internet, drawings or magazines, thus visual and limited texts. Similarly, the study by Campbell (2017), investigated the information use of an architecture faculty, and noted the popularity of the use of internet resources and images. Furthermore, Campbell (2017) found that personal book collections were the most important sources for both research and creative inspiration, while personal communication with peers was the most important resource for architectural education. Lastly, Campbell (2017) stated that e-books, discussion lists and conversations with librarians were the information sources used the least. The study by Makri and Warwick (2010), focusing on the electronic information-seeking and use behaviour among graduate architecture students, concluded that inspiration and creativity are the main drivers behind the information work in the architecture domain. The use of the Google search

engine, Google Images, Google Videos, Google Maps and Google bookmarks were of particular importance.

The preceding studies revealed the spectrum of architects' information needs and wants, and their information use throughout the design project (Makri and Warwick 2010; Annemans et al 2014; Campbell 2017). Overall, architects used various internet sources to inspire creativity, but also included printed material.

Table 1: Review of architecture literature in relation to information use behaviour

<b>ARCHITECTURE AND INFORMATION USE BEHAVIOUR LITERATURE</b>			
<b>Authors</b>	<b>Scope of study</b>	<b>Participants</b>	<b>Findings on information use</b>
Annemans et al. (2014)	Investigated how architects currently use information in design, and how experiential user data could change their thinking about their projects and ways of working	Two focus groups consisting of architects designing healthcare buildings	The architects used photographs, drawings made by patients, video recordings of hospital trajectories, biographical text, project site information, design brief, general legal information, books, internet, cooperation with engineers, client, architectural examples (mostly called "references works") and feedback from former projects
Campbell (2017)	Examined the information-seeking behaviour of, and perceptions of library services of architecture faculty across the United States	Architecture faculty	Faculty used personal books, internet resources, and conversations with peers and these were ranked as the information source most used. In addition, images (e.g. architectural plans, details and photographs) were used
Makri and Warwick (2010)	Examined the electronic information-seeking and use of postgraduate architectural design and urban design students in the faculty of the built environment at a large London university	Postgraduate architectural design and urban design students	Students used personal information collections, the Google search engine, Images, Videos, Maps, and bookmarks; Youtube; blogs (i.e. personal and peers); Facebook, and domain expertise (i.e. peers, tutors or other domain experts)

## Maniotes' third space in guided inquiry model as theoretical framework

According to Verbaan and Cox (2014: 212), third space theory has been predominantly promoted by Bhabha (1994) with regard to its potential for literary, geographical, historical, political and cultural studies. Third space

institutes a “site of interaction, contestation, tension and transformation between two cultural systems” (Chulach and Gagnon 2015: 54). Several fields of practice have acknowledged the value of integrating and exploring the third space (“in-between space”) produced between two or more discourses or conceptualisations (Elmborg 2011: 345), such as, urban environmental design (i.e. green space) (Soja 1996; Tahmaseb-McConatha 2015), linguistic studies (Fitts 2009; Lee 2009), leisure studies (Hollinshead 1998; Purnell 2015), literacy learning (Pane 2007; Levy 2008), tourism landscapes (Fagence 2014), and library and information science (Kuhlthau, Maniotes and Caspari 2007; 2012; 2015; Elmborg 2011; Chan and Spodick 2014). The value of exploring third space in learning and educational practices has also been widely noted (Maniotes 2005; McDonough 2014; Skattebol and Arthur 2014; Jónsdóttir, Gísladóttir and Guðjónsdóttir 2015).

For this article, Maniotes' (2005) third space in guided inquiry model is used as an information behaviour lens through which information about the information use of architecture students during creative design projects can be revealed. The model was developed from Maniotes' (2005) doctoral thesis. The idea of a third space has been advanced by Kuhlthau et al. (2007; 2012) with regard to guided inquiry and inquiry learning as viewed from an educational or information literacy perspective. Maniotes' (2005) third space in the guided inquiry model indicates the importance of constructing an intersection zone between the students' personal world (first space) and their class curricula (second space) that creates a dynamic, hybrid learning-centred space (third space) for hands-on-learning (Maniotes 2005; Kuhlthau and Cole 2012). Refer to Figure 1.

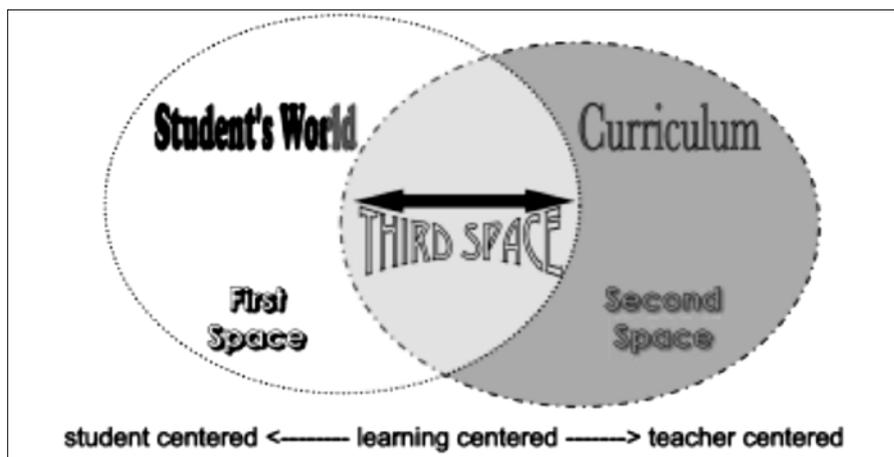


Figure 1: Maniotes' third space in guided inquiry model (Kuhlthau et al. 2015: 26).

Throughout the literature various terms related to the concept of third space were noted, namely, deep learning, dynamic learning, inquiry learning, independent learning, in-between learning space, learning-centred environment,

organic environment or space, hybrid space and safe space (Kuhlthau et al. 2007; 2012; 2015). Kuhlthau et al. (2015: 145) argue that third space interactions promote inspiration and curiosity throughout the inquiry process, and lifelong learning once a project is completed. Guided inquiry is grounded in the philosophy of constructivist learning and Kuhlthau's (1991) information seeking in process (ISP) model. It is a dynamic process of learning from a variety of information sources (Kuhlthau et al. 2015: 53). The constructive process of guided inquiry establishes a zone of intervention, which was moulded on Vygotsky's zone of proximal development (1978). Therefore, lecturers and librarians can determine when a student requires assistance and as a result guidance can be provided to connect a student's world (first space) with his or her tertiary curriculum (second space) producing a dynamic learning and teaching space called the third space (Maniotes 2005; Kuhlthau et al. 2007; 2012; 2015).

## Setting of the exploratory descriptive study and participants

The research reported in this article was conducted in 2016 at an architecture department situated in what is referred to as the building science discipline at a designated university in South Africa. This exploratory study employed a mixed methods research approach, which integrated elements of the qualitative and quantitative research approaches (Pickard 2013; Creswell 2014; 2015; Meyer 2016). Quantitative data were collected through a self-administered online (web-based) profile questionnaire, and qualitative data through individual semi-structured interviews. Quantitative data were analysed using Google Forms and Excel, and the qualitative data through thematic analysis. A purposive sampling method was used in the selection of the sample group for the study, namely, 60 third-year architecture students registered for a third-year module in architectural design (titled as Module Anonymous<sup>1</sup>), the head of department, and lecturer in Module Anonymous. The acting head of department participated on behalf of the head of department. From the 60 third-year architecture students, 23 actually participated in the online profile questionnaire, resulting in a response rate of 38%. Of the 23 third-year architecture students only 19 indicated their willingness to take part in the individual interview as well. As a result, a response rate of 32% was achieved. This article will only report on findings from the quantitative component. Findings of the full project are reported by Meyer (2016).

## Quantitative findings from profile questionnaire

This section reports on the analysis of the descriptive quantitative findings collected from the third-year architecture students' profile questionnaire (Meyer 2016). The profile questionnaire was administered online to participants before the individual interviews were conducted. The questionnaire consisted of seven semi-structured questions ranging from multiple-choice to Likert scale questions. Open-ended questions were also included. Participants for the questionnaire needed to be registered third-year architecture students. In total 23 copies of the completed questionnaire could be fully used for analysis. No personal information was requested in regard to gender, name and surname, age and race to increase the anonymity of the participants and to adhere to institutional requirements for ethical research conduct (very strong motivation is required for ethical clearance if data on gender and age is to be collected). Therefore, pseudonyms (also labelled aliases) were used to present the findings from the students. The findings are discussed under three main topics, namely, background of the architecture students, creativity, and preferences for information sources.

### Background of the architecture students

This section reports on the analysis of the first three questions of the questionnaire. For the first question, participants had to confirm that they were third-year architecture students and more specifically registered for a third year module in architectural design (Module Anonymous).

The second question asked the participants to indicate whether they had any prior industry work experience, and if so to elaborate. Only seven of the 23 (30%) participants reported industry work experience. For example, internships at architecture firms, performing freelance work in computer-aided design (CAD) and drafting, or being part of the quantity surveying and site analysis team in projects.

In question three participants were asked to indicate their preference in regard to working in collaboration or individually when working on an architecture design project. This question used a 10-point Likert scale where a score of 1 indicated the highest preference for collaboration and 10 the highest preference for individual work.

Nearly half of the participants, 11 of 23 (48%), preferred working individually during architecture design projects (selecting a score of 7, 8, 9 or 10 on the Likert scale). Other significant findings included:

- none of the participants specified an extremely high preference for collaboration, thus selecting a score of 1 on the Likert scale. Nearly a quarter of the participants (22%) selected scores of 2 or 3 on the Likert scale;
- four participants (17%) indicated a moderate preference for collaboration by selecting a score of 4 or 5 on the Likert scale;
- six participants (26%) indicated a moderate preference for working individually, thus selecting a score of 6 or 7 on the Likert scale;
- six participants (26%) stated that they had a high preference for working individually, thus selecting a score of 8 or 9 on the Likert scale, and
- only two participants (7%) specified had an extremely high preference for working individually, thus selecting a score of 10 on the Likert scale.

## Creativity

Questions four and five focused on the participants' opinion on the importance of creativity in architectural design activities and their self-reported levels of confidence in their creative abilities during design projects.

For question four, participants had to indicate on a 10-point Likert scale how important creativity is during the completion of a design project, where a score of 1 indicated not important at all and 10 extremely important. More than half of the participants (52%) indicated that creativity is extremely important (selecting 10 on the Likert scale) during the completion of design projects. Furthermore, more than a quarter of participants (26%) selected 9 on the Likert scale, whereas four participants (17%) indicated either 8 or 7 on the Likert scale. The lowest rating on the Likert scale was a 6 by only one participant of the 23 (4%), indicating the importance of creativity as moderate. On average this shows that 100% considered it from moderately to extremely important (i.e. selecting a score of 6, 7, 8, 9 or 10 on the Likert scale). The importance of creativity in completing a design project is thus well acknowledged.

Question five focused specifically on how confident a participant was in his or her creative abilities. Confidence is part of creativity, as confidence drives individuals creatively to seek, explore and experiment with new information (Anderson 2006). A 10-point Likert scale was used to measure the participants' self-rating of their confidence. A score of 1 indicated no confidence at all and 10 indicated extremely confident. A majority of the participants, 16 (70%), indicated that they were highly confident in their creative abilities (selecting 7, 8, 9 or 10 on the Likert scale). Other significant findings included:

- none of the participants reported no confidence in their creative abilities (i.e. selecting a score of 1 or 2 on the Likert scale);

- two participants (9%) reported very low confidence in their creative abilities (i.e. selecting a score of 3 or 4 on the Likert scale);
- nearly a quarter of the participants (22%) indicated that they had a moderate degree of confidence in their creative abilities (i.e. selecting a score of 5 or 6 on the Likert scale);
- four participants (17%) indicated that they had a fairly high degree of confidence in their creative abilities (i.e. selecting a score of 7 on the Likert scale);
- nearly half of the participants (44%) stated that they had a high degree of confidence in their creative abilities (i.e. selecting a score of 8 or 9 on the Likert scale), and
- only two participants (9%) specified that they had an extremely high degree of confidence in their creative abilities (i.e. selecting a score of 10 on the Likert scale).

## Preferences for formal and informal information sources

The last two questions (i.e. question six and seven) focused on the significance of various types of scholarly information resources in different contexts to inspire and motivate creativity. The term “scholarly information” was used in association with formal and informal sources to indicate that the sources noted must be academic. “Formal source, which is a kind of source which is well planned and paid for, for example books, periodicals, journal articles, research papers, etc. Informal source is a kind of source which is not pre-planned and non-paid like blogs, personal websites, social media platforms, etc.” (Akhter and Kaur 2016: 449). Although some planning goes into the creation of informal sources, it is with less rigour than for formal sources. The rationale for selecting the formal and informal sources, as indicated in Tables 2 and 3, are based on the architecture literature reviewed, specifically Annemans et al (2014), Campbell (2017), and Makri and Warwick (2010).

Question six assessed the use of formal sources of information. A 4-point Likert scale (never, seldom, often and very frequently) was used to rate use of the following formal information sources: libraries, databases to which libraries subscribe, Google Scholar, journal articles, conference papers, books, design standard or technical instruction manuals and multimedia. More detail on the findings is presented in Table 2.

Table 2: Formal sources of information used for architecture design projects

<b>Formal sources of information (N=23)</b>	<b>Never</b>	<b>Seldom</b>	<b>Often</b>	<b>Very frequently</b>
<b>Libraries</b>	1	7	12	3
	(4.3%)	(30.4%)	(52.2%)	(13%)
<b>Databases to which libraries subscribe</b>	2	13	6	2
	(8.7%)	(56.5%)	(26.1%)	(8.7%)
<b>Google Scholar</b>	2	10	9	2
	(8.7%)	(43.5%)	(39.1%)	(8.7%)
<b>Journal articles</b>	0	5	10	8
	(0%)	(21.7%)	(43.5%)	(34.8%)
<b>Conference papers</b>	7	13	3	0
	(30.4%)	(56.5%)	(13%)	(0%)
<b>Books</b>	0	2	12	9
	(0%)	(8.7%)	(52.2%)	(39.1%)
<b>Design standard/ technical instruction Manuals</b>	0	2	15	6
	(0%)	(8.7%)	(65.2%)	(26.1%)
<b>Multimedia</b>	4	6	7	6
	(17.4%)	(26.1%)	(30.4%)	(26.1%)

## Findings from analysis of Table 2:

- the formal information sources most frequently used were books (39.1%), journal articles (34.8%), design standard or technical instruction manuals (26.1%) and multimedia sources (audio/image, CD-ROM/DVD) (26.1%). Fairly frequently used sources (i.e. selecting “frequently” on the Likert scale) were libraries (13%), Google Scholar (8.7%) and databases to which libraries subscribe (8.7%). Conference papers were not used by any of the participants;
- the formal information sources used most often were design standards or technical instruction manuals (65.2%), libraries (52.2%) and books (52.2%). Information sources used fairly often (i.e. selecting “often” on the Likert scale), were journal articles (43.5%), Google Scholar (39.1%), multimedia (30.4%) and databases to which libraries subscribe (26.1%). Conference papers again were the least often used information source (13%);
- the formal information sources used most seldom included conference

papers and databases by over half (56.5%) of the participants and Google Scholar is seldom used by less than half (43.5%). These were followed by the information sources used fairly seldom, namely, libraries (30.4%), multimedia (26.1%) and journal articles (21.7%). Only two participants (8.7%) indicated that they seldom used books and design standards or technical instruction manuals were the least seldom used (8.7%); and

- as for information sources never used, more than a quarter of participants (30.4%) have never used conference papers, whereas, only four participants (17.4%) reported never using multimedia and two participants (8.7%) reported never using Google Scholar. Only two participants (8.7%) reported never using databases to which their libraries subscribe, and only one participant (4.3%) has never used any libraries. In the case of journal articles, books and design standards or technical instruction manuals, the option of 'never used' was not selected at all since these resources were often or frequently used by the majority of the participants.

Additional formal information sources mentioned by the participants included blogs (Pinterest and Archdaily), architectural magazines, dissertations (other masters students), and projects of previous years. None mentioned doctoral theses.

Question seven collected data regarding the use of informal sources of information. Details regarding the findings are presented in Table 3.

Table 3: Informal sources of information used for architecture design projects

<b>Informal sources of information (N=23)</b>	<b>Never</b>	<b>Seldom</b>	<b>Often</b>	<b>Very frequently</b>
<b>People you know</b>	0 (0%)	0 (0%)	10 (43.5%)	13 (56.5%)
<b>People you do not know</b>	5 (21.7%)	11 (47.8%)	6 (26.1%)	1 (4.3%)
<b>Search engines</b>	0 (0%)	1 (4.3%)	6 (26.1%)	16 (69.6%)
<b>Social networking sites</b>	1 (4.3%)	3 (13%)	5 (21.7%)	14 (60.9%)

As with question six, a 4-point Likert scale (never, seldom, often and very frequently) was used to rate the use of the following informal information sources: people you know (e.g. experts, peers, friends, family members, etc.), people you do not know (e.g. Q&A sites, discussion groups, blogs), search engines (e.g. multimedia and image search engines) and social networking sites (e.g. YouTube, Pinterest, Facebook, Instagram, etc.).

Here follows the analysis of Table 3:

- the informal information source most often reported as used very frequently was search engines (69.6%). This was followed by more than half of the participants (60.9%) using social networking sites and people they know (56.5%). Only one participant (4.3%) reported very frequently using people s/he did not know (assuming that this refers to not knowing a person personally) as an information source;
- participants also reported on information sources they used often, but not necessarily very frequently. Ten (43.5%) participants reported that they often use people known to them as an informal information source. This was followed by more than a quarter of participants (26.1%) reporting that they use search engines or people they do not know as informal information sources. Social networking sites received the lowest response as an information source often used by participants (21.7%);
- the informal information source most seldom used was “people you do not know” (47.8%). This was followed by three (13%) participants who reported that they seldom use social networking sites and only one participant (4.3%) indicated that s/he seldom uses search engines. Therefore, all of the participants consulted people they know often or frequently; and
- five (21.7%) participants reported that they have never consulted “people you do not know”, and one participant (4.3%) reported never using social networking sites.

Additional informal information sources highlighted by the participants included architecture websites and personal friends and family. The latter two count as people known.

### Main findings in relation to architecture students’ creativity and information use behaviour

Participants were asked to indicate whether they had prior industry experience, and if so to elaborate. This question is also linked to Maniotes’ (2005) third space in guided inquiry model, as questions relating to students’ personal experience and personal knowledge system (personal resource collection and industry experience) formed part of their first space. Findings revealed that only

seven of the 23 (30.4%) participants reported having industry work experience. Prior industry experiences would have enabled the students to understand the practical side of design (i.e. cost, site analysis, time management and effective communication) (Meyer, 2016). More on this aspect can be noted in the qualitative findings in Meyer (2016). Williamson's (2009: 1) study found that work experience gives students "the opportunity to work collaboratively; to become effective communicators; and to be participants in the analytical and creative analysis of building projects". It also exposes them to "new knowledge, new skills and procedures for the design and documentation of a real project". Theoretical information derived from research is far too abstract to be the only information used while designing. Thus, practical knowledge and skills should form part of students' architectural education, such as inviting industry expertise.

The findings indicate that students had a higher preference for working individually rather than collaboratively during their design projects. This is considered very noteworthy as collaboration during idea generation could enrich the creative design process and its application (Kowaltowski, Bianchi and De Paiva 2010). Similarly, Makri and Warwick (2010) confirmed that collaboration among peers is done through sharing images, videos, URLs and bookmarks on social networking sites. Thus, these findings could assist academic libraries in establishing collaboration spaces to facilitate idea generation techniques such as brainstorming sessions (including collaborative brainwriting and brain-netting), group discussions, role playing, and storyboarding.

Participants noted the value of using informal information resources such as search engines and networking sites, specifically, Pinterest and Archdaily (blogs) to draw inspiration. (This was not confirmed by the acting head of department or the lecturer.) However, Campbell (2017), and Makri and Warwick's (2010) studies supported the researcher's findings. These findings could inform functionality design of domain specific Web 2.0 applications to share organised online bookmarks with others, allowing tagging of search results (textual snippets or image and video thumbnails), and importing them into social networking sites.

The acknowledgement of creativity as being extremely important during the completion of architecture projects by the majority of participants, 12 (52.2%), is in line with the findings of studies by Campbell (2017), and Danaci (2015). Makri and Warwick (2010) confirmed that students' architectural projects frequently involve creativity for inspiration, information-seeking and information use activities. Furthermore, the encountering of images and videos

as inspiration to trigger creativity was noted as the main driver behind information work in the architecture domain (Campbell 2017), thus indicating a connection between creativity and inspiration. Stimulating inspiration through serendipitous information encountered during design projects can provoke an outburst of creativity to generate novel ideas and solutions.

Overall, the findings revealed that a range of formal and informal information sources are used by the participants for their architecture design projects. On average, the highest preferences were for books as formal information sources, and search engines as informal information sources. The use of books as a key information source was confirmed by participants' responses in both data collection instruments, and by the study findings of Makri and Warwick (2010). Furthermore, the findings of studies by Annemans et al (2014), Campbell (2017), and Makri and Warwick (2010) agree with regard to the value of gaining and sharing informal information resources by making use of search engines and networking sites (e.g. blogs and Facebook) from or to peers to gain inspiration. Lastly, libraries were less often used by the participants than their peers, lecturers and family members to inspire creative ideas. Therefore, libraries should make use of various opportunities to play an important role in providing guidance to students in acquiring information and information support.

## Recommendations on the role of academic libraries based on the suggested framework

Maniotes' (2005) third space in the guided inquiry model served as a theoretical framework for the study by Meyer (2016). The findings show that architecture students require a wide spectrum of formal and informal information sources throughout the design project to trigger creative ideas and solutions. Therefore, it is recommended that the theoretical framework can be used as a point of departure by academic libraries to inform information literacy training and information resources with the specific intention to form a bridge between their out-of-school experience (e.g. industry experience), curriculum content (e.g. the design module presented to students) and their preferences for information sources to complete design tasks as part of their studies by offering support in the following manner:

- provide access to appropriate scholarly information (printed and electronic) based on the third space concept, and in so doing, bridging the gap between students' theoretical knowledge (curriculum knowledge) and its practical application (personal knowledge) to generate creative outcomes;
- provide the information and information support needed during the

various stages of an architectural design project to promote the underlying idea of intervention and guidance to support the students' information-seeking, use and needs (Harris and Simons 2006; Kuhlthau 2010);

- offer a great starting point to get the ball rolling by teaching participants how to seek, analyse, evaluate and reference information correctly (information literacy training); and
- help shape and influence designs by drawing on various sources of inspiration, thus providing access to virtual and physical spaces of information sources and services.

In summary, accessibility to various spaces (virtual and physical), resources (electronic and printed) and guidance are the roles that academic libraries could fulfil for information provision and information support.

## Conclusion

Zumthor (2010: 12) describes architecture as "the background for life". As architects' designs influence people's daily experiences considerably, architects need sufficient and suitable information to comprehend their clients' spatial perception, needs and desires fully. This study reported on the quantitative descriptive findings of a mixed methods study by Meyer (2016), focusing on the information behaviour of architecture students during the design stages of an architectural design project. Internet resources, especially images and videos, are perceived as more valuable overall, but rather than replacing print sources, they are providing additional options. Neutrality toward academic libraries as a key information resource was noted. It was suggested that Maniotes' (2005) third space in guided inquiry model be used by academic libraries as a framework to investigate information behaviour and thus, with this knowledge, improve academic library services to architecture students. Ultimately, it seems worth making the effort to extend our understanding of architects' information use behaviour to inform guided-inquiry, idea generation and zones of intervention during information support and provision by academic libraries. Even more, investigating how architecture students use specific information to stimulate creativity from an information behaviour lens could enhance services, training, tools and spaces provided by academic libraries. "A library cannot be everything for everyone, but perhaps we should see the architecture library as less a collection of all necessary information and more a directory, or jumping-off point, from which to gain access and become inspired" (Campbell, 2017: para. 31).

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## Endnotes

<sup>1</sup> The actual module code and name was taken out and replaced with Module Anonymous to ensure anonymity of the participants and associated institution.

<sup>2</sup> The Hong Kong University of Science and Technology Library.

<sup>3</sup> The issue number is identical to the date of publication, as this is an open access online journal. This practice has been followed for other similar sources in the reference list.