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# An Exploratory Analysis of International Students' Information Needs and Uses

# Exploration et analyse des besoins et des utilisations d'information des étudiants internationaux

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**Abstract:** Focusing on information behaviours in the context of everyday life, this study seeks to explore the information needs and uses of international students—one of the fastest-growing student groups within the university—in their daily activities. Using data from 60 respondents to the survey questionnaire and a total of 263 information activities from the online diary survey of 28 participants, this study investigated four research questions regarding information needs, information sources, the digital devices used for information searches, and the relationships between information needs, information sources, and digital devices in international students' daily information environments. The findings demonstrate that international students with diverse information needs sought information from a wide range of information sources, including search engines and human-mediated sources, using portable digital devices for their information searches. This study revealed that participants used different information sources and digital devices depending on the type of information needs. The findings provide useful insights into the information services available to international students in a higher education context.

**Keywords:** information behaviour, information needs, information use, international students, college students

**Résumé :** Les étudiants internationaux constituent une des populations dont la croissance est la plus forte aux États-Unis. Cette étude, en mettant l'accent sur ses comportements informationnels dans le contexte de la vie quotidienne, se propose d'explorer les besoins informationnels des étudiants internationaux et l'utilisation qu'ils en font dans leurs activités quotidiennes. À partir des données provenant de 60 répondants au questionnaire d'enquête et un total de 263 activités d'information obtenues par l'enquête du journal en ligne de 28 participants, notre étude a examiné quatre questions de recherche : les besoins informationnels, les sources

d'information, les appareils numériques utilisés pour la recherche d'information, et les relations entre les besoins informationnels, les sources d'information, et les appareils numériques utilisés dans les environnements informationnels quotidiens des étudiants internationaux. Les résultats de cette étude démontrent que les étudiants internationaux avec divers besoins d'information ont utilisé un large éventail de sources d'information, y compris des moteurs de recherche et des sources utilisant une médiation humaine, et qu'ils ont utilisé des appareils numériques portables pour leurs recherches d'information. Notre étude a révélé que les participants ont utilisé des sources d'information et des appareils numériques différents selon le type de besoin d'information, et elle fournit des indications utiles sur les services d'information disponibles pour les étudiants internationaux dans le contexte de l'enseignement supérieur.

Mots-clés : comportement informationnel, besoins informationnels, utilisation de l'information, étudiants internationaux, étudiants collégiaux

## Introduction

Since profound understandings of how people seek, evaluate, and use information are crucial for developing effective information systems and services, users' information needs and behaviours have been studied for several decades in the field of information science. The accumulated understandings of users' information behaviours have been expanded in diverse contexts and extended to a wide variety of user groups. A primary user group that has been explored is undergraduate and graduate students from various institutions. Because college students as a user group represent a younger generation and an elite group in society, the understandings and implications from this user group may provide valuable inputs for the field. As [Rieh and Hilligoss \(2008\)](#) and [Given \(2002\)](#) have noted, college students are likely to seek information out of a wide variety of information needs, based on academic purposes, work, and leisure, and they have highly complicated information behaviours. However, in investigating college students' information needs and behaviours, the foci tend to be limited to academic information needs and behaviours. To view college students' information behaviours from a holistic perspective, a few studies have recently begun to explore the everyday context of users' information needs and behaviours ([Head and Eisenberg 2011](#); [Kwon et al. 2013](#); [Safahieh and Singh 2006](#)). Moreover, college students fall within a wide variety of sub-populations, such as ethnic, economic, and social groups, particularly in the United States. Among these diverse subgroups of college students, international students are one of the fastest-growing populations worldwide and in the United States.<sup>1</sup> International students are defined as "students who have crossed a national or territorial border for the purpose of education and are now enrolled outside their country of origin" ([UNESCO Institute for Statistics 2015](#)). International

<sup>1</sup> According to a report by the Organisation for Economic Co-operation and Development, there are 4.5 million international students worldwide ([OECD 2013](#)). In the 2012–2013 academic year, there were 819,644 international students in the United States ([Institute of International Education 2013](#)).

students in the United States who came by themselves or with their families are likely to have information needs and behaviours that help them not only succeed in academics but also survive in everyday life. Coping with language barriers, cultural differences, different legal systems, and social isolation, international students seek, evaluate, and use information to address their challenges. However, the understanding of international students' information needs and behaviours is still limited. As indicated by [Sin and Kim \(2013\)](#), most studies of international students focus on academic information needs and the use of academic libraries. Factors that influence academic life, such as language barriers ([Bilal 1989](#); [M. Liu and Redfern 1997](#); [Onwuegbuzie and Jiao 1997](#)), educational status ([Yi 2007](#)), cultural background ([Liao, Finn, and Lu 2007](#); [M. Liu and Redfern 1997](#)), and length of stay in host countries ([M. Liu and Redfern 1997](#)), have typically been investigated as factors that affect the information behaviours of international students.

As previous studies have indicated, the research on international students' information behaviours is scarce and limited. Despite the growth of the international student population, few studies have attempted to explore international students' information needs and behaviours in the context of everyday life ([Alzougool et al. 2013](#); [Sin et al. 2011](#); [Sin and Kim 2013](#)). Moreover, these studies were limited to the contexts of academic purposes and social media usage by international students. In an attempt to fill this gap, this study investigated international students' information needs and uses in the information behaviours of everyday life. This study used an online diary method to gain a holistic understanding of international students' information behaviours. Following the example of [Bolger, Davis, and Rafaeli \(2003\)](#), the information behaviours of international students were captured in light of everyday-life information activities in a way that is not possible using traditional research methods. To achieve this purpose, this study addressed the following four research questions:

- RQ 1: What are the information needs of international students in their everyday lives?
- RQ 2: What information sources do international students use in their everyday lives?
- RQ 3: What information devices do international students use in their everyday lives?
- RQ 4: What are the characteristic relationships among information needs, information sources, and information devices?

With an improved understanding of the ways international students seek and use information in the context of their everyday lives, this study provides useful insights into and guidelines for the information services available to international students in a higher education context.

### **Related studies**

Within the context of users' information behaviours, this study aimed to explore the information needs and uses of international students in the context of everyday life. To achieve the purposes of this study, we examined two relevant lines

of research: (1) college students' information behaviours and (2) international students' information behaviours.

### *College students' information behaviours*

Numerous studies have attempted to identify college students' information behaviours from a wide variety of perspectives. Relevant research on college students' information behaviours can be divided into two groups. One group attempts to examine the effects of innovative information and communications technology (ICT) services and devices on college students' information behaviours. The other group of studies emphasizes college students' information behaviours in academic settings. In the first group of studies, [Kwon et al. \(2013\)](#) investigated the uses of ICT by undergraduate and graduate students majoring in sciences and engineering. A data set including responses from 83 undergraduate and graduate students was created based on observational logs, a survey instrument, and content analysis. The study indicated that desktop computers, laptop computers, and smartphones were the three most frequently used devices for information and communication. Differences in the selection of ICTs were apparent between work-related and non-work-related tasks and between undergraduate and graduate students. [Davis \(2011\)](#) focused on examining one college student's usage, purposes and goals, perceptions of opportunities, and challenges with digital media from an everyday-life perspective. According to the study's findings, the participant always felt connected and associated this connected feeling with quality of life. However, her experiences revealed the intricacy of social media uses. Although she felt connected to friends, family, and acquaintances, she simultaneously reported a sense of disconnection and fragmentation from social media in her daily life. Studies of how college students use new ICT tools indicate that they are likely to use new technologies and media with mixed perceptions of connection and disconnection.

The other group of studies focused on college students' information behaviours in academic settings. [Guo et al. \(2011\)](#) analysed and developed a framework for students' social media usage in learning environments in terms of the increasing popularity of social media services in college students' daily lives. Using various research methods, this study explored the characteristics and uses of specific social media and the motivations behind such social media usage. Guo et al.'s study revealed two important reasons that students choose specific social media services: accessibility and mode of communication. In addition, the study indicated four significant purposes of students' social media usage: information seeking, interaction, entertainment, and escape. To identify the relationship between group potency and group maintenance, [Lira et al. \(2013\)](#) examined the social media impacts of this relationship in a longitudinal view. The study investigated a total of 176 participants—44 groups of four members each—by comparing two communication media: face-to-face and computer-mediated communication. The study revealed a positive relationship between group potency and group maintenance. In addition, the positive relationship was found to be stronger in computer-mediated communication than in face-to-

face communication. [Quan-Haase \(2008\)](#) reviewed the body of research on how instant messaging services play a role in college students' academic and social lives and their communication. The results demonstrated that instant messaging was used for social communication and group projects, but students tended to perceive instant messaging as an obstacle to their academic achievement because it is likely to always be on. In a comparative study, [He et al. \(2012\)](#) examined how undergraduate college students in the United States and China use and perceive Internet-based information resources for academic tasks. The findings of He et al.'s study demonstrated that college students were likely to use online information resources, particularly for complicated tasks. Slight differences were detected between the two groups of college students from the United States and China. The participants in China were more likely than the participants in the United States to use traditional information resources. In addition, participants in China were more dependent on social network sites for information searches than those in the United States.

The two groups of studies about college students' information behaviours that we examined indicated that college students were likely to use innovative new ICTs to seek information with various motivations, positive relationships, and cultural differences. Within the context of these characteristics of college students' information behaviours, this study focuses on the students' information needs for and uses of ICTs and the growing use of social media services.

### *International students' information behaviour*

Although the information behaviours of international students have predominantly been explored in relation to academic contexts, a few recent studies ([Alzougool et al. 2013](#); [Sin et al. 2011](#); [Sin and Kim 2013](#)) have begun to illuminate students' information behaviours in the context of everyday life.

Studies such as those of [Liao, Finn, and Lu \(2007\)](#), [M. Liu and Redfern \(1997\)](#), and [Yi \(2007\)](#) have sought to understand international students' information needs and behaviours in academic contexts. In a survey of 91 international students and 224 American students, [Liao, Finn, and Lu \(2007\)](#) noted that international students used academic libraries more actively than American students. One possible explanation for this conclusion is that international students prefer group study at libraries more than American students do. [M. Liu and Redfern \(1997\)](#) surveyed international students, mostly Asian, at a San Jose-area university to investigate information seeking and behaviours in an academic library setting. The results conveyed that fluency in languages and length of stay might affect international students' use of libraries and reference librarians. Similarly, [Yi \(2007\)](#) surveyed 61 international students to identify their information needs and behaviours in relation to academic libraries. The survey results indicated that international students' dominant needs relate to coursework, and the differences in these needs depend on the international students' academic status levels, as noted by [Liao, Finn, and Lu \(2007\)](#). Investigating 25 international students through a critical incident methodology, [Hughes \(2010, 2013\)](#) attempted to understand their learning needs and experiences in Australian academic library contexts. [Hughes](#)

(2010) focused on the international students' experiences and perceptions of two Australian university libraries in terms of meeting their learning needs. Through a qualitative analysis of the participant interviews, Hughes suggested that the libraries focus on three goals: maintaining ongoing interactions with international students, identifying their learning needs, and developing strategies to address these needs. In addition, through an information literacy lens, Hughes (2013) reported on the international students' uses of online information resources using the same data as Hughes (2010). Hughes demonstrated that international students experienced a set of successes and challenges in terms of using information in the learning process. International students' learning needs and learning-support needs were revealed through an examination of their experiences with online information resources. G. Liu and Winn (2009) focused on how Chinese graduate students sought information in Canadian academic libraries. Through 12 interviews with Chinese students, the study demonstrated that the participants were unlikely to use library services and resources owing to language and cultural differences, but they felt confident in searching for information. More recently, to gain a holistic understanding of international students' information behaviours, Sin and Kim (2013) explored how international students sought information in their everyday lives by focusing on the use of social media services alongside their preliminary findings (Sin et al. 2011). By surveying 180 international students in the United States, the authors determined that international students valued social network services in the context of their adjustment to life in a different country. This study demonstrated that social media services are a primary tool in students' everyday information seeking. Younger, extroverted undergraduates are more likely to lean toward social media services. In addition, the participants believed that social network services were useful information sources. In identifying the information sources on which international students relied in their everyday lives, Alzougool et al. (2013) found that international students' use of information sources was characteristic of general information source usage. For instance, international students tended to use different information sources when they had non-academic information needs, such as for pre-arrival details, social activities, news, and accommodations.

Only a few recent studies explored information behaviours in everyday life. Moreover, the studies of international students' information behaviours were limited to particular contexts, such as academic environments and the use of social network services. To improve understanding of international students' information behaviours, this study aimed to examine information needs, information sources, the digital devices used for information searches, and the relationships among information needs, information sources, and digital devices in the context of everyday life.

## Research method

### *Data collection*

To understand the information behaviours of international students in the United States, this study designed two phases of data collection: (1) a preliminary survey that was designed to select diverse groups of participants for an

online diary survey and (2) an online diary survey. This study was conducted at a major university in the southeastern United States. As of fall 2014, the ratio of international students at the university was 3,257 (7.8%) to 41,888 ([University of South Florida 2014](#)), which is higher than the national percentage of international students in higher education institutions, which was 4.2% from 2013 to 2014 ([Institute of International Education 2014](#)). After permission to recruit students was obtained from the institutional review board and participants' confidentiality was ensured, the first phase of the study began, consisting of a preliminary survey with 12 questions relating to demographic information, language skill level, the use of digital devices and the Internet, and the use of library services. From January 15 to February 15, 2014, recruitment flyers were distributed across campus, including via student centres, libraries, international student organization offices, and international students' e-mail listservs. As a result, after reviewing an informed consent form, a total of 60 international students participated in this phase of data collection. The second phase of data collection used an online diary method. The online diary survey method has been used in recent studies to more vividly capture users' daily information behaviours ([Kwon et al. 2013](#); [St. Jean et al. 2012](#)). The diary survey method has been determined to be useful in vividly capturing information, activities, and experiences and what projects participants are working on at various times. For diary studies, a practical concern is the necessity of detailed participant training for activity reporting; this current study thus attempted to provide participants with detailed processes through which they could report their daily activities on an online diary website ([Bolger, Davis, and Rafaeli 2003](#)). Of the 60 participants from the first phase, a total of 30 participants were invited to join the diary study; these participants represented a diverse group and demonstrated an interest in participating in an online diary survey of their daily information behaviours. Two participants withdrew in the process of the online diary survey. As indicated in [Appendices 1, 2, and 3](#), the final 28 participants represented a diverse group of international students, who differed in terms of academic status (undergraduate or graduate status), length of stay in the United States, marital status, ethnic group, and use of ICTs and digital devices. Over a period of three consecutive days from February 16 to 18, 2014 (Sunday, Monday, and Tuesday), our research teams contacted 28 participants via e-mail to report their information activities in a timely manner, that is, five times per day, and they were required to report their activities at least two times per day. The online diary report was developed on the Internet, and participants were able to report up to three information activities in total. The report form for the online diary included questions about the duration and purpose of the information activity, the information sources, the device used for information activities, the satisfaction level with information activities, and the challenges associated with information activities. The 28 participants submitted 263 information activities that were used for the data analysis. On average, each participant reported 9.39 information activities over the three days—3.13 information activities per day.



*Data analysis*

We used 16 items of information needs, which were initially used by [Sin and Kim \(2013\)](#). The coding procedure primarily consisted of two steps. In the first step, the authors of the current study independently coded 53 items (20% of the 263 information activities). After we coded 53 items, we reviewed the items that were subject to disagreement, resolved the discrepancies through discussions, and agreed to add more categories to the initial list of information needs. After reviewing the final coding scheme, the authors and coders of this study agreed that five more information needs should be added, including academic searches, job searching, shopping, living, and other needs. In the second step, two independent coders used the categories in the final coding scheme to recode each of 263 information activities. The list of categories and examples for each category are displayed in [Table 1](#).

**Results***Demographic characteristics*

The demographic information for the preliminary study of 60 participants and the online diary study of 28 participants is displayed in [Appendix 1](#). In both studies, approximately half of the participants are male, and the other half are female. Most participants fall into two age ranges: 18 to 25 years old and 26 to 35 years old. In terms of academic status, undergraduate students comprise approximately half, and the other half are graduate students who are enrolled in master's and doctoral programs. In the two studies, Asians and Pacific Islanders are found to be the primary ethnic group (preliminary survey: 47%; online diary survey: 43%), followed by Hispanic/Latino students (preliminary survey: 22%; online diary survey: 36%). White/Caucasian, Black/African American, and multiracial/mixed-race students also participated in both studies. Because all participants, as international students, are from other countries, they have various lengths of stay in the United States. Approximately half of the participants have been in the United States for less than one year, and 20% have been in the United States between one and two years. For the preliminary study, 11 participants (18.3%) have been in the United States between two and five years, and 8 participants (13.3%) have stayed for more than five years. For the online diary survey, most participants have stayed for periods of less than one year and between two and five years (32% for each), followed by periods of one to two years and more than five years. With regard to language fluency, the participants mostly perceived their fluency as average (preliminary survey: 7%; online diary survey: 11%), good (preliminary survey: 25%; online diary survey: 32%), and very good (preliminary survey: 48%; online diary survey: 46%). Those who perceived their fluency to be at native level made up 20% and 11% of the participants in the preliminary survey and the online diary survey, respectively. Based on the participants' citizenship, 33 countries were represented in the preliminary study and 20 countries in the online diary survey, as displayed in [Appendix 2](#). With regard to the participants' majors (displayed in [Appendix 3](#)), a wide variety

Table 1: Categories of information needs and example

Needs category	Example
Academic*	"I searched for more information on collaborative writing, but this time, I was more specific. I want articles about writing in Arabic to finish synthesizing my literature review." (P4, male, doctoral program)
Finance	"... scholarships for studies abroad in England for next semester—I need more money and don't know what kind of scholarships there are for it." (P25, female, undergraduate)
Health	"Remedies for cold sores. I have a cold sore on my lip." (P17, male, undergraduate)
News	"... news, [especially] technology news. [I] want to find out about news in the tech world." (P9, male, master's program)
Housing	"Apartments around [the university]. [I] was looking for a better rate for a 1-Bed/1-Bath apt." (P10, male, doctoral program)
Entertainment	"[It's] entertainment [the purpose]. [I] want to know the] match results: Liverpool vs. Arsenal. I did not watch the game, and I wanted to know if Liverpool won." (P15, male, undergraduate)
Food and drink	"[I] was looking for a] hummus recipe. I bought the last ingredient I needed, and I wanted to make a different recipe from the one I've made before." (P5, female, undergraduate)
Transportation	"When the next C Bus was going to pass by Marshal Center, I wanted to take the Bull Runner to go to the library." (P6, male, undergraduate)
Interpersonal relationships	"I need to know how to be friends with my classmates." (Hypothetical example because it does not appear in the current study's data set)
US culture	"Greek life to be more socially involved in school." (P2, female, undergraduate)
Legal	"I want to extend my stay in the United States after graduation. [I am looking] for information on how to legally stay here longer." (Hypothetical example because it does not appear in the current study's data set)
Self/group identities	"[The] Venezuelan flag—I'm supporting a cause." (P5, female, undergraduate)
Job searching*	"Local job opportunities. I'm graduating in the summer, and I'm looking for internships and full-time opportunities." (P6, male, undergraduate)
Shopping*	"I wanted to search for a microwave and vacuum cleaner for my flat. A microwave was needed for facilitating cooking, and a vacuum was required for cleaning the house." (P7, female, master's program)
Living*	"I looked for a place to get my hair cut. My hair was long, and I needed a haircut." (P24, male, undergraduate)
Others*	"... definition of a word, casual." (P21, female, master's program)

\* This study adds these information needs categories to the list provided by Sin and Kim (2013).

of subject fields were represented, from French and history to mechanical engineering and dentistry.

Use of digital devices, sources, and the library for information

To understand the technological environments for the participants' information and communication activities, digital device ownership, social network usage, and campus library usage were examined, as displayed in Table 2. The participants tended to own portable digital devices, such as laptop or netbook

Table 2: Use of digital devices, social network services, and the library

	Preliminary survey		Online diary survey	
	No. of participants	%	No. of participants	%
Digital device ownership*				
Laptop computer or netbook	59	39	56	50
Smartphone	54	5	26	23
Tablet computer	23	15	14	13
E-book device or e-book reader	10	7	10	9
Desktop computer	6	4	5	5
Other	1	1	0	0
Total	153	100	111	100
Use of social networking sites*				
Facebook	60	40	28	41
LinkedIn	33	22	16	23
Twitter	21	14	9	13
Google+	17	11	9	13
Pinterest	9	6	3	4
Other	7	5	2	3
MySpace	2	1	2	3
Total	149	100	69	100
Use of the library or library website				
On average, 1–2 times per week	17	28	6	21
Almost every day	15	25	8	29
On average, 3–5 times per week	15	25	8	29
On average, 1–2 times per month	9	15	4	14
Never	4	7	2	7
Total	60	100	28	100

\*Multiple answers were allowed.

computers, smartphones, tablet computers, and e-book devices. Ownership of stationary devices, such as desktop computers, was least common. Students were likely to use social network sites to communicate with others. As defined by [boyd and Ellison \(2007\)](#), social network services are Web-based tools that allow individuals to build a profile, communicate with other users, and view and link their connections. We categorized the services that the participants used according to this definition. Facebook was the primary social network service used, followed by LinkedIn, Twitter, and Google+. On average, the participants had joined approximately 2.5 social network services each. In addition, campus library services or library website services were used frequently. Frequent library use was found: 1–2 times per week, 3–5 times per week, and every day. On average, the participants were likely to use library resources at least weekly. The following sections will include the 263 information activities reported by 28 participants, as recorded through the online diary method.

Table 3: Time of day of daily information-seeking activities

Time of day	No. of activities	%
Early morning (6 a.m.–8:59 a.m.)	22	8
Morning (9 a.m.–11:59 a.m.)	66	25
Early afternoon (12 p.m.–2:59 p.m.)	47	18
Afternoon (3 p.m.–5:59 p.m.)	53	20
Evening (6 p.m.–8:59 p.m.)	39	15
Night (9 p.m.–5:59 a.m.)	35	13
N/A	1	0
Total	263	100

Table 4: Duration of daily information-seeking activities

Duration	No. of activities	%
0–5 minutes	57	22
5–30 minutes	116	45
30–60 minutes	42	16
More than 60 minutes	43	17
Total	258*	100

\*The duration was not reported for five information activities.

### *Daily information-seeking activities*

A total of 263 information activities were reported by 28 participants through the online diary survey. On average, the 28 participants reported 9.39 information activities over three consecutive days, which implies that each participant reported 3.13 information activities per day on average. According to the information activities reports of the 28 participants, as displayed in Table 3, they seek information at practically every moment of their daily lives. Although early morning (8%) is the least common time slot, the participants reported that they constantly seek information in the morning, early afternoon, afternoon, evening, and late night.

As revealed in Table 4, the duration of information seeking indicates that “quick seeking,” which lasts less than 5 minutes, constituted 22% of information-seeking activities. Most information-seeking activities lasted between 5 and 30 minutes (45%). Conversely, “longer seeking,” taking more than 30 minutes, constituted 33% of information-seeking activities. Although “quick-seeking” behaviour is found in this data set, the results indicate that time spent on seeking information is not a trivial part of students’ daily lives.

### *Information needs, sources, and devices*

The 28 participants in the online diary survey reported their information needs, as categorized in Table 5. Because 3 information needs out of 263 information activities were described poorly and unclear for classifying, 260 information needs were categorized. As indicated in the distribution of information needs, no distinctly dominant information needs were revealed; however, academic needs were reported most frequently (28%), followed by shopping (15%), entertainment (11%), and living-related needs (10%). Although this finding confirms

Table 5: Information needs categories

Needs categories	No. of activities	%
Academic*	74	28
Shopping*	38	15
Entertainment	28	11
Living*	25	10
Transportation	20	8
Food and drink	15	6
News	14	5
Job search*	14	5
Health	8	3
Others*	9	3
Finance	7	3
Self/group identities	4	2
Housing	2	1
US culture	2	1
Legal	0	0
Interpersonal relationships	0	0
Total	260	100

\*Indicates categories of information needs in addition to the results of [Sin and Kim \(2013\)](#).

that international students are likely to need academic information ([Yi 2007](#)), this study demonstrated a wide variety of information needs that were not limited to academic settings.

Because the participants were students who were working toward their bachelor's, master's, or doctoral degree, they primarily needed information for academic purposes. As described in the distinctive examples from undergraduate and graduate participants, they needed to seek information for class group projects and/or class assignments.

How to do a specific task in MS Access for a group project. (P3, male, undergraduate)

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[It's an] academic [purpose]. A topic for a class project for the course, "seepage and subsurface drainage." An abstract on your topic needs to be submitted for next week's class. (P27, female, doctoral program)

The participants also sought information for shopping purposes. As indicated in the examples from two female participants, the information needs for shopping can be classified as specific shopping and browsing.

I wanted to search for a microwave and vacuum cleaner for my flat. A microwave was needed for facilitating cooking, and a vacuum was required for cleaning the house. (P7, female, master's program)

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[I want to have some good] deal information . . . [I] want to do some online shopping. (P1, female, master's program)

Table 6: Sources for information seeking

Source	No. of activities	%
Search engine (Google, DuckDuckGo)	64	36
Social network services (blogs, Twitter, Instagram, Facebook, Yelp)	32	18
Friends and family	21	12
Specific website	19	11
YouTube	16	9
University website	9	5
Printed materials (book, magazine, etc.)	7	4
University library site	3	2
Online magazine/news site	3	2
Apps	1	1
Other related person/organization	2	1
Google Scholar	1	1
Total	178*	100

\*The information source was not reported for 85 information activities.

The participants also needed information for entertainment purposes. For instance, they needed information about spring break vacation travel and outdoor activities.

I searched for information about Costa Rica. I searched for this because I will be going to Costa Rica for Spring Break. (P14, female, undergraduate)

Outdoor recreation activities. I like to do outdoor activities on the weekends, and I wanted to know if there were any available that I like. (P24, male, undergraduate)

For the living-related needs category, the participants demonstrated various needs for information regarding their everyday lives. For instance, to find lost items, they needed to find specific websites that might reveal whether the lost items had been found. They sometimes needed to know whether specific chemical products might work for cleaning.

[I searched my university's] lost and found site because I lost my student ID card. (P1, female, master's program)

[I wanted to know if] hydrogen peroxide can be used to clean silver ornaments. [I wanted] to clean silver ornaments. (P10, male, doctoral program)

As shown in Table 6, with a wide variety of information needs, as the participants seek information, they tend to rely mostly on search engines (36%). Although search engine reliance is the primary finding, students also often seek information through social network services, friends and family, and specific websites. This result indicates that the participants tend to depend on people within their social networks and previous experiences on specific websites when seeking information.

Table 7: Digital devices for information searches

Digital device	No. of activities	%
Laptop computer or netbook	141	62
Smartphone	45	20
Desktop computer	30	13
Tablet computer	9	4
E-book device or e-book reader	2	1
Other	0	0
Total	227*	100

\*The digital device was not reported for 36 information activities.

As indicated in Table 7, the participants used digital devices for their information seeking. The 28 participants used digital devices a total of 227 times for their information searches. Laptop computers or netbooks (62%) were found to be the dominant devices for information searches, followed by smartphones (20%). Stationary devices, such as desktop computers, were used only 30 (out of 227) times (13%). The use of tablet computers was relatively low (4%), even though these devices are portable. This limited tablet usage may result from the fact that the participants are more likely to use a substantial amount of time to seek information.

Figure 1 offers a means to explore the relationships between four significant information needs and information sources. Across all four significant information needs, the use of search engines was dominant. When academic-related information needs were explored, search engine use was also dominant. In addition to search engines (53%), the university library (12%) is determined to be an important information source, followed by YouTube (8%), printed materials (5%), and friends and family (5%). For shopping information needs, search engine use (71%) was even more dominant than for academic information needs. Along with search engine use, the participants reported that they used specific websites (10%) for specific items and asked their friends and family members (10%) for shopping information. For entertainment purposes, the participants used a variety of information sources. Although search engines (38%) were used most frequently, the participants' dependence on search engines for entertainment purposes was relatively low. Other sources, such as specific websites (21%) and YouTube (18%), were used frequently. For living-related needs, the participants used search engines the most (68%), although social network services (6%) and university websites (6%) were also used. Although the participants indicated that search engines were their primary information source across academic, shopping, entertainment, and living-related information needs, proportional differences between these types of information needs were revealed.

Figure 2 indicates the relationship between information needs and digital devices. One of the major devices across all four information needs was the laptop or netbook. Similar to the results for information sources and different information needs, slight differences existed in the digital devices used by the participants. For academic information needs, along with the primary use of laptops/netbooks (54%), desktop use (27%) was found to be considerable, followed

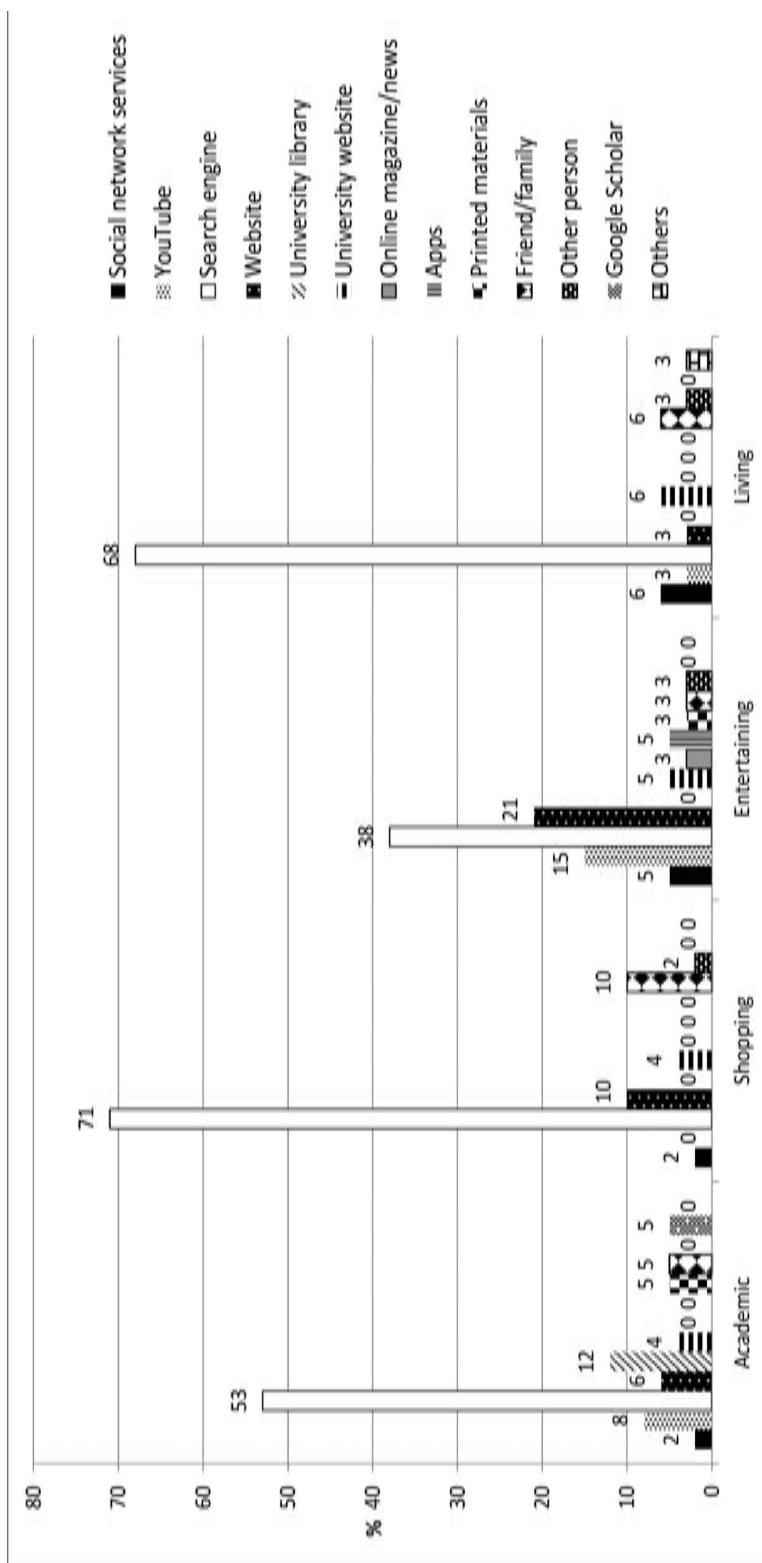


Figure 1. The relationships between four significant information needs and information sources



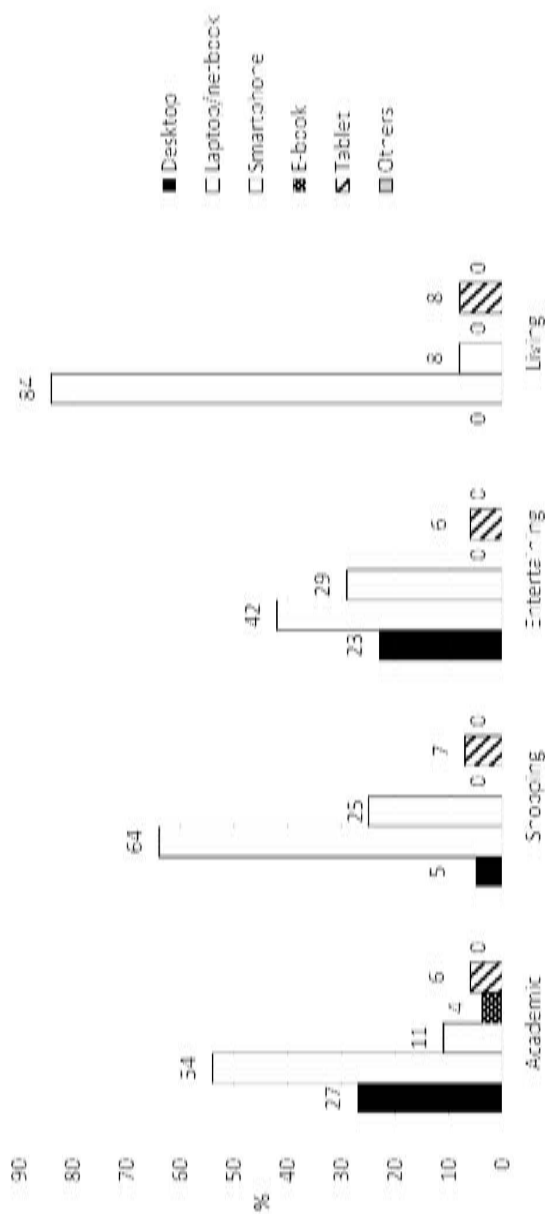


Figure 2. The relationships between four significant information needs and information devices

by smartphone use (11%), e-book reader use (4%), and tablet use (4%). For shopping purposes, the laptop/netbook (64%) was used most frequently, while smartphone use (25%) was noticeable. For entertainment purposes, a wide variety of digital devices were found, such as laptops/netbooks (42%), smartphones (29%), desktops (23%), and tablets (6%). Laptops/netbooks (84%) were found to be the dominant devices for living-related needs, along with smartphones (8%) and tablets (8%).

## Discussion

International students are one of the fastest-growing populations in higher education, and understanding their information behaviours is vital to improving information services for them. An online diary method and a questionnaire instrument were used to capture international students' information activities at a large public university in the southeastern United States.

Specifically, to understand the information needs and uses of international students, four research questions guided this research. This study reveals international students' information needs, information sources, choice of digital devices, and the relationships between these three factors in the students' everyday lives.

### *RQ 1: What are the information needs of international students in their everyday lives?*

Through the online diary survey, 28 international students provided information-activity data that revealed their information needs for everyday life. This study indicated a wide range of information needs. The results largely confirm the findings of previous studies—that academic information is one of the significant information needs for international students (Liao, Finn, and Lu 2007; M. Liu and Redfern 1997; Yi 2007). However, this study revealed that academic information needs are only a small part of international students' daily information needs. In addition to academic information needs, shopping, entertainment, living, transportation, and food/drink information needs were found to be significant for international students. A wide range of needs were found, as international students must adjust their daily lives and confront challenges, such as linguistic barriers and complicated legal systems, during their stays in foreign countries. These findings have implications for not only information services for international students but also research areas that consider international students. International students' information services may expand to include more diverse information needs, and more research needs to be conducted to identify these students' information needs and the accompanying behaviours.

### *RQ 2: What information sources do international students use in their everyday lives?*

With a wide range of information needs, the participants of this study used a wide variety of information sources to obtain relevant information. The most commonly used information sources were search engines (at 36%). In addition to search engines, social network services were found to be a common resource

when international students sought information. This finding demonstrated that international students tended to use social network services to meet their information needs in the same ways that college students use social network services in their own countries (Guo et al. 2011; Quan-Haase 2008; Sin and Kim 2013). As Fisher and Julien (2009) indicated, when users connect with a wide range of people, they tend to seek information from their connections through social network services. This study found that international students, as a young generation in a foreign society, frequently used social network services as significant information sources. However, interestingly, the reliance on social media services for information seeking differed depending on the type of information needs. We will discuss this issue in the RQ 4 section.

*RQ 3: What information devices do international students use in their everyday lives?*

For a total of 227 information activities, international students primarily used laptop computers for information seeking, followed by smartphones, tablet computers, e-book readers, and desktop computers. The percentages of digital device ownership clearly indicated that participants used different devices for information searches according to their information needs. However, this study revealed that laptop computers and smartphones were preferred to other digital devices. This result may indicate that the portability of digital devices has become more important for information-seeking purposes. In addition, Web-based information services for international students may have to adjust their user interfaces and features based on the popularity of mobile digital devices. More important, as Kwon et al. (2013) indicated, participants chose different devices depending on the type of task (i.e., work-related or non-work-related tasks). The relationships between needs, sources, and devices in the data collected in this study will be discussed in the following section.

*RQ 4: What are the characteristic relationships among information needs, information sources, and information devices?*

Participants in this study chose different information sources and digital devices depending on their information needs. Although dominant information sources, such as search engines and social network services, were revealed, differences for all types of information needs surfaced based on individual information needs. A sharp contrast was found when the participants reported their sources for entertainment-related information needs. The dominance of search engines decreased, and diverse information sources, including specific websites, were reported. In contrast, shopping and living-related information needs relied heavily on search engines. Although portable digital devices, such as laptops and netbooks, were found to be the prominent devices for all types of information needs, slight variances were noted depending on individual information needs. For instance, mobile devices, such as smartphones, were used relatively more often for particular information needs, such as shopping and entertainment needs. These findings have implications for information services for international

students. International students' information services may expand to include various digital devices depending on the type of information needs.

### Conclusion

This study conducted an online diary survey and used a questionnaire instrument to investigate the information needs and behaviours of a specific user group—international students in the United States—in the context of everyday life. With four specific research objectives, this study investigated international students' information needs, information sources, digital devices used for information searches, and the relationships between information needs, information sources, and digital devices. The dominant information needs were found to be academic-related information needs, along with shopping, entertainment, and living-related needs. Search engines and social network services were found to be primary information sources, and laptop/netbook computers were the most frequently used devices for information searches. Considering the relationships between information needs, sources, and devices, this study found that participants chose different information sources and digital devices depending on the type of information they needed.

This study reveals several practical implications for information services and systems for international students. The findings indicate that international students' information needs vary widely, possibly because international students must adjust their lives and confront new challenges in foreign countries. To provide specific information services and systems for international students, a wide range of information needs, not only academic information needs, should be considered. When information services are provided, appropriate information sources and digital devices must be considered according to the types of information needs. Because this study aimed to explore the information needs and uses of international students in their everyday lives, its generalization is limited owing to the small sample size. In addition, impact variables, such as length of stay, linguistic level, cultural background, and academic level, were not analysed in terms of how they affected information needs and uses in this exploratory study. Future research agendas from this perspective can be discussed. As a quantitative approach to understanding the information needs and uses of international students, the impact of length of stay, linguistic level, cultural background, and academic level on international students' information behaviours should be analysed and compared.

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**Appendix 1: Demographic information for study participants**

	Preliminary survey ( <i>n</i> = 60)		Online diary survey ( <i>n</i> = 28*)	
	No. of responses	%	No. of responses	%
Gender				
Female	29	48	13	46
Male	31	52	15	54
Age				
18–25 years	41	68	15	54
26–35 years	18	30	12	43
More than 36 years old	1	2	1	4
Academic status				
Undergraduate	27	45	12	43
Master's	18	30	8	29
PhD	13	22	7	25
English Language Institute	1	2	0	0
Others	1	2	1	4
Ethnicity				
White/Caucasian	6	10	3	11
Black/African American	7	12	2	7
Asian/Pacific Islander	28	47	12	43
Hispanic/Latino	13	22	10	36
Native American	0	0	0	0
Multiracial/mixed race	6	10	1	4
Other	0	0	0	0
Duration of stay in the United States				
Less than 1 year	26	43	9	32
1–2 years	12	20	5	18
2–5 years	11	18	9	32
5 years or more	8	13	5	18
N/A	3	5	0	0
Perceived English fluency				
Native	12	20	3	11
Very good	29	48	13	46
Good	15	25	9	32
Average	4	7	3	11
Poor	0	0	0	0
Very poor	0	0	0	0

\*The online diary survey originally included 30 participants, but 2 participants withdrew from the study.

**Appendix 2: Country of citizenship of study participants**

Preliminary survey	No.	Online diary survey	No.
Antigua	2	Bangladesh	1
Bahamas	1	Barbados	1
Bangladesh	2	Brazil	2
Barbados	2	Canada	1
Belize	1	China	1
Brazil	2	Colombia	3
Canada	1	Costa Rica	1
Cayman Islands	1	Ghana	1
China	2	Honduras	1
Colombia	3	India	4
Costa Rica	1	Morocco	1
Ghana	1	Nigeria	1
Honduras	1	Pakistan	1
Hong Kong	1	South Korea	1
India	12	Spain	1
Indonesia	1	Sri Lanka	2
Italy	1	Sweden	1
Jamaica	3	Venezuela	2
Japan	1	Vietnam	1
Morocco	1	Total	28
Nigeria	1		
Pakistan	1		
South Korea	1		
Spain	1		
Sri Lanka	2		
Sweden	1		
Taiwan	1		
Thailand	1		
Turkey	1		
United Kingdom	3		
Venezuela	6		
Vietnam	2		
Total	63*		

\*Several students were citizens of multiple countries.



### Appendix 3: Major of the study participants

Preliminary survey	No.	Online diary survey	No.
Accounting	1	Advertising	1
Advertising	1	Anthropology	1
Anthropology	1	Biology	1
Biology	2	Biomedical sciences	2
Biomedical sciences	5	Business management	1
Business management	1	Civil and environmental engineering	2
Civil and environmental engineering	2	Communication sciences and disorders	1
Communication sciences and disorders	1	Criminology	1
Computer engineering	3	Dentistry	1
Criminology	2	Education	1
Dentistry	1	Electrical engineering	1
Education	2	Environmental science	1
Electrical engineering	3	Finance	2
Entrepreneurship	1	French	1
Environmental science	1	History	1
Finance	3	Industrial engineering	2
French	1	Information system management	3
History	1	Marketing	1
Industrial engineering	2	Mass communication	1
Information system management	5	Mechanical engineering	1
Information technology	1	Physics	1
International business	3	Transportation engineering	1
Marketing	3	Total	28
Mass communication	1		
Mechanical engineering	3		
Physics	2		
Political science	1		
Pre-business	1		
Public health	2		
Second Language Acquisition/ Instructional Technology	1		
Social work	1		
Studio art	1		
Transportation engineering	1		
Total	60		