# Tuba Ciftci\*, Kathrin Knautz Chapter 5. Information Literacy Levels of Facebook Users

**Abstract:** How information literate are Facebook users? An online survey (N = 742) was conducted to examine how Facebook allows users to develop skills and abilities concerning the correct use of information (e.g., knowing how to find information, correctly dealing with information on Facebook, and adhering to privacy, as well as legislation governing Internet policies). One approach, based on the Association of College and Research Libraries standards and the derived research model, provides the framework for our study design and data interpretation. We investigate users' self-assessments of their perceptions of information literacy on Facebook. Concerning evaluation, adherence to laws/ethics, and privacy, our participants performed well. In terms of representation, making use of, and creating information, however, they felt less sure of themselves. Taking all building blocks into account, users appear to rate themselves, on average, at a medium level of information literacy (1.71 on a scale between 0 and 3). In addition, the differences between our women and men are statistically very significant. Men estimated their information literacy levels to be higher than women did. Comparing general Facebook use with Facebook groups' behavior indicates that general Facebook functions develop more information literacy abilities than do operations in Facebook group functions. Thus, users' general information behavior strongly influences their information literacy levels on Facebook.

**Keywords:** Information literacy, Privacy, Social media, Facebook, ACRL, Information retrieval literacy, Social media literacy, Knowledge representation literacy, Facebook groups, Facebook functions, Information behavior.

# Introduction

Facebook is currently the top social networking service (SNS) and one of the most visited social media websites (Statistica, 2015). Founded in 2004, it has become one of the most popular tools for sharing, commenting on, and posting new

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content (e.g., text, photo, link, video, etc.). Many educators complain that students may feel negative effects through social media usage. However, positive effects in the area of information retrieval and knowledge representation often are not picked up by the debate nor in scientific studies, yet are nevertheless important to consider.

With the advent of social media (Web 2.0), web users handle information differently than they did even 10 years ago, with the ability to do so usually linked to information literacy. Only a few studies have treated Facebook in terms of information literacy (e.g., Hanell, 2014). Unfortunately, only one study, an analysis by Witek and Grettano (2012) entitled "Information Literacy on Facebook: An Analysis," has extensively investigated information literacy. However, to date, no one has produced any empirical research. Thus, the analysis of Witek and Grettano (2012) serves as an inspiration for our study. Recognizing this void in the literature, our study will illuminate this area and examine the acquisition of practical competencies for information retrieval and knowledge representation literacy through the use of the SNS Facebook.

To analyze Facebook users' self-assessments concerning information literacy, we looked at their actual information literacy abilities. The purpose of this study is to identify the nature and self-perception of Facebook users' information literacy levels and the competency factors that develop and promote information literacy. Practical competencies of information literacy regarding Facebook have been empirically evaluated. We present two primary components of information literacy with their competencies listed below:

- Information Retrieval
- recognizing information needs
- searching for and retrieving information
- evaluating information quality
- making use of information
- Knowledge Representation
- creating information
- representing and storing information
- providing for privacy
- providing for an understanding of information laws and ethics

Additionally, we observed Facebook users operating at different competency levels. Therefore, the study attempts to identify the knowledge level of Facebook users according to a model of the level of competence (Zichermann & Cunningham, 2011) and subsequent application of information literacy (Knautz, 2015). We work with four competency levels:

- level 0: information illiterate person
- level 1: novice
- level 2: problem solver
- level 3: expert

### **Information Literacy**

When addressing the concept of *information literacy*, what do we mean? Due to the increasing amount of digital content available – especially in the context of social media – searching, finding, using, generating, and indexing information have become necessary skills in the 21st century. Information literacy refers to the ability to access and use a variety of information sources to solve an information need. It means defining one's information needs, searching, finding, evaluating, using, and subsequently communicating that found knowledge. Hence, an information literate person must be able to identify the knowledge gap as well as identify appropriate research methods. Additionally, he must be able to critically evaluate and formulate questions accordingly. For this, she must be able to search for answers to those questions in increasingly diverse ways. Finally, individuals must constantly be learning to remain information literate as it is a "learning experience" (Hapke, 2007).

Information literacy includes two competencies. The first one encompasses all that pertains to information retrieval literacy (recognition, searching, finding, evaluating, and using information). The term "information literacy" was coined by the president of the Information Industry Association, Paul Zurkowski, in 1974:

People trained to the application of information resources to their work can be called information literates. They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information solutions to their problems (Zurkowski, 1974, p. 6).

Since that time, many other definitions have been applied to the term. One of the most widely recognized definitions and the one most often applied today comes from a 1989 "Final Report" by the American Library Association (ALA): "To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ALA, 1989, p. 4).

Social media use has led to the development of additional literacies of knowledge representation includes creating, representing, and storing information, as well as providing for its privacy. An information literate person must know how and be able to create, represent, and be able to store information. In addition, he or she must be able to understand the economic, legal, and social issues surrounding the information and be able to adhere to privacy requirements concerning it (Stock & Stock, 2013). This competency of providing for an understanding of information laws and ethics is relevant for both literacies we have outlined – information retrieval and knowledge representation.

Some researchers have examined the relationship between social media and research skills (Hicks & Graber, 2010; Purdy, 2010). Numerous studies have been conducted concerning Facebook. Unfortunately, only two analyses treat the topic of information literacy. Hanell (2014) conducted an ethnographic study of a Facebook group and analyzed – more as a by-product – the impact on information literacy. The study by Witek and Grettano (2012) was divided into two parts, with the second part not yet finalized. The first part (groundwork for the second) consists only of an analysis of Facebook functions. Witek and Grettano analyzed Facebook with particular regard to the Association of College and Research Libraries (ACRL) Information Literacy Competency Standards for Higher Education (ACRL, 2000). They analyzed each of the ACRL standards and examined which Facebook functions promote and support being an "information literate person." Questions they asked included "Which Facebook features enable users to locate or find information?"; "Which tools aid users in the evaluation of information?"; and "In what ways does Facebook help users utilize information to accomplish a specific purpose?" (Witek & Grettano, 2012, p. 244).

It has been found (but only in theory) three Facebook functions (feeds, shares, and comments) lead to Facebook users acquiring greater information literacy. According to this analysis, there are two types of feeds (News Feed and Timeline). In the News Feed, users can decide which information they want to receive. In the Timeline, a user publishes content. Relevant information is detectable in the Timelines of Facebook friends and of all others who publish their information publicly. Both functions aid Facebook users in controlling their content on the SNS. The share function is helpful for evaluation and syntheses (ACRL, 2000, p. 11). In addition, with the comment functions, Facebook users have the possibility to recognize information needs.

Some studies discuss web use in terms of information literacy. For example, Luo interpreted Web 2.0 tools in relation to information literacy (Luo, 2010, p. 32). Another analysis mentioned Facebook as an information literacy tool (Click & Petit, 2012); however, the authors merely discussed it, but did not describe or analyze it. Bicen and Cavus (2011) found Facebook tools can help increase users' knowledge, concentration, and search abilities. Witek and Grettano (2014) identified social media usage effects – Facebook use specifically – on students' information literacy practices and behaviors.

Applying the work of Zichermann and Cunningham (2011), Facebook users' knowledge can be categorized into levels of information literacy. Kathrin Knautz (2015, pp. 94–95) also applied this concept on gamification with regard to information literacy. Zichermann and Cunningham (2011) have five levels ("novice," "problem solver," "expert," "master," and "visionary") in their model to use in recognizing the progress of competency and in acknowledging which knowledge level the user has attained.

In our study, Facebook users were only categorized as far as the "expert" level because we did not use the "master" and "visionary" levels. We applied knowledge levels in our study to identify in which areas Facebook users perform well with regard to information literacy. With the help of mean values of our empirical evaluation, Facebook users were categorized into four levels (scale: 0 = "information illiterace person" to 3 = "expert"). Depending on the level of information literacy, a Facebook user may be observed at different levels handling different types of information (see Table 1).

Level of Information Literacy	Description
Level 0: "information illiterate person"	Information illiterate persons are ignoramus and they do not know which functions will be offered to them. Thus, they are not familiar with Facebook. Additionally, they do not have the basic skills and knowledge (e.g. the conditional terms or the functions on Facebook). Users with a mean value of our empirical evaluation (scale: 0 to 3) between 0 and 0.74 have been categorized into this level.
Level 1: "novice"	At the next level, the user is introduced to the "new learning environ- ment." So, on the level of "novice" they learn the basic skills and abilities of information literacy but they do not deal with "deeper problems yet" (Knautz, 2015, pp. 94–95). Users with a mean between 0.75 and 1.49 have been categorized into this level.
Level 2: "problem solver"	In the next step, the problems and challenges are becoming "increas- ingly complex." The user acquires new skills and knowledge to handle the functions and information on Facebook correctly, which will allow him/her to solve challenging problems (Knautz, 2015, pp. 94–95). Users with a mean between 1.50 and 2.24 have been categorized into this level.

Table 1: Levels of Information Literacy, According to Zichermann and Cunningham (2011).

#### Tab. 1 (continued)

Level of Information Literacy	Description
Level 3: "expert"	After this, the user progresses to a higher level, with a mean of 2.25–3. In terms of the level of knowledge and skills, she learned the new skills and extensive abilities. The user knows more than the standard user: "At the expert level, a player knows something that is not obvious to the casual player" (Zichermann & Cunningham, 2011, p. 31). If there is a problem, the user applies her existing knowledge and can solve the problem. She can always solve the problem. Hence, the user has an extensive knowledge base. The user has completely understood the learning application and believes that she has everything under control.

All older models of information literacy concentrate on information retrieval. Models of information retrieval literacy describe the phases of detecting information needs, information search, information evaluation, and found information utilization. The 1989 ALA "Final Report" inspired a group of university professors in the United States to develop models concerning the process of searching for information, resulting in the creation of the "big 6 skills" model by Eisenberg and Berkowitz (1990). The "information seeking process" model by Kuhlthau (1991) was also successful. Further interesting models were developed, such as the "seven pillars model for information literacy" (SCONUL, 1999), and two German models, the "dynamic model of information literacy" by Homann (2000), and the "information literacy 2.0" model by Hapke (2007).

With the growing importance of information literacy in schools and higher education, national and international standards have emerged from these models and definitions. In terms of university students, the "Information Literacy Competency Standards for Higher Education" (ACRL, 2000) and the Australian "Information Literacy Standards" (Council of Australian University Librarians, 2001) have been enforced. There now are also standards for information literacy, such as the "Nine Information Literacy Standards for Student Learning" (American Association of School Librarians, 1998) and the German standards of the network information literacy Baden-Württemberg (NIK-BW, 2006).

According to Catts and Lau (2008), the competencies are portrayed as a layer model (basic competence, media competence, and information literacy). With these existing definitions and models, the original model can be extended to include a "new dimension of the practical skills for knowledge representation" (Gust von Loh & Stock, 2013, p. 4). Figure 1 represents the building blocks of the information literacy model according to Stock and Stock (2013). This model includes two main dimensions – practical competencies for information retrieval and practical skills for creating and representing information. There are eight building blocks:

- Recognizing information needs What information do you need?
- Searching for and retrieving information How will you search and where might you find the information?
- Evaluating the quality of found information How useful is this information?
- Making use of information How will you use this information?
- Creating information How to create new information?
- Representing and storing information Are you able to store and to index this information?
- Providing for privacy Are you aware of the privacy (settings)?
- Providing for an understanding of information laws and ethics Do you adhere to information laws and to information ethics?



Figure 1: Building Blocks of Information Literacy: Source: Stock and Stock (2013, p. 79).

The information literate person begins by *recognizing information needs*. The ability to do so is the basic requirement for successfully retrieving information. An information literate person must know what she already knows and be able to identify any knowledge gaps. In addition, she must determine which information will satisfy her information needs and understand the form, volume, and format this information will take. What does the term "information needs" mean? Generally, if someone desires knowledge of things unknown, those are information needs. They are not always easily recognized, however, because a person must

first realize a knowledge gap exists. Only then can it be decided which kind of information is necessary.

This building block is present in almost all models and standards of information literacy. The ACRL of the American Library Association also offers a description of information needs: "The information literate student determines the nature and extent of the information needed" (ACRL, 2000, p. 8). This also includes identifying terms, research topics, and question wording. Furthermore, articulating information needs is equally important. An information literate person should be able to articulate information to other people that is helpful in terms of information organization. One could ask whether she has acquired sufficient information for understanding a topic. For example, to obtain a subject overview, one source might be adequate, but when writing a term paper, a researcher must be able to recognize that more sources ought to be consulted with more information gathered. In most cases, a single source is insufficient to satisfy information needs. For this reason, one must also revise her information needs as she goes about assembling and organizing data.

What does recognizing information needs mean when applied to an SNS, such as Facebook? Some of Facebook's most useful functions can have a positive effect on users themselves in recognizing their own information needs. As mentioned above, Witek and Grettano (2012) analyze the News Feed function as follows: "News Feed content is an information retrieval system that is completely customized to the user's information needs and optimized to display content only from trusted or preferred sources" (Witek & Grettano, 2012, p. 247).

With the help of the News Feed function, the Facebook user gets much new content posted by other subscribers. By reading this, he comes to recognize his information need. This is the passive solution: Users read new posted content on their News Feed and realize they have an information gap in terms of understanding it. This indicates they must acquire more information. The posted information one has been read can help in getting new ideas. Furthermore, there is an active solution that can play an important role. Users can acknowledge their information needs by posting or commenting on new content on their timelines. They must be clear on which topic they are posting new content; therefore, they must examine it diligently. Thus, the process begins with producing a question. By posting new content, users must be clear about which words and information they want to include in their post to express themselves.

After recognizing one's information needs, the information literate person next moves to *searching for and retrieving information*, a standard the ACRL defines as follows: "The information literate student accesses needed information effectively and efficiently" (ACRL, 2000, p. 9). This standard, which includes searching for and locating information, characterizes the importance of and

ability to search for and retrieve information. Because of the missing information (knowledge gap), the person must ascertain where to obtain needed information and then how to find out exactly what he wants to know. First, the information literate person must create and develop an effective search strategy by identifying and locating useful, accurate, and accessible information sources (e.g., "How will I search for and where might I find the information?"). He might ask, "Is the needed information digital or analog?" An information resource can be digital (e.g., a file on the Internet or a post on Facebook) or analog (e.g., a book). One must have access to the needed information. Certain databases (e.g., LexisNexis, STN International, Genios, etc.) can only be accessed by registered users *at a cost*. Therefore, the user or his institution must pay for the information. As a result, many people primarily search online for information that has no monetary cost attached to it via general search engines, such as Google.

How do users search for and find (quality) content on Facebook? In general, Facebook offers only a very restricted search function. It has a search bar on every page, into which users can enter terms to find posts, photos, groups, places, events, or videos that are public or were shared with them in the past, but can only do so by entering 1) names of Facebook users, 2) title terms of posts, or 3) hashtags. Through this primary search capability, one can also find a search function in Facebook groups, where users can search with keywords in posted content, group members, files, and so forth.

The next step for users is *evaluating the quality of found information*. The ACRL defines this third information literacy standard as follows: "The information literate student evaluates information and its sources critically, and incorporates selected information into his or her knowledge base and value system" (ACRL, 2000, p. 11). Users must critically evaluate all retrieved data. Any information found on the Web or elsewhere must be evaluated. Thus, the information literate person determines a source's relevance and importance as regards the given information. How does one decide which information is necessary? For this, he can ask the following questions to determine relevancy: "Is the source reliable?"; "Is this piece of information necessary?", and "Will it satisfy my need for knowledge or understanding?" In this way, sources and search results can be refined, leading to new search arguments. Information is only relevant if it helps to answer the respective questions.

Furthermore, criteria must be invoked that will enable the user to decide whether information or sources are reliable. Which critical factors will influence the decision made through the evaluation? How meaningfully the search was begun is crucial for the quality of the results returned by the information search process. If the information source is inadequate, the result cannot be sufficient. Smith (1997) proposes a list of criteria to be applied, including analog and digital publications, in both form and content. Thus, evaluating information quality is divided into two areas. First, using the metadata, a user can evaluate the information or a source, without having to read it. Before doing so, however, one must answer the question "What might be a more credible, reliable source?" Then, in the second step, the content should be evaluated.

Is there "information overload" through Facebook? Koroleva, Krasnova, and Günther (2010) explore this idea. Because the SNS is essentially free to use, it may be too much information or content is available. Accordingly, Facebook users must decide which information is useful and "good" in terms of quality. How can the SNS enable an evaluation? Witek and Grettano (2012) discuss the utility for doing so using Facebook functions, such as commenting and sharing, that enables a type of evaluation process on Facebook. Other users can comment on posts. This may start a discussion following the post. The outcome of this is assessment and reevaluation of content, and these differing interpretations can bring forth new understanding, provocation for new arguments, an idea, or maybe an endorsement. The comment function enables collaborative evaluation and collective understanding. The share function enables the preparation of new information. Additionally, the "like" function can operate in the same way a social peer review does.

After finding and evaluating information, it must be *used and transformed into* "*action-relevant knowledge*" (Stock & Stock, 2013, p. 42). The ACRL defines this aspect of information literacy as a fourth standard: "The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose" (ACRL, 2000, p. 13). The information literacy process cannot be completed without the user effectively and efficiently making some use of the information. Effective use would be to fill identified gaps and information needs, to achieve predefined targets, or to gain new insights. In addition, this process includes independently developing theses, ideas of one's own, and selecting appropriate information.

Like other building blocks of knowledge representation literacy, *creation of information* is not denied as a separate point of ACRL. With the advent of social media, however, a paradigm shift has occurred on Internet usage. The web user ("consumer") has also become a "producer." Users create new information (e.g., on Facebook as a post or write an entry on Wikipedia) in the role of producers and at the same time actively use these services as consumers – summarized in the term "prosumer" (Toffler, 1980).

How can users create new information with the help of Facebook functions? The SNS offers many ways to create new information. One way is by creating or posting new content (e.g., a post, image, video, or link on a user's timeline). Moreover, the comment function itself may indirectly influence this process. If a user comments on something, this may start a new discussion topic, which in turn creates new, more informed knowledge and learning opportunities. The same applies for asking and answering questions on Facebook.

The next new dimension includes practical skills for *storing and representing information* (Gust von Loh & Stock, 2013, p. 3). Representing information in this context focuses on selecting appropriate means for information retrievability. This dimension includes two steps: The first aspect is the ability to store or save self-created information on an information service, for example, uploading an image or a video on Instagram, Flickr, YouTube, or Facebook. The second aspect refers to the description of the stored information by expressive titles and by tags (or – in some services – by hashtags) (Peters, 2009).

Information on social media in general as well as on Facebook in particular must be retrievable. In this area, Facebook offers some options for representing and storing information. What are the options for saving information on Facebook? Using the Save function, users are offered the option to upload documents (e.g., links, videos, images, music) onto the SNS, which makes them retrievable. Furthermore, in Facebook groups, a user can create a file or document and store it for later retrieval. The type of search for a file or document in Facebook groups makes the whole process easier. Here, visibility plays an important role. Information can be posted as usual on Facebook with the exception that the document is only visible "by me." It will be stored and retrievable.

The same type of saving can be done with photos. Users can create a photo album and constrain its visibility. We see then the role of Facebook functions is important. Because of its many possibilities for creating new information, Facebook users become active users. Creating information on social media (e.g., on Facebook) thus can be understood an important building block of information literacy. Hence, Facebook users create much new information that needs to be stored and effectively indexed (e.g., by hashtags).

In the age of social media, *providing for privacy* as well as *for information laws and ethics* has become increasingly important (Gust von Loh & Stock, 2013). Again, we can refer to the ACRL for an appropriate standard to follow: "The information literate student understands many of the ethical, legal, and socioeconomic issues surrounding information and information technology" (ACRL, 2000, p. 14). This area of information literacy includes the topic and the role of laws and ethics, which refer to aspects of treating other social media users with consideration. Ethical values and information on legal principles are usually closely related.

A typical question for this building block of information literacy is "What should I mention before posting anything on Facebook?" Intellectual property is a vital concern (Linde & Stock, 2011, p. 120). One critical consideration is how to safeguard copyrighted material. Whose right is being infringed upon? If a person

did not create a wall post or a photo by herself (e.g., recording a live concert), by whose legal authority does she operate in posting the concert's music or related images? By what license does she post? Facebook prohibits the posting of content to which other people or entities hold the copyright without first receiving the owner's permission. Additionally, content that includes the following is forbidden: hate speech, threats, anything inciting violence, pornography, images containing nudity, and graphic or gratuitous violence. Facebook users are instructed to provide their real-life names and provide accurate personal information on the site. False information and fake or pseudonymous names are forbidden. Users can register only one account for their use.

Providing for privacy also concerns using information responsibly as well as protecting personal (one's own and others') data on the Internet (Beutelspacher, 2013). Which steps can Facebook users take to protect their private data? They can control their posts and personal information. They can choose with whom and which information they share on the site (i.e., by understanding and using settings for public, friends of friends, friends, only me, custom) and can target specific audiences to receive status updates. Privacy settings thus are an essential type of knowledge to acquire and apply.

## **Research Questions, Model, and Methods**

In this section, we present the questions, model, and methods for our research. A user-related concept for answering these questions by self-assessment has been developed. Our study aims to discover and investigate Facebook users' self-perceptions of their information literacy levels. We ask several questions: Which Facebook function covers a building block of information literacy? How effective are the Facebook functions? How does Facebook promote information literacy? Do Facebook users handle Facebook correctly, lawfully, and fairly? A sub-question treats the knowledge level on a scale of 0 to 3 of Facebook users. In addition, this study also distinguishes between general Facebook functions and functions in Facebook groups. This refers to, for example, the general search function in Facebook or the search function in a Facebook group. Thus, we ask our first research question (RQ):

#### RQ1: What are Facebook users' perceptions of their own information literacy and which Facebook functions aid in developing information literacy behavior?

To deepen our knowledge, we ask two sub-questions with regard to gender and general Facebook/Facebook group use:

# RQ1.1: Is there any difference between male and female information behavior?

# **RQ1.2:** Are there any differences between information behavior concerning Facebook groups and general Facebook use?

Additionally, we analyzed different forms of information behavior (RQ2.1 to RQ2.7) in relation to the users' information literacy:

#### **RQ2:** Does users' information behavior trigger different information literacy levels on Facebook?

RQ2.1: Are there differences between library users and nonusers?

RQ2.2: Which differences are there between users who control their content on Facebook and those who do not?

RQ2.3: Do the terms on Facebook influence user behavior?

RQ2.4: Are users who store their real names on Facebook more likely to be information literate than users who create fake accounts?

RQ2.5: Are users who view third-party content more likely to be information literate than users who do not?

**RQ2.6:** Are there differences in providing for privacy with regard to privacy settings ("public" and "custom")?

RQ2.7: Is there a difference between users who have an account to accomplish a specific purpose and users who joined Facebook groups just for fun?

Figure 2 presents our research model, developed on the information literacy model and its building blocks. Our model has three main focuses:

- to analyze the self-perceptions of the users' state of information literacy on Facebook,
- to analyze gender-specific differences as well as differences between general Facebook use and behavior concerning Facebook groups,
- to relate general information behavior (e.g., library use) and information literacy.

The research model presupposes that the identified eight building blocks are indeed the key factors of information literacy. The information literacy model used was empirically examined with the help of German Facebook users. To assess their information literacy levels, an online survey was designed and distributed on both Facebook and an Internet forum frequented by German Facebook users, which asked them to identify their knowledge level in terms of information literacy with a subsequent pretest (10 participants). The online survey used multiple-choice questions with predefined answers given (Bühner, 2010). Beutelspacher (2014) has noted that with this survey method, every participant gets identical questions and predefined answer options.

The target participants of this study were current Facebook users in Germany. Empirical data for this study were collected via the online survey tool umfrageonline.com. The study was open for four weeks (9 March–12 April 2015) and was based on previous study questions by Förster and Orszullok (2013) and the information literacy model by Stock and Stock (2013). The survey included items regarding the above-discussed building blocks of information literacy (questions 1–44) and, in addition, demographic factors (questions 45–48), such as gender, age, and date of graduation. Thus, the survey included 48 items. Participants answered questions concerning self-perception of their information literacy on Facebook and assessed their information literacy levels on a scale from 0 ("information illiterate person") to 3 ("expert").



Information Behavior



Figure 2: Our Research Model.

As noted, the questions were designed to cover each building block of the information literacy model. Typical questions were "How often do you share/post new content (e.g., post, link, etc.) on Facebook?"; "Who can see your private data and your posts on Facebook?"; "Are you satisfied with the Facebook privacy settings?"; "Facebook has a save function. Do you use it?"; "How often do you use Facebook?"; and "Are you satisfied with the search function generally in Facebook and with the search function in Facebook groups?"

The total number of participants was 975. Of these, 742 (76.1%) completed the survey. Cases that were incomplete and in which the participants answered only a few questions were removed from the analysis. Data analysis was conducted using IBM SPSS Statistics 21 and Microsoft Excel 2010. Mean scores, standard deviations, and significance tests (*t* tests) were used for data analysis. In addition, a reliability analysis was performed to check the reliability and validity of the given data. We distinguish among four levels of statistical significance, namely, the 95% level (marked by one asterisk "\*"), the 99% level (\*\*), the 99.9% level (\*\*\*), and all other cases as "not significant" (*ns*).

# Facebook Users' Self-Perceptions of Information Literacy

Of the participants, 51.5% are women, 47.3% are men, and 1.2% of participants did not specify gender. Most of the participants (43.4%) are between 18 and 24 years old. A total of 31.2% spend more than 3 hours a day on the Internet, and 30.6% spend between 11 and 30 minutes a day on Facebook. This is consistent with previous research (e.g., Ellison, Steinfield, & Lampe, 2007). More than half of all participants (52.4%) have the general qualifications for university entrance, with 29.1% having graduated from university.

We present Facebook users' self-perceptions for the different building blocks and over all building blocks (see Table 2). Additionally, we calculated mean values with regard to gender. We found Facebook users' self-perceptions of their information literacy were not very high – the arithmetic mean is 1.71 (on a scale from 0 to 3). We can identify very low competency values for the buildings blocks of creation of information (1.37), representation of information (1.43), recognition of information needs (1.45), and searching (1.48). In social media, abilities in creating and representing information are essential. In this category, our participants scored at the novice level. Recognizing information needs and searching are the first steps for successful retrieval; and again, our participants scored at the novice level.

Table 2: Facebook Users' Self-Perceptions of Information Literacy.
All: <i>N</i> = 742; Female: <i>N</i> = 382, Male: <i>N</i> = 351; <i>SD</i> : Standard Deviation.

Building Blocks	Female Mean (SD)	Male Mean (SD)	All Participants Mean (SD)	Significant difference between genders?
Recognition	1.39 (0.83)	1.46 (0.99)	1.45 (0.85)	ns
Searching	1.48 (0.41)	2.00 (0.43)	1.48 (0.42)	**
Evaluation	1.50 (0.74)	2.23 (0.83)	2.19 (0.79)	*
Making Use	1.33 (0.68)	1.62 (0.91)	1.51 (0.73)	**
Creation	1.30 (0.75)	1.39 (1.10)	1.37 (0.84)	ns
Representation	0.75 (0.68)	1.44 (1.10)	1.43 (0.87)	**
Privacy	2.17 (0.78)	2.20 (1.10)	2.11 (0.92)	ns
Law/Ethics	2.17 (0.78)	2.18 (0.83)	2.17 (0.79)	ns
Over All Building Blocks	1.51 (0.71)	1.82 (0.91)	1.71 (0.77)	**

We observed statistically significant differences between female and male participants over all building blocks. Men (mean: 1.82) estimated their understanding at a higher level with regard to information literacy than women did (mean: 1.51). Both can be categorized at the "problem solver" level. Men estimated their information literacy higher than women did for several levels: searching (2.00 vs. 1.48), evaluating (2.23 vs. 1.50), making use of information (1.62 vs. 1.33), and representing (1.44 vs. 0.75). In nearly all building blocks (recognizing, searching, making use, creating, and representing), female participants ranked themselves at the "novice" level, whereas males ranked themselves as "problem solvers." It remains an open question whether men really are more information literate or whether their self-perception is inflated.

Over all building blocks, we found a small, but significant difference between general Facebook use (1.74) and behavior concerning Facebook groups (1.58) (see Table 3). Minimal differences were observed as regards recognizing, searching, creating, and representing. Facebook group users fail to make use of information compared with general Facebook use (0.75 vs. 1.41). Obviously, information found in groups is not as useful as information retrieved outside groups. Providing for privacy in the groups is much lower than observed in Facebook in general (1.53 vs.

2.24). In groups, especially closed groups, privacy seems to be more unimportant than in general Facebook use.

Building Blocks	General Facebook Mean (SD)	Facebook Groups – Mean (SD)	Significant?
Recognition	1.84 (0.81)	1.91 (0.87)	ns
Searching	1.64 (0.66)	1.69 (0.71)	ns
Evaluation	1.82 (0.73)	1.95 (0.71)	*
Making Use	1.41 (0.71)	0.75 (0.76)	*
Creation	1.89 (0.99)	1.91 (0.98)	ns
Representation	0.76 (1.07)	0.81 (1.06)	ns
Privacy	2.24 (0.76)	1.53 (1.07)	**
Law/Ethics	2.33 (0.65)	2.10 (0.65)	*
Over All Building Blocks	1.74 (0.79)	1.58 (0.85)	*

**Table 3:** General Facebook Use and Behavior Concerning Facebook Groups.N = 742

We present the distribution of different knowledge levels regards participants' self-perceptions of their information literacy (see Figure 3). The first circular chart (a) shows the distribution for all participants. Our participants estimated themselves as "problem solvers" (59.0%) at a higher rate than they did as "novices" (41.0%). The values for "information illiterate person" and "expert" were each 0.0%. Circular charts (b) and (c) depict the distribution as regards gender. Men estimate themselves to be "problem solvers" (69.0%) much more often than as "novices" (31.0%). In addition, most women estimated themselves as "problem solvers" (54.0%) and 46.0% as "novices." Concerning Facebook groups (59.0%) problem solvers) and Facebook use in general (65.0% problem solvers), the differences over all eight building blocks are not very high. On the one hand, it is satisfying to note we found no information illiterate persons, but on the other hand, it seems alarming that no single participant believes him- or herself to be expert at information literacy.



**Figure 3:** Participants by Information Literacy Level (*N* = 742).

We show information literacy levels for all eight building blocks (see Figure 4). There are only two levels, namely, "novice" and "problem solver." On average, we found no "information illiterate persons," but also no "experts." We could identify more problem solvers than novices for evaluating information quality (73.0 % problem solvers), providing for privacy (86.0 %), making use of information (53.0 %), and providing for information laws and ethics (88.0 %). For all other information literacy building blocks, our participants estimated themselves to be only at the level of novice. In particular, two knowledge representation building blocks display very high values of novices (creating information: 84.0 %; storing and representing information: 89.0 %). Our respondents judged themselves to be mostly novices in terms of recognizing information needs (62.0 %), and searching for information (58.0 %).

Concerning *recognizing information needs* (see Figure 4a), participants answered questions about recognizing their own information needs on Facebook (e.g., "In what way do you recognize your information needs on Facebook, e.g., through posting or reading new posts?") Only 20.8% of participants recognize their information needs while posting on their timeline, and 20.9% believe they recognize their information gaps through Facebook groups. Furthermore, 34.7% specified they recognize the need for information while reading new posts on their News Feed. Again, about 33.0% recorded they recognize this need while reading posts on Facebook groups. Users can recognize their information needs when they formulate a question because they are thinking about how to pose it appropriately. Of participants, 52.3% have worried about their phrasing when they want to post something in a Facebook group. Similarly, 47.6% of participants worry about their phrasing while posting in general on Facebook.

Concerning *searching for and retrieving information* (see Figure 4b), our study's findings confirm results of previous studies (e.g., Head & Eisenberg, 2011). Online information sources are preferred, with favorite sources being Google (75.3%) and Wikipedia (53.4%). Participants do not often use Facebook as a tool for searching (18.9%), and offline sources, such as libraries, are only rarely visited (7.2%).

Of participants, 51.4% *evaluate* the content they found (see Figure 4c), with 48.6% stating they do not evaluate any content on Facebook. The majority (85.3%) believe they can distinguish between relevant and irrelevant content. More than half (52.7%) compare the information found on Facebook with that found on other sources.

Of participants, 55.4% specified they can effectively *use the information* in Facebook (see Figure 4d), with less than half of participants believing they are not able to do anything with it.

Many participants estimated they are not very advanced while *creating information* on Facebook (see Figure 4e). Of participants, 45.1 % responded to the question "How often do you post new content on your timeline?" with "less than once a week"; in addition, 11.7 % stated "never." Of participants, 21.0 % noted they had created a "survey on Facebook," 23.4 % had created new questions on the site, 49.3 % created new posts, and 23.2 % had left comments on Facebook posts "daily." The survey also offered some interesting findings concerning sharing: 24.3 % of participants shared a new video, photo, or link on Facebook "daily," but 39.1 % stated "less than once a week." Of participants, 38.9 % stated they are in Facebook groups because they like to comment on posts, while 37.2 % join groups because they want to share new content. With regard to creating surveys on Facebook, 12.0 % have created a survey in Facebook groups (here, questions



Figure 4: Participants by Information Literacy Level for All Building Blocks (N = 742).

had predefined answer options) "several times a day," and 11.7 % say they do this on their personal timeline.

Of participants, 63.9% are aware of Facebook's functionalities to store and to represent information (see Figure 4f), 42.7% specified they "always" use the "saved folder," 17.7% use the "notice," and approximately one-quarter (23.2%) apply the files option for storage.

Of our participants, 69.3 % know Facebook offers *privacy settings*. The question of this building block covered three areas: photos, wall posts, and personal data. Of participants, 7.4 % set their photos on Facebook to "public." Obviously, these participants believe they have nothing in their images to hide. However, the majority is more cautious, with more than half (59.9 %) having changed the visibility of their photos to viewing "only by friends." A scant 7.8 % share specified its wall posts are visible to everyone ("public"), with a much higher share, 54.9 %, setting it to "only friends." Of participants, only 10.3 % set personal data to "public" (e.g., "details about you," "family and relationship," "contact and basic info"); and 37.9 % check privacy settings "once a week" or "several times a week."

We found 62.3% is satisfied with Facebook's privacy settings; furthermore, 62.3% knows and uses the function "View as specific person." This lets users see how their timeline appears to either the public or a specific friend. They understand how to control the visibility of their status updates. These findings confirm the results of a previous study on Facebook's privacy settings: "The majority of Facebook users report having an understanding of privacy settings and make use of their privacy settings" (Debatin, Lovejoy, Horn, & Hughes, 2009, p. 93).

Do our participants make a provision for *information laws and information ethics*? Of participants, 64.4 % answered "yes" to using a real name on Facebook, however, 15.4 % has created more than one personal account. The majority (65.8 %) knows copyright law forbids posting foreign content without permission, 85.7 % specified it does not post forbidden content (e.g., hate speech or pornographic content), and pays attention to the law; and 90.7 % answered "no" to defaming other Facebook users.

# Information Behavior and Information Literacy on Facebook

Is there a relation between users' general information behavior and their state of information literacy on Facebook? We identified seven dimensions of information behavior (library use, content control, Facebook terms recognition, real name vs. fake name, copyright observation, privacy, and motivation) that might trigger information literacy.

Given a certain information need, where do users search? On Facebook or in libraries? The act of searching on Facebook (without visiting any library) will be compared with searching in libraries (see Table 4). There are high and significant differences between Facebook users who prefer Facebook for searching (1.80) and users who decide to travel to libraries (2.16). Additionally, users who search in libraries estimate their information literacy level to be higher in recognition than those who reserve their searching for Facebook (1.69 vs. 1.47). Additionally, it should be noted we observed big differences in building blocks seven and eight (providing for laws/ethics (1.76 vs. 2.481) and privacy (1.83 vs. 2.91). Thus, library users are more familiar with the search function and are aware that all Facebook users can search and find personal data. Hence, they are experts concerning privacy and information laws/ethics. Additionally, "library searchers" also used their found information more than nonusers did (2.28 for making use vs. 1.92 for searching in Facebook). They probably have a targeted search for a particular topic and know how to make use of it. Overall, Facebook users who search in libraries estimate themselves to be much more information literate than users who prefer searching on Facebook alone.

Building Blocks	Searching in Facebook – Mean (SD)	Searching in Libraries – Mean (SD)	Significant?
Recognition	1.47 (0.89)	1.69 (0.98)	**
Searching	1.98 (0.86)	2.12 (0.95)	ns
Evaluation	2.61 (0.56)	2.65 (0.64)	ns
Making Use	1.92 (0.99)	2.28 (0.96)	**
Creation	1.01 (0.77)	1.18 (0.76)	*
Representation	1.89 (1.00)	1.95 (1.06)	ns
Privacy	1.83 (0.73)	2.91 (0.85)	***
Law/Ethics	1.76 (0.63)	2.48 (0.61)	***
Over All Building Blocks	1.80 (0.80)	2.16 (0.85)	**

**Table 4:** Searching on Facebook Versus Searching in Libraries. Question: *Which Source Do You Use for Your Search?* Facebook N = 137, Libraries N = 25.

Question: <i>Do You Check the Content on Facebook?</i> Yes, I Do: <i>N</i> = 388, No, I Do Not: <i>N</i> =				
Building Blocks	I Check the	I Do not Check	Significant?	-
	Content –	the Content –		

Table 5: Checking Content on Facebook = 352.

	Content – Mean (SD)	the Content – Mean (SD)	
Recognition	1.29 (0.99)	1.31 (0.98)	ns
Searching	1.75 (0.56)	1.61 (0.61)	ns
Evaluation	2.83(0.76)	1.91 (0.86)	***
Making Use	1.98 (0.66)	1.77 (0.54)	**
Creation	1.37 (0.96)	1.87 (0.86)	***
Representation	2.18 (0.81)	1.98 (0.87)	ns
Privacy	2.43 (0.78)	2.45 (0.63)	ns
Law/Ethics	2.26 (0.98)	1.99 (1.01)	**
Over All Building Blocks	2.01 (0.81)	1.73 (0.79)	**

We present the relation of critical assessment of posted content and information literacy (see Table 5). There are significant differences between Facebook users who check content (2.01) and users who do not (1.73). It is striking that participants who answered the question with a "no" estimate their information literacy in creating at a higher rate (1.87) than do participants who answered with a "yes" (1.37). Members from the first group obviously create arbitrary new content without reflecting on what they do. According to their self-perceptions, users who check content score higher in both evaluating (2.83 vs. 1.91), and making use (1.98 vs. 1.77) than users who do not check. Additionally, the building block of providing for information laws/ethics (2.26 vs. 1.99) for users who check content is higher than for users who do not. Users who perform an evaluation know which information can also be used effectively and is suitable for further processing. Furthermore, they adhere to laws and ethics because they know which problems and consequences may arise in the future if they do not.

#### Table 6: Facebook Terms and Privacy Settings.

Question: *By the Terms, I Learn that in Facebook There Is a Privacy Setting*; Privacy Setting Known: *N* = 501, Privacy Setting Unknown: *N* = 170.

Building Blocks	Privacy Setting Known – Mean (SD)	Privacy Setting Unknown – Mean (SD)	Significant?
Recognition	1.47 (0.56)	1.33 (0.61)	ns
Searching	2.43 (0.69)	1.97 (0.75)	***
Evaluation	2.75 (0.77)	1.99 (0.86)	***
Making Use	2.52 (0.81)	2.37 (0.92)	*
Creation	1.54 (0.57)	1.36 (1.00)	**
Representation	1.89 (0.51)	1.81 (0.67)	ns
Privacy	2.54 (0.89)	2.45 (0.75)	ns
Law/Ethics	2.97 (0.74)	2.43 (0.70)	***
Over All Building Blocks	2.26 (0.69)	1.96 (0.78)	**

We next investigated the perception of the terms of Facebook with special regard to privacy settings (see Table 6). The majority of our participants (67.5%) has known from the beginning about the privacy settings. However, we found a significant difference over all building blocks (2.26) versus people who know about Facebook's terms and privacy settings (1.96). Users who know about the privacy settings estimate their information literacy level at higher rate for searching (2.43 vs. 1.97), evaluating (2.75 vs. 1.99), and providing for laws and ethics (2.97 vs. 2.43).

What differences are apparent between users who publish using their real names on Facebook in contrast to those who prefer a fake name (see Table 7)? In all, such differences are not very great, but we can observe significant differences concerning creating (0.76 vs. 1.71), representing (1.47 vs. 0.77), and providing for laws and ethics (1.63 vs. 1.25). Users with fake names pay only minor attention to privacy (level "illiterate") and to laws and ethics, but exhibit high scores in creating information. Covered by their fake name, they obviously feel free to publish "creative" content.

 Table 7: Real Names Versus Fake Names.

Question: How Do You Indicate Your User Name on Facebook? Real Name: N = 427, Fake Name: N = 91.

Building Blocks	Real Name – Mean (SD)	Fake Name – Mean (SD)	Significant?
Recognition	1.17 (0.46)	1.16 (0.51)	ns
Searching	1.01 (0.78)	0.98 (0.75)	ns
Evaluation	1.25 (0.56)	1.19 (0.54)	*
Making Use	0.82 (0.80)	0.79 (0.82)	ns
Creation	0.76 (0.79)	1.71 (1.00)	***
Representation	1.47 (0.76)	0.77 (0.69)	**
Privacy	1.47(0.65)	0.72 (0.74)	**
Law/Ethics	1.63 (0.79)	1.25 (0.91)	***
Over All Building Blocks	1.01 (0.69)	1.07 (0.74)	*

#### Table 8: Considering Copyright.

Question: Do You Know That You Must Specify the Source When You Post Foreign Content on Facebook? Copyright Considered: N = 494, Copyright Not Considered: N = 248.

Building Blocks	Copyright considered – Mean (SD)	Copyright not considered – Mean (SD)	Significant?
Recognition	2.15 (0.78)	1.81 (0.88)	ns
Searching	2.45 (0.56)	1.28 (0.71)	***
Evaluation	1.89 (0.77)	1.31 (0.78)	***
Making Use	2.45 (0.99)	2.62 (0.96)	**
Creation	1.76 (0.57)	2.01 (0.76)	**
Representation	1.21 (0.85)	2.34 (0.96)	***
Privacy	2.56 (1.10)	2.51 (1.01)	ns
Law/Ethics	2.85 (1.01)	1.93 (0.99)	***
Over All Building Blocks	2.17 (0.82)	1.97 (0.88)	**

Do users respect the copyright of someone else's content? The difference is very high between Facebook users who know they must specify the sources (mean: 2.17) and users who do not know it (mean: 1.97) (see Table 8). There are significant differences for nearly all building blocks. According to users' self-perceptions, it is obvious that both users who answered with "yes, I consider the copyright" and users who do not consider copyright can be categorized at the "problem solver" level. Users who consider copyright estimate themselves in searching (2.45 vs. 1.28), evaluating (1.89 vs. 1.31), and laws/ethics to be more information literate than users who do not consider it. In contrast, users who do not consider copyright estimate their information literacy to be remarkably higher in creating (1.76 vs. 2.01) and representing (1.21 vs. 2.34) information. Does this finding mean members of the latter group feel free to "create" and represent both their and other users' content on their timelines?

The next information behavior is concerned with Facebook users' privacy settings. We only compared "public" and "custom" settings (see Table 9). Are there differences between users who publish their information as "public" and users who customize their settings? Does either choice have any effect on users' information literacy? The difference observed in favor of public settings (2.18 vs. 1.77) over all building blocks is significant. More than half of the building blocks exhibit statistically significant differences. The differences in recognizing (2.49 vs. 1.79), searching (2.98 vs. 1.07), and evaluating (2.12 vs. 1.91) are high or even very high. We found it particularly notable there are high values and significant differences in providing for privacy (2.97 vs. 2.45). Users with public privacy settings are obviously well aware of this "publicity" of all their content (their privacy is at the "expert" level). Additionally, such users are the better searchers (recognizing and searching are on the "expert" level as well).

Building Blocks	Public – Mean (SD)	Custom – Mean (SD)	Significant?
Recognition	2.49 (0.96)	1.79 (0.99)	***
Searching	2.98 (0.63)	1.07 (0.70)	***
Evaluation	2.12 (0.77)	1.91 (0.86)	**
Making Use	1.66 (0.88)	1.77 (0.91)	ns
Creation	1.11 (0.57)	1.16 (1.00)	ns

**Table 9:** Privacy Settings on "Public" or "Custom."

Question: Do You Set Your Data on Facebook on Public or Custom? Public: N = 122, Custom: N = 323.

Building Blocks	Public – Mean (SD)	Custom – Mean (SD)	Significant?
Representation	1.44 (0.51)	1.52 (0.67)	ns
Privacy	2.97 (0.89)	2.45 (0.75)	***
Provision	2.67 (1.11)	2.53 (1.04)	ns
Over All Building Blocks	2.18 (0.82)	1.77 (0.86)	**

Tab. 9 (continued)

Why do users join Facebook groups? Do "cool" users have a different state of information literacy than those who are not (see Table 10)? Over all building blocks, we observed a statistically significant difference (1.71 vs. 2.03) in favor of the "other reasons" group. Users who answered our question with "I join Facebook groups because I feel cool" have lower values for all building blocks. Especially for creating information, they rated themselves as having too little information literacy (1.10 in contrast to 2.16). There are also some interesting findings on providing for privacy – with a significant difference, users with a specific purpose scored well (2.45). Users who answered "I join Facebook Groups because I feel cool" (1.89) do not observe as much privacy. Facebook users who set out to accomplish a specific purpose estimated themselves to be more information literate than users who are in groups just for fun and because they "feel cool."

Table 10: Motivation for Joining Groups.

Response to the statement: *I Join in Facebook Groups Because I Feel Cool*, "Cool:" N = 151, Other Reasons: N = 527.

Building Blocks	"Cool" – Mean (SD)	Other Reasons – Mean (SD)	Significant?
Recognition	1.69 (0.95)	1.89 (0.98)	**
Searching	1.92 (0.75)	2.07 (0.71)	*
Evaluation	2.02 (0.76)	2.41 (0.86)	***
Making Use	1.61 (0.98)	1.77 (1.01)	ns
Creation	1.10 (0.97)	2.16 (1.01)	***
Representation	1.48 (0.81)	1.52 (0.87)	ns
Privacy	1.89 (0.72)	2.45 (0.65)	***

Building Blocks	"Cool" – Mean (SD)	Other Reasons – Mean (SD)	Significant?
Law/Ethics	2.01 (1.01)	2.03 (1.04)	ns
Over All Building Blocks	1.71 (0.89)	2.03 (0.89)	**

#### Tab. 10 (continued)

## Conclusion

Our survey demonstrated Facebook users are simultaneously looking for and publishing information on the SNS. In order to search for and publish information efficiently and effectively, prosumers need to possess two kinds of literacy skills: information retrieval and knowledge representation. The purpose of this chapter was to present our findings on Facebook users' self-perceptions concerning their abilities and behaviors relevant to information literacy. We defined a research model of information literacy with eight building blocks and four literacy levels ("illiterate," "novice," "problem solver," and "expert"). We outline our main results below:

- On average, our participants estimate their information literacy competency (on a scale from 0 to 3) at a level of medium high (1.71). We found rather good scores in providing for laws and ethics, privacy, and evaluating information. We found very low scores for competencies in creating and representing information as well as for recognizing information needs, searching, and making use of information.
- Men estimate their information literacy capabilities to be higher than women do.
- General Facebook use fosters information literacy more than using Facebook groups does. Facebook group users fail to make use of information.
- On average, Facebook users are at the "problem solver" level (59.0%), with a further distribution of 69.0% for men and 54.0% for women.
- Users' general information behavior strongly influences their information literacy levels on Facebook.
- Library users scores are higher than those of users who rely only on Facebook's content for confirming information. Nevertheless, this group rates itself at the "expert" level concerning privacy as well as laws and ethics.

 Users who (a) check content on Facebook, (b) have knowledge about privacy settings, (c) respect copyright, (d) set their privacy setting to "public," and (e) join groups with a specific purpose are more information literate than others who choose differently.

Our study confirms the analyses of Witek and Grettano (2012; 2014) who theorized that Facebook offers many helpful functions in relation to fostering information literacy. In using Facebook, people can find numerous simple ways for handling information. According to our findings, participants apply these Facebook functionalities in very different ways and from different levels of information literacy.

This study has some limitations. An online survey is only a first step into this research area. Further methods, such as qualitative interviews with Facebook users would deepen our knowledge concerning information literacy. Additionally, our study only refers to participants' self-assessments and not to any actual assessed information literacy competencies. Here, the application of an information literacy test (e.g., Beutelspacher, 2014) would be very useful. Future studies should separate participants according to educational levels as well as – which may be even more important – user groups (e.g., age cohorts), cultures, countries, and so forth.

To our knowledge, this endeavor is the first empirical study of Facebook users pertaining to information literacy. Our results are only descriptive. We lack any theory and any explanation as to why Facebook users handle information so differently. Why do men estimate their information literacy level to be higher than women do? Why do people act in a more information literate way, when pursuing general Facebook use than they do in Facebook groups? How does users' information behavior (e.g., library use or their consideration of copyright) influence their information literacy? We must leave these questions unanswered, but believe much room for further study exists.

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