

# A Unified Framework of Information Needs and Perceived Barriers in Interactive Video Retrieval

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## ABSTRACT

Information needs of users have been examined both generally and as they pertain to particular types and formats of information. Barriers to information have also been investigated, including those which are situational and also across certain domains and socioeconomic contexts. Unified studies concerning both information needs and barriers are needed. Both are likely always present in any given interactive search situation; further, users' attempts to satisfy their own individualized information needs will likely encounter barriers of some sort. The present study employed a survey method to collect users' perceptions of video information needs and barriers as part of recent video search situations. Findings from this analysis establish a unified framework, based on the themes emerging directly from the responses of users, and present the suitability and benefit for informing future designs and evaluations of user-centered interactive retrieval tools.

**Keywords:** Interactive video retrieval, information needs, information barriers

## 1. INTRODUCTION

Gaps in knowledge form the basis of information needs, which then motivate and stimulate information seeking and retrieval (Belkin, Oddy, & Brooks, 1982).

Research about information needs dates back, well before the digital era. Further, information needs have been thoroughly examined across many different contexts and life situations (Case, 2012). Examining these needs has provided knowledge about end-users and

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uses of information, even ultimately helping conceive designs of early information storage and retrieval tools, such as the library catalog, based on how people look for information to satisfy such needs (Wilson, 1994).

In more recent times, information needs that correspond to specific types or formats of digital information have also been examined. Image research, in particular, has been quite active in studying the information needs across different visually-oriented domains, which, in turn, has provided generalizations of basic need types (Choi & Rasmussen, 2003; Hastings, 1995; Jörgensen, 1996; Fidel, 1997). Jörgensen (1996) is one example that described types or categories of image needs. The image needs emerging from Jörgensen's study demonstrated that image criteria can be directly recognized by users, i.e. "perceptual" and/or individually deciphered, i.e. "interpretive." Image content itself has also been generally depicted to exist along the "object pole" and/or the "data pole" based on tasks that involve the use of images (Fidel, 1997). Information needs whether as a concept or concrete sets of categories have not only been argued and defined, but also tested in terms of their influence within interactive retrieval situations (Fidel, 1997; Garber & Grunes, 1992; Jörgensen & Jörgensen, 2005).

Information barriers, on the other hand, have also been examined from different perspectives. Information access (or lack thereof) throughout various domains and contexts, including health and education, has revealed some significant existing barriers and their impact (Barta, 1995; McKenzie, 2003). Factors associated with information literacy are also seen as contributors to information barriers based on suitability of provided content for given audiences. Barriers have also been shown to derive from disparities in technological access, such as across socioeconomic and/or groups with varying levels of skills and abilities (Hilbert, 2014; Albertson & Whitaker, 2011). However, even users with both the means and abilities to access and use information effectively may still face difficulties from individualized obstacles that are present as part of their own everyday information seeking and retrieval situations (McKenzie, 2003).

Interactive video retrieval, as an area of research, examines the seeking, discovery, assessment, selection, and use of video information for satisfying information needs of users. The makeup and structures of video as a multi-channeled time-based format make it unique;

such characteristics can present additional criteria and/or considerations for users with video needs (Albertson & Ju, 2015). In turn, interactive searches for video may present certain limitations related to the information needed and the retrieval system(s) used (e.g. navigating to a time-point within a particular video), prompting additional effort by the user (Albertson & Meadows III, 2011). The potentially distinct aspects among both the needs and barriers for video information within an interactive retrieval context motivate the current study. Moreover, needs and barriers have not been framed together, regardless of context, which, considering their interrelated nature, is needed. Few information needs are satisfied automatically, without complication. Therefore, if researchers strive to understand information needs, it is also important to reveal common barriers in order to provide more holistic knowledge of the interactive video retrieval experience.

## 2. STUDY OBJECTIVES AND RESEARCH QUESTIONS

Despite the interrelated existence and tensions between information needs and barriers, they are rarely examined in conjunction with one another. Also, generally speaking, there has yet to be a sufficient examination of either within the context of video retrieval, specifically – even separately. Findings from a unified exploration of both information needs and barriers in video search can provide positive implications for future research. The potential is demonstrated by the results of prior studies – across other contexts like image retrieval – contributing practical applications for retrieval tools like digital libraries (e.g. visual arts digital libraries).

The overarching objective of the present study is to examine information needs and perceived barriers of users (for fulfilling their needs) within a video search context. Progress of the current study will provide generalizable understanding of the characteristics of both needs and barriers in video search, and thus help develop a unified framework with the capability to represent each with unique and measurable examples from users. Further, the current study aims to further assess the significance of any emerging generalized quality or category of needs and barriers in order to also provide

a prioritization which can enable more precise or granular application for future work. Having information needs and barriers generalized and prioritized together can support future research by providing expanded yet contrasting understanding of each within a video search context. Definitions of the concepts operationalized and applied as variables for the purposes of the current study include:

*Need:* the video information users require in order to fill gaps in current knowledge and/or to facilitate the completion of tasks necessitating video information.

*Barrier:* a challenge or difficulty users experience when attempting to satisfy information needs either before, during, or after formal action in a video search process.

The need for understanding of these factors within a video search context motivates an exploration of the corresponding research questions:

- *RQ1a.* At what level do users perceive themselves as knowing or understanding the video information they need as they initiate a search for video?
- *RQ1b.* What are the primary or generalizable video information needs of users in a typical video search?
- *RQ2a.* At what level do users perceive themselves as facing or experiencing barriers in a search for video?
- *RQ2b.* What are the perceived primary or generalizable barriers of users attempting to fulfill video information needs in a typical search?
- *RQ3.* How are the generalized categories of both video information needs and barriers in a video search prioritized, based on number of occurrences?

These research questions provide the means for achieving the overarching goal of the current study. The resulting analysis will provide the impetus to conceive a framework that can generalize information needs and barriers in video search situations, together, yet also enable a comparison of the prioritization of the qualities of each from a user-centered perspective. Video, a time-based resource with a combination of structural and physical components, can present its own unique aspects about what is both needed and actually experienced in search situations.

### 3. LITERATURE REVIEW

As discussed above, different types of information needs and barriers have been examined, identified, and described over the years, including across diverse contexts. Conceptual and even theoretical research, as reviewed here, which inform and provide implications for investigations of information needs and barriers are also pertinent to the current study.

#### 3.1. Information Needs

Information needs have been deliberated from many different perspectives, even as they pertain to the psychological and physiological states of humans. Taylor (1968), in a first of its kind study, examined queries expressed by users to the reference desks of libraries in order to frame needs according to different cognitive stages. These stages were discovered to include visceral, conscious, formalized, and compromised information needs. Such research on information needs sparked new investigations into information seeking and retrieval (Belkin et al., 1982; Kauthau, 1988). Further research into information needs and behavior continued, providing significant understanding of the different types and criteria of information needs including as part of image-based tasks and visually-oriented domains.

Within information seeking, need formulation is a common (and expected) phase of the larger process. Even further, the realization of everyday goals, not limited to information seeking, has been described in behavioral models that generalize daily tasks and courses of action taken by humans (Norman, 1990). The development stages of everyday goals are many times viewed as a parallel (or corresponding) function to the formulation of information needs within an information seeking process.

Conniss, Ashford, and Graham (2000) demonstrated that need formulation is present in the starting stage of the image seeking process. Here, it was discovered that needs require individualized defining by users who set boundaries and levels of flexibility around need criteria. The formulation of visual needs by users, in particular, can be a rapid process or can take time to resolve, depending on level of complexity, importance, abstraction, and the need for feedback. Garber and Grunes (1992) qualitatively assessed visual need development

in an advertising context and found that image needs originated mostly from the development of a larger initial artistic concept. The formulation and defining of visual needs has been shown to not be isolated to the initial stages; users' criteria have also been shown to develop as a search continues (Garber & Grunes, 1992). Furthermore, a visual need becomes further specified in the visual information seeking process and may even result in a search for a known image. This prior research is significant to the current study by establishing a process of need development and the continuous shaping of visual needs within the cognitive processes of users which has relevance to understanding a search for video information.

Further, information needs ultimately motivate and thus bridge to a course of action taken by users in an attempt to fill gaps in knowledge and/or reduce uncertainty. Users have been shown to act upon their realized needs by targeting and selecting resources that demonstrate potential to facilitate fulfillment. As part of this course of action, users must express their needs through the constraints of a system that they target for use. Feedback from this process, as depicted in information seeking models, serves as the basis for assessing need fulfillment and for potentially reformulating information needs and seeking strategies (Kulthau, 1988). Research shows that needs are influential to the progress, processes, and outcomes throughout the full information seeking process.

### 3.2. Barriers to Information Needs

The presence of barriers within information seeking or search can form a significant factor and set of consequences for users. Further, barriers can influence selection, use, and acceptance of technology based on users' perceived difficulties for using technology in order to successfully facilitate the completion of tasks. Girard (2014), in a review of existing research, categorized, tallied, and tabulated the approaches and methods as previously employed for examining information barriers within an e-book use context. Notably, barrier types were generalized for the purposes of examination and discussion, and shown to include the categories of cognitive, social, and physical barriers (Girard, 2014). These categories inform the basis and structure for reviewing literature pertinent to the current study.

With regard to cognitive or psychological barriers,

user confidence is one of many factors which can develop into or influence existing barriers. For example, user confidence is many times operationalized as perceived self-efficacy, based on the work of Bandura (1994), which takes into account how people (users in this case) view themselves and their chances in performing a given task at hand. Research has shown that as confidence and perceived self-efficacy decrease, so does the likelihood of selecting approaches or putting forth the needed effort in order to complete tasks (Billings & Macvarish, 2010). Of relevance to the current study is that perceived self-efficacy can be seen as a stimulus for barriers in the cognitive or psychological states of users in an information seeking or search situation.

As adopted in human computer interaction (HCI) studies, the gulfs of execution and evaluation from Norman (1990) also provide a psychological perspective and explanation to certain barriers as a result of internal obstacles or challenges that can ultimately impede progress toward the successful attainment of overarching goals. The gulf of execution presents challenges, as in the example of a search task, when attempting to apply or express information needs through the constraints of the user interface of a system. Further, to bridge the gulf of execution, users must successfully translate their internal needs and cognitive manifestations of the need into concrete expressions and action. The gulf of evaluation denotes the difficulties in employing feedback for determining success or goal attainment. The challenges pertinent to the gulf of evaluation arise during the process of assessment or evaluation by users.

Social influences on barriers have also been studied and are considered relevant for the current study. For example, social and subjective norms have been examined as they relate to and influence perceptions and ultimate action, including with regards to the use of technology (Ajzen, 1991; Pynoo et al., 2011). Users' decisions to pursue a given task at hand with a particular tool or resource can be influenced by what others think and believe, particularly those who the users see as important to them (Lee & Kim, 2009; Pynoo et al., 2011). As a result, low regards from social groups or inner circles can construct the basis for inaction and thus barriers based on the social influences surrounding the user.

Physical barriers, in a technology use context, have

been described to pertain to computing hardware that does not successfully accommodate expectations, use, and ultimate fulfillment of information needs of users. Examples of physical barriers can also include limitations for actually possessing the technology as needed in a physical setting and other capabilities as expected by users for enhancing the process to acquire information (Girard, 2014).

As evident, there are many extensions of research that have examined barriers of some sort, spanning studies that are more conceptual up through direct issues related to information access. Further, barriers arising from the internal or cognitive processes of users along with social influences are significant to consider for the research of the current study.

## 4. METHODOLOGY

A survey method was employed to explore the research questions of the current study; an online survey was designed, distributed, and collected. Data collection was open for approximately two months. At the end of the data collection period, a total of 215 participants contributed full valid surveys. Participants were recruited through a subject pool as coordinated by a research institute at a large university. As a result, undergraduate students comprised the overwhelming majority of the sample, which is considered an acceptable limitation of available sampling in social science research. Further, considering the current study is the first of such to examine users' perceived needs and barriers in a video search context, data collection and analysis were not confined to a particular domain; with a more general scope to the current study, recruitment of participants was open to available sampling.

### 4.1. Demographics of Participants

The use of a subject pool at a university as the primary recruitment approach meant that a vast majority of participants fell between the ages of 18-20 (92%), with lower rates observed for the 21-22 (7%) and 23-29 (1%) age groups. Participants were also asked to self-identify their level of experience with video searching, i.e. how often or how regularly they search for video online. Participants rated their level of video search experience on a scale of 1-5, with 5 representing "all the time" and

1 "never." Video search experience among the sample was, on average, high, with a mean of 4.08, a SD of 0.82, and a range of 3; no respondents identified as a 1 ("never search for video"). Demographic data were used to ensure that participants and the overall sample possessed a suitable level of video search experience for participation in the study.

### 4.2. Data Collection

The survey was broken up, logically, into two parts. One part presented questions pertinent to information needs, and the other collected data about perceived barriers of users, both framed from the perspective of video searching. Both parts on the survey included one closed, i.e. scaled, and one open-ended question. The basic approach to the survey, overall, particularly the open-ended questions, was to collect data from participants by having them reflect on recent experiences with searching video, not before or after any formal action or part of any interactive experimentation.

First, for one of the scaled questions on the survey, participants were asked to rate the extent that they believe they know or understand the video information needed when initiating a search. This question was followed up with an open-ended question asking participants to provide up to five examples of video information needs they could recall from recent searches. This same question sequence was then used for collecting data about perceived barriers; further, participants first rated their level of agreement with a statement that they (as users) feel they encounter barriers when searching for video, followed by a request for up to five open-ended examples of barriers when searching for video.

### 4.3. Data Analysis

Responses on the closed-ended questions were analyzed quantitatively. Descriptive statistics were computed for both scaled questions, and a correlation test measured the level of association between the two variables – i.e. participants' rated levels of 1) knowing their video needs and 2) feeling of encountering barriers in a video search.

Responses to the open-ended questions were first examined independently by the primary researcher of the study in order to begin defining a preliminary set of themes or categories of both video information needs and barriers. Content analysis was then conducted on

all individual responses using this set of categories. The content analysis process involved two separate researchers (i.e. coders), with no further involvement on the study, who worked independently through the sets of participants' responses. Both coders coded every response provided for both open-ended questions; therefore, every video need and perceived barrier statement freely provided by participants on the survey was ultimately coded twice (once by each coder). In sum, a total of 775 open-ended video need statements and 638 perceived barriers were coded with what the coders saw as the most appropriate of the three categories or "not applicable." This analysis would be used to assess the suitability of the proposed categories for framing users' needs and barriers.

In the end, a total number of 23 openly expressed video needs from participants had to be removed from the response set, as they were not relevant to the study, resulting in a total number of 752 ultimately coded needs. Forty-one non-applicable barrier statements also had to be excluded, bringing the number of categorized barriers to 597.

Following, the codes from each coder were compared. Consistency among all assigned codes was quantified using inter-rater agreement rate and Cohen's Kappa. This analysis enabled formal assessment of the emerging categories in terms of their potential for framing needs and barriers in video search. Results here were used to support (i.e. validate) the categories and their respective boundaries according to the direct responses from participants.

After the levels of similarity and agreement-rates were calculated, all individual disagreements were resolved by the primary researcher of the study, who ultimately served as a third (and "tie breaking") vote, only when needed, to decide the final code. Thus, a final category code was assigned to all applicable open-ended responses from the participants for both need and barrier statements.

The final assigned code to each response was then used to tabulate frequencies or number of occurrences for each of the primary categories. The frequency level for each category was based on the number of times each was provided by participants in their responses (and coded as such). This analysis enabled both simple and weighted frequencies and the ranking or prioritization of the individual categories in terms of their signif-

icance for video information needs and barriers. Simple frequency provides the number of times for each categorical occurrence (i.e. concept) across the overall set of responses; weighted frequency is calculated using the occurrence of each concept in relation to the total number of an individual participant's responses (up to five) on the survey. Further, simple frequencies provide the overall tally, while weighted frequency enables a more precise measurement of frequencies based on equality. Findings using these methods aim to provide a richer understanding of the application of the emerging framework in terms of not only generalizing video needs and perceived barriers together, but also depicting the significance of the different categories, separately. Finally, a percentage of occurrence for each category was computed, presenting an overall rate according to the full response set of both needs and barriers.

## 5. RESULTS

Data analysis of the current study provided a variety of insightful and important findings. Results from both the scaled survey questions and the quantification of the open-ended data, using content analysis, are presented here. Results address the research questions of the present study.

### 5.1. Perceived Levels of Knowing Video Needs and Experiencing Barriers

As described above, participants rated their level of agreement ("5" representing strong agreement, and "1" strong disagreement) with the two separate statements on the survey that captured the essence that when searching for video they (as users): 1) know or understand the video they need when initiating a search, and 2) feel that they encounter barriers when searching for the digital video they need. A mean score of 4.12 out of 5.0, with a SD of 0.55 and a range of 3, was produced with regards to participants believing they know their video needs as they begin a search. On the other hand, participants perceived themselves as encountering barriers during a search for video at a mean of 3.08, with a SD of 0.89 and a range of 4. A correlation test between participants knowing their needs and perceiving they encounter barriers produced a coefficient of  $r(212)=0.324$   $p=.068$ , statistically insignificant.

### 5.2. An Emerging Framework

Three categories were formulated based on themes emerging from the open-ended responses of participants. These categories were used to construct and test a framework capable of generalizing both video needs and perceived barriers of users together. The framework comprised the categories of *distinctive*, *evaluative*, and *associative* in order to apply for both needs and barriers in a video search context. The definition for each includes:

- *Distinctive*: Qualities of video derived directly from content by users
- *Evaluative*: Qualities of video requiring individualized assessment by users
- *Associative*: Situational or contextual factors corresponding to access and use

Specific examples of both needs and barriers for each of these categories, as taken directly from the responses of participants, are presented in Table 1. Table 1 provides examples in order to further define each category and depict their respective boundaries.

These three categories (Table 1) were employed as the coding scheme for the content analysis component of the current study. The inter-rater agreement rate across the 752 applicable coded open-ended video needs from participants was .798, with Cohen’s Kappa = .652 ( $p < 0.001$ ). The 597 barrier responses from participants were categorized at a rate of agreement of .861 and a Kappa = .746 ( $p < 0.001$ ). These results provide a moderate to high level of significant agreement, providing confidence in the categories of the framework.

**Table 1.** Video Needs and Barriers of Participants

	Need	Barrier
Distinctive	<ul style="list-style-type: none"> <li>• Specific series or program</li> <li>• Known or existing things (“puppies,” “kittens,” “Taylor Swift”)</li> <li>• Genre or video type (e.g. “dance videos,” “music videos,” “how-to videos,” “sports clips,” “speeches”)</li> <li>• Date (e.g. “new videos”)</li> </ul>	<ul style="list-style-type: none"> <li>• Advertisements</li> <li>• Accessibility (e.g. “login,” “not available in area or country,” age)</li> <li>• Obvious unsupportive duration</li> <li>• Date (e.g. “old” information)</li> <li>• Language</li> <li>• Video access (i.e. “removed”)</li> </ul>
Evaluative	<ul style="list-style-type: none"> <li>• Exploratory topics</li> <li>• Application suitability (e.g. “educational,” “helpful,” show to demonstrate “media bias”)</li> <li>• Personal value (e.g. “funny,” “entertaining,” “interesting”)</li> <li>• Abstract (“conspiracy”)</li> </ul>	<ul style="list-style-type: none"> <li>• Bias content (e.g. “produced by a proprietary company”)</li> <li>• Irrelevant videos after assessment</li> <li>• Inaccurate video representation (e.g. “visual does not match content”)</li> </ul>
Associative	<ul style="list-style-type: none"> <li>• Desired quality for device or situational use (e.g. “high,” “mobile”)</li> <li>• Current “hype” or social interest (e.g. “trending” or “viral video”)</li> </ul>	<ul style="list-style-type: none"> <li>• Technological (e.g. “internet connection,” “hardware,” “video plugin”)</li> <li>• Search difficulties (e.g. ineffective retrieval, interface)</li> <li>• Not recalling known item</li> <li>• Not currently popular</li> <li>• Lack of help for using video</li> </ul>

### 5.3. Prioritization of Video Information Needs and Barrier Categories

Once the open-ended responses from participants were coded, regular and weighted frequencies of the different categories were calculated. A percentage level for each category, i.e. its rate of occurrence among the overall response set, was also calculated. Results from these analyses provide a priority level for each category of the framework, including for both video needs and perceived barriers.

Table 2 and Table 3 present the categories of the framework along with these different measures for ranking their levels of occurrence, thus enabling a prioritization of the categories of information needs and barriers existing in a video search. These results provide a number of observations, including demonstrated variations between the information needs of users in relation to their perceived barriers in video search; implications of these findings for future work and research will be further described below.

## 6. DISCUSSION AND IMPLICATIONS

### 6.1. Discussion of the Results

Results, as presented, demonstrate a number of positive implications for video retrieval research with several immediate insights for user studies of information needs and perceived barriers. A major contribution of the current study is the user-centered categorical framework of generalized video information needs and perceived barriers, together, accompanied with applicable examples of each (Table 1). The framework included *distinctive*, *evaluative*, and *associative* categories of video needs and barriers, which emerged from the responses of study participants.

Evaluation of the video information need statements, as they correspond to the framework, demonstrated significant levels of agreement and coding consistency from the independent coders. Further, participants of the study provided a total of 752 valid video need statements and, in turn, rated their perceived level of knowing or understanding their video needs (when a search is initiated) at a mean of 4.12 out of 5.0. The most common types of video needs were distinctive in nature, i.e. information that users needed or sought to attain directly from the video content itself. These needs were followed by evaluative and associative needs, respectively, according to frequency among responses.

In regard to the perceived barriers in video search, the

**Table 2.** Frequencies, Percentages of Occurrence, and Weighted Frequencies of Need Categories

	Frequency	Percentage of Responses	Weighted Frequency
Distinctive	534	71	144.7
Evaluative	179	23.8	50.2
Associative	39	5.2	11.2

**Table 3.** Frequencies, Percentages of Occurrence, and Weighted Frequencies of Barrier Categories

	Frequency	Percentage of Responses	Weighted Frequency
Distinctive	176	29.5	56.6
Evaluative	96	16.1	31.8
Associative	325	54.4	109.2



emerging framework was, again, assessed for its ability to depict and categorize them. Content analysis of the video barrier statements of study participants produced similar rates of agreement and levels of significance to those of the video need statements. Further, 597 perceived barriers were provided from participants, suggesting a general awareness of hindrances or difficulties in video search, based on users' ability to identify and articulate them. This finding lends support to formulating a framework of barriers as well within video search, along with video needs. The priorities for different types of barriers in video search were also assessed, showing a different order of frequencies among the categories, as compared to video needs. Further, the order of priority of barriers included associative, distinctive, and then evaluative.

Next, while participants of the current study identified themselves as having a clear idea of their video needs when initiating a search, results showed that when they decide to seek video there is a lower expectation that barriers will be encountered during the search process. The results of a correlation test between these two scaled variables, i.e. 1) level of understanding about video information needs and 2) rated perceptions that barriers will be encountered, yielded an insignificant coefficient. The variation among these perceptions of users does not detract from the value of a framework, but rather lends support to prior research (and vice versa) of existing knowledge and search topic familiarity. Prior research has shown a positive influence of topic familiarity on search performance and satisfaction (Albertson, 2010), potentially suggesting, in turn, lower levels of perceived barriers when video needs are better known by users. While a significant negative correlation was not achieved in the current study, results do indicate that users who are capable of identifying barriers of a typical video search feel less hindered or obstructed than their perceived level of knowing their information needs. This finding suggested that their perception of existing barriers could have been lessened as a result of feeling that they know their video needs and that other barriers derive from factors not directly related to the video need. This is evident from the categories and examples of the emerging framework.

## 6.2. Implications of Video Information Needs

The framework emerging from the set of current findings provides positive implications to support fur-

ther development in this area. Further, findings can provide insights for designing video search tools centered on the needs of users. Understanding video information needs may also help counterbalance against the barriers as perceived by users, as reflected in the unified framework, when designing video search tools.

Future potential of having a framework of video needs can be highlighted by the applied findings from similar studies in other contexts. Prior studies have contributed understanding of information needs and, in turn, informed recommendations or implications for enhancing retrieval. Image research, in particular, has framed user-centered designs of information storage and retrieval components around the needs of users, such as specialized record structures or bibliographic access points, retrieval functions, and interface features (Hastings, 1995; Choi & Rasmussen, 2003; McDonald & Tait, 2003). Results of the current study can serve as a basis for similarly supporting video search through new understandings of users and their needs, perceptions, and experiences.

A framework of video information needs can also benefit information retrieval experimentation by supporting the creation of realistic (i.e. valid) sets of information need statements, such as sample video search topics. Realistic information need statements are necessary for targeted and ecologically-valid retrieval systems evaluation (Christel, 2007). Sets of information need statements, i.e. test search topics, have also been carefully designed and assembled for the purposes of standardized video retrieval evaluations, including search task experiments of the Text REtrieval Conference's Video Retrieval Evaluation (Search: TRECVID 2009 Guidelines, 2009) and other venues. Video search topics can comprise attributes uniquely applicable to video separately, as an information resource, such as needs that require aspects of motion. Previous studies conducted subsequently to formal participation in standardized evaluations – like TRECVID – have extended the use of the common test dataset(s) and video search topics for examining interactivity (of system and users), search tactics, and user behavior (Wilkins et al., 2009; Yang, Wildemuth, & Marchionini, 2004). These considerations demonstrate the significance for studies on video needs separately, or in addition to image and textual research. Yet, despite the fact that standardized video retrieval evaluations are routinely conducted,

video needs themselves have not been systematically tested, described, and/or categorized. Having such a framework can serve as a basis for supporting future video retrieval evaluations, demonstrating another positive implication for having a framework.

### 6.3. Implications of Perceived Barriers

Understanding the perceived barriers of users with video information needs can also provide immediate insights for continued research and development in this area. First, more generally, the current study provides a unified categorization of general needs and barriers together in one emerging framework, which is significant as interactive search processes will inevitably comprise both (needs and barriers). Further, as part of the design process, after identifying the target audience, designers and researchers can consider the envisioned needs and tasks along with potential barriers of users; needs should not be considered necessarily without also taking into account other factors potentially influential to the successful fulfillment of those needs. Therefore, it is significant in its own right to frame needs and barriers for categorizing the “do’s” and “do not’s” as part of one supporting framework. Application of these findings can be similar to that of applying an understanding of needs for designing retrieval tools. Findings here provide an overall framework to consider throughout design, along with concrete examples which can be used to counterbalance or avoid hindrances in users’ experiences. Overall, the current study provides a fuller picture than preceding studies of needs and barriers in video search and thus enhances its potential to support the development of interactive tools like digital libraries.

Implications for having a better understanding of barriers in video search can also be informative for future studies that aim to investigate effects of difficulty and/or complexity in interactive retrieval. Studies of complexity and difficulty particularly as part of search tasks and topics have been quite active over time (Kelly et al., 2015; Wildemuth, Freund, & Toms, 2014; Bystrom & Jarvelin, 1995). Findings here provide further evidence of the barriers as perceived by actual users in video search situations, which can be indicative or associated with factors related to difficulty. For example, situations that involve perceived barriers can be considered in subsequent studies and serve as a basis for examining user response in the face of common difficulties. Future

research can also expand understanding about users’ intentions to adopt and sustain use of video retrieval tools in relation to different types of barriers including as they correspond to video information needs and overarching tasks.

### 6.4. Implications of Prioritizing Video Information Needs and Barriers

The prioritization of needs and barriers, based on frequency, weighted frequency, and percentages, among the responses of participants, contributes additional specificity in the findings in the current study. Priorities of needs and barriers are viewed as added value to the emerging framework, enabling more informed and precise application of the findings. Drawing upon this prioritization from users, video retrieval tools, again, can ensure availability and heightened emphasis of those prioritized features that support access and enhance usability. Results of the current study provide the basis for both having a categorical framework to define such conscious video needs and barriers of users and the ability to confidently and accurately apply such findings in future research

## 7. CONCLUSIONS

The level of analysis provided at this stage of research is informative; for example, information needs specific to video search and retrieval have yet to be analyzed and formally described. In addition, barriers and information needs are many times described separately across separate distinct studies, with no explicit connection made between the two, which is significant as they will both be undoubtedly present in an interactive search situation. The findings provided here address the research questions of the current study and, in turn, provide descriptions and prioritizations of the needs and barriers within a video search context. Findings, even at this stage, can improve designs of user-centered retrieval features and indexing approaches, and also support evaluations, such as interactive experiments, which involve users and sample search topics in retrieval situations to help conform to “ecological validity” (Christel, 2007).

There is opportunity for future analyses to expand upon these findings and further advance understand-

ing of users, information needs, and barriers in the interactive video retrieval experience. Information needs, as they are depicted in prior research, and barriers are complex and dynamic; they can evolve throughout an information seeking process and comprise multifaceted structures and characteristics. Yet, the current study was not longitudinal in nature; therefore, the needs and perceived barriers of participants were specific to a particular point in time and thus expressed prior to any formal search for video and/or subsequent learning. The potential to depict needs and barriers as they occur over the course of a full interactive situation remains.

Also, one key finding of the current study was the high frequency level for “how-to” video needs. Users’ criteria for these needs (and corresponding useful videos) may overlap with different categories or need types as provided in the included framework. Such a finding about video needs complements prior research in image retrieval tasks, which were discovered to comprise needs for visual and data objects, known as the data pole and object pole, as part of still images (Fidel, 1997). Considering this finding, it may be warranted to further flesh out further influences with regard to these particular types of video (i.e. “how to’s”) in distinct studies of users, needs, and barriers as part of expanded interactivity and feedback to users beyond initial query statements (Albertson, 2012).

Further, it will be important to continue to readdress the criteria, needs, and barriers in a video context as technology use and development changes. As one example, social media video has demonstrated the reemergence of the importance of the shot (e.g. up to 7 seconds) for use from much larger video sets. This type of situation can contain inherently different characteristics and influences of both information needs and barriers than more traditional contexts of video search, e.g. from a digital library and/or education purpose. A re-framing and contemplation of user factors involving needs and barriers as technology evolves will be significant.

## REFERENCES

- Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Albertson, D. (2010). Influences of users’ familiarity with visual search topics on interactive video digital libraries. *Journal of the American Society for Information Science and Technology*, 61(12), 2490-2502.
- Albertson, D. (2012). Examining feedback in interactive video retrieval. *Journal of Information Science*, 38(6), 501-511.
- Albertson, D., & Ju, B. (2015). Design criteria for video digital libraries: Categories of important features emerging from users’ responses. *Online Information Review*, 39(2), 214-228.
- Albertson, D. & Meadows III, C. (2011). Situated topic complexity in interactive video retrieval. *Journal of the American Society for Information Science and Technology*, 62(9), 1676-95.
- Albertson, D., & Whitaker, M. S. (2011). A service-learning framework to support an MLIS core curriculum. *Journal of Education for Library and Information Science*, 52(2), 152-163.
- Bandura, A. (1994). Self-efficacy. In V. S. Ramachandran (Ed.), *Encyclopedia of Human Behavior* (Vol. 4, pp. 71-81). New York: Academic Press.
- Barta, K. M. (1995). Information-seeking, research utilization, and barriers to research utilization of pediatric nurse educators. *Journal of Professional Nursing*, 11(1), 49-57.
- Belkin, N. J., Oddy, R. N., & Brooks, H. M. (1982). ASK for information retrieval: Part I. Background and theory. *Journal of Documentation*, 38(2), 61-71.
- Billings, J. R., & Macvarish, J. (2010, January). Self-Efficacy: Addressing behavioural attitudes towards risky behaviour - an international literature review. Retrieved from [https://kar.kent.ac.uk/26082/1/Self\\_Efficacy\\_Final\\_Report.pdf](https://kar.kent.ac.uk/26082/1/Self_Efficacy_Final_Report.pdf)
- Bystrom, K., & Jarvelin, K. (1995). Task complexity affects information seeking and use. *Information Processing and Management*, 31(2), 191-213.
- Case, D. O. (2012). Looking for information: A survey of research on information seeking, needs and behavior. Bingley, UK: Emerald Group Publishing.
- Choi, Y., & Rasmussen, E. M. (2003). Searching for images: The analysis of users’ queries for image retrieval in American history. *Journal of the American Society for Information Science and Technology*, 54(6), 498-511.
- Christel, M. G. (2007). Examining user interactions with video retrieval systems. In A. Hanjalic, R. Schettini, & N. Sebe (Eds.), *Proceedings of Interna-*

- tional Society for Optical Engineering Conference (SPIE), Vol. 6506, Multimedia Content Access: Algorithms and Systems.* Bellingham, WA: Society of Photo-Optical Instrumentation Engineers.
- Conniss, L. R., Ashford, A. J., & Graham, M. E. (2000). Information seeking behaviour in image retrieval: Visor I final report. Newcastle: University of Northumbria at Newcastle, Trading Services.
- Fidel, R. (1997). Image retrieval task: Implications for the design and evaluation of image databases. *The New Review of Hypermedia and Multimedia*, 3(1997), 181-199.
- Garber, S. R., & Grunes, M. B. (1992). The art of search: A study of art directors. In P. Bauersfeld, J. Bennett, & G. Lynch (Eds.), *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 157-163). New York: ACM Press.
- Girard, A. (2014). Reader's block: A systematic review of barriers to adoption, access and use in e-book user studies. *Information Research*, 19(2) paper 624. Retrieved from <http://InformationR.net/ir/19-2/paper624.html>
- Hastings, S. K. (1995). Query categories in a study of intellectual access to digitized art images. In T. Kinney (Ed.), *Proceedings of the 58th Annual Meeting of the American Society for Information Science* (pp. 3-8). Medford, NJ: Information Today.
- Jørgensen, C. (1996). Indexing images: Testing an image description template. In S. Hardin (Ed.), *Proceedings of the 59th Annual Meeting of the American Society for Information Science* (pp. 209-213). Medford, NJ: Information Today.
- Jørgensen, C., & Jørgensen, P. (2005). Image querying by image professionals. *Journal of the American Society for Information Science and Technology*, 56(12), 1346-1359.
- Hilbert, M. (2014). Technological information inequality as an incessantly moving target: The redistribution of information and communication capacities between 1986 and 2010. *Journal of the Association for Information Science and Technology*, 65(4), 821-835.
- Kelly, D., Arguello, J., Edwards, A., & Wu, W. C. (2015). Development and evaluation of search tasks for IIR experiments using a cognitive complexity framework. In J. Allan & B. Croft (Eds.), *Proceedings of the International Conference on the Theory of Information Retrieval* (pp. 101-110).
- Kuhlthau, C. C. (1988). Developing a model of the library search process: Cognitive and affective aspects. *Reference Quarterly*, 28, 232-242.
- Lee, S., & Kim, B. (2009). Factors affecting the usage of intranet: A confirmatory study. *Computers in Human Behavior*, 25, 191-201.
- McDonald, S., & Tait, J. (2003). Search strategies in content-based image retrieval. In *Proceedings of the 26th Annual International Conference on Research and Development in Information Retrieval* (pp. 80-87). New York: ACM Press.
- McKenzie, P. J. (2003). A model of information practices in accounts of everyday-life information seeking. *Journal of Documentation*, 59(1), 19-40.
- Norman, D. A. (1990). *The design of everyday things*. New York: Doubleday.
- Pynoo, B., Devolder, P., Tondeur, J., Braak, J., Duyck, W., & Duyck, P. (2011). Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behavior*, 27 (2011) 568-575.
- Search: TRECVID 2009 Guidelines. (2009). Retrieved May 24, 2016 from <http://www-nlpir.nist.gov/projects/tv2009/tv2009.html#4.3>
- Taylor, R. S. (1968). Question-negotiation and information seeking in libraries. *College and Research Libraries*, 29(3), 178-194.
- Wildemuth, B., Freund, L., & Toms, E. G. (2014). Untangling search task complexity and difficulty in the context of interactive information retrieval studies. *Journal of Documentation*, 70(6), 1118-1140.
- Wilkins, P., Troncy, R., Halvey, M., Byrne, D., Amin, A., Punitha, P., Smeaton, A. F., & Villa, R. (2009). User variance and its impact on video retrieval benchmarking. In *Proceedings of the ACM International Conference on Image and Video Retrieval*. New York: ACM Press.
- Wilson, T. D. (1994). Information needs and uses: Fifty years of progress. In B. C. Vickery (Ed.), *Fifty years of information progress: A Journal of Documentation Review* (pp. 15-51). London: Aslib.
- Yang, M., Wildemuth, B., & Marchionini, G. (2004). The relative effectiveness of concept-based versus content-based video retrieval. In *Proceedings of the Twelfth Annual ACM International Conference on Multimedia* (pp. 368-371). New York: ACM Press.