

AECT Handbook – Chapter 25  
Technologies for Information Access in Library and Information Centers  
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An Overview

Information access – a physical, psychological, social, cultural, and political issue involving cognitive, affective, and physical components moderated by cultural, sociological, and economic factors subject to the constraints of technology, science and education.

Article discusses

- research and methodological issues
- analysis of significant studies
- directions for future research

Chapter limitations – subject content, time frame, scope of literature reviewed . . . covers a 15-year time span beginning in 1980

Categories of Research in Information Access – **Users, Access, Information**

- 1 **Users** – different roles -- search intermediaries or end users
  - 1.1.1 users play a significant role in establishing and maintaining the problem situation
  - 1.1.2 beliefs, behaviors, needs – characteristics and variables important to informant access
  - 1.1.3 users initiate the information access process
  - 1.1.4 three areas of discussion – user studies, information seeking, information skills
    - 1.1 user studies address different types of user groups, needs of various people, general characteristics of users that may impact information need – earlier studies focused on identifiable groups and system-centered questions – current research looks at individuals and focuses on user-centered behavior and questions user research
      - 1.1.1 methodology is moving from sociological surveys toward qualitative techniques (case studies, ethnographic research, grounded theory)
      - 1.1.2 quantitative methods from communications theory and cognitive psychology are also being applied
      - 1.1.3 early research emphasis on user groups predominated the early research (Hewins, 1990) and still accounts for a large portion of research
        - 1.1.3.1 such research literature may be found in different content areas
        - 1.1.3.2 current foundations encompass communications theory, social psychology, and cognitive psychology
        - 1.1.3.3 reviews appear in the Annual Review of Information Science and Technology (ARIST) since 1966 – Dervin & Nilan (1986) review 8 years – 1978-1986 with 300 citations identify need for theory, need for better definitions and premises
        - 1.1.3.4 recognize four changes for users studies
          - 1.1.3.4.1 increase the match between information systems and users to serve the client better = greater accountability, fewer under served clients.
          - 1.1.3.4.2 focus on user needs and uses = user as a central issue for research not the system or the technology
          - 1.1.3.4.3 closer look at person-machine link
          - 1.1.3.4.4 technology of user access
    - 1.1.1.1 Dervin & Nilan (1986) identify need for improvement in systems study – current systems study looks at degree that user has actually used the system, satisfaction with attributes of the system, demographics, sociological components, life-style tasks – contrast of traditional and alternative approach

- 1.1.1.1.1 objective vs. subjective information
- 1.1.1.1.2 mechanistic, passive vs. constructivist, active users
- 1.1.1.1.3 trans-situationality vs. situationality
- 1.1.1.1.4 atomistic vs. wholistic views of experience
- 1.1.1.1.5 external behavior vs. internal cognitions
- 1.1.1.1.6 chaotic vs. systematic individuality
- 1.1.1.1.7 quantitative vs. qualitative
  
- 1.1.1.1 Hewin's (1990) review updates Dervin & Nilan – research has shifted from sociological to psychological [Dervin & Nilan proposed a change from traditional empirical studies to user studies providing rational frameworks and systematic bases for methods and definitions] exclude studies which are site, system, or service specific and do not contribute to method, theory or model building
- 1.1.1.1.1 three new approaches are emerging – user values, sense making, anomalous states of knowledge (ASK) – identifying user characteristics rather than measuring system performance
- 1.1.1.1.2 new cognitively based approaches include categorization techniques long- and short-term memory, learning styles, motivation, personality types, semantic factors
  
- 1.1.1.1 Verhoeven (1990) – reviews user surveys, the most common method of data collection in user studies but which have methodological and conceptual problems
- 1.1.1.1.1 incomparable results
- 1.1.1.1.2 lack of generalizability
- 1.1.1.1.3 confounding methods
- 1.1.1.2 Verhoeven (1990) suggests new approaches to the user survey
- 1.1.1.2.1.1 improve survey techniques, finding a new directions
- 1.1.1.2.1.2 research on why surveys do not work
- 1.1.1.2.1.2.1 surveys as the old approach are positivist focused on user satisfaction, interaction with specific services
- 1.1.1.2.1.3 new approach is phenomenological and will identify situations that guide user need
- 1.1.1.3 Applegate (1993) identifies new method for determining user needs using material satisfaction model, emotional satisfaction model-simple path, emotional satisfaction model-multiple path
- 1.1.1.3.1 clearly specify what definition of satisfaction is being measured
- 1.1.1.3.2 more standardized instruments for data collection are needed
  
- 1.1.1.1 studies need to look at social constraints, cultural influences, effects of demographic variables (age, gender, class)
- 1.1.1.1.1 Chen & Herndon (1982) studied under-served populations
- 1.1.1.1.1.1 users who are not using library information center services
- 1.1.1.1.1.2 users who are not able to use library information center services (elderly, disabled)
- 1.1.1.1.2 Metoyer-Duran (1993b) study found, that for minority populations, the source of information can serve as gatekeeper to access for both the individual and the community
  
- 1.1 information seeking is an active process involving cognitive processes which are used to access information -- user search strategies
- 1.1.1.1.1 two types of users are considered – intermediary and end users
- 1.1.1.1.1.1 information seeking and search strategies differ depending on who is seeking; there are differences between end users and search intermediaries
- 1.1.1.1.1.2 researchers investigate the individual strategies and techniques users employ to look for and find answers
  
- 1.1.1.1 there are two theoretical positions and foundations – communication theory and cognitive psychology
- 1.1.1.1.1 communications research is foundation for sense-making theory which builds on constructivist principles and programmatic research, conducted over time, systematically examining problems and issues in information seeking and use

- 1.1.1.1.2 sense-making theory – (Dervin) is founded in communications research
- 1.1.1.1 the new trend in information seeking research uses two qualitative approaches: ethnography and grounded theory
  - 1.1.1.1.1 Ellis (1993) examines information-seeking patterns of academic researchers to compare researchers in the physical and social sciences – outlined categories to represent information-seeking patterns: starting, changing, browsing, differentiating, monitoring, extracting, verifying, ending
  - 1.1.1.1.2 Marchionini, Dwiggins, Katz, and Lin (1993) examine information-seeking within the context of electronic technologies – content experts focused on search strategies that emphasized content while search intermediaries were problem driven
- 1.1 information skills research on models of information skills functions and information search processes, primarily within the context of school library media center, to define the nature and scope of information access processes
  - 1.1.1.1 research is divided between model development and information skills process
    - 1.1.1.1.1 Kuhlthau (1983, 1988, 1993b) qualitative research / grounded theory on model development – explored stages of the information search developing affective and cognitive aspects of the process developing the Information Search Process (ISP) model / theory
    - 1.1.1.1.2 Bartolo and Smith (1993) Used the ISP theoretical model in a study of manual and on-line search methods focused on interdisciplinarity
  - 1.1.1.1 research agenda is emerging with future direction for information skills research directed to model development, longitudinal studies on integrating information skills with content areas, alternative assessment measures
- 1 **Access** is the user and point of access as a physical location [near or distant]
  - 1.1.1 factors which may enhance or limit access: space, time, culture, mechanics, environment
  - 1.1.2 there are four areas of discussion: access point, work and use space, building and facilities space, outside environment.
  - 1.1.3 current research emphasizes electronic technologies, design of electronic technologies and users' beliefs about electronic technologies which are impacted by issues of work space, facilities use, and public policies – influenced by technical and social issues
  - 1.1.4 literature relates to design, implementation, and planning resulting in prescriptions based of logic, common sense, rationality and the application of local knowledge to solve general problems (choosing work-station locations, providing effective sign systems, location of new facilities)
  - 1.1.5 research has focused on aspects of technologies (on-line public access catalogs, on-line search services)
  - 1.1.6 access research draws on theory from other disciplines and applies findings (human factors, human-computer interaction, cognitive science, cognitive ergonomics)
- 1.1 access point is the point at which the user and the gateway to information come into contact – two aspects of research are examined: 1) the human-computer access point interface, 2) technologies of access
  - 1.1.1 human-computer access point interface
    - 1.1.1.1 two areas of literature on human-computer interaction (as access to large bodies of collected information)
      - 1) advice – models based on practice 2) psychologically-based research, a cognitive component (presented here)
    - 1.1.1.2 research is cross-disciplinary [requiring a variety of resources for converging information]
    - 1.1.1.3 significant gaps exist in understanding relative value of interface features
    - 1.1.1.4 intervening variables: cognitive styles, eye-hand coordination, previous experiences
    - 1.1.1.5 differences among researchers about how and what to study
      - 1.1.1.5.1 Allen (1991) in examination of agenda setting/research foundations identifies research implications of cognitive science for the design of information systems
      - 1.1.1.5.2 there are four types of knowledge related to users and cognitive models: world knowledge, system

- knowledge, task knowledge, domain knowledge [cognitive processes of cognitive load, learning, memory, problem solving are also discussed] using methods drawn from cognitive science [interviewing, think-aloud protocol analysis – Hancock-Beaulieu (1990)]
- 1.1.1.5.2.1 Allen (1991) p. 23-24 identifies issues for ongoing research
    - 1.1.1.5.2.1.1 cognitive research to understand how cognitive processes contribute to information behavior
    - 1.1.1.5.2.1.2 knowledge-based information retrieval and the creation of prototype systems
    - 1.1.1.5.2.1.3 development and testing of interface designs to guide search strategy creation and intelligent tutoring systems
    - 1.1.1.5.2.1.4 application of understandings of domain and task knowledge to increase the quality of information retrieval systems
  - 1.1.1.6 Shneiderman (1987) in review of interface design research identifies implications for human factors and ergonomics
    - 1.1.1.6.1 identifies three types of human-computer interaction: commands, menus, direct manipulation – mixed results are reported
    - 1.1.1.6.2 Nielsen & Molich (1989) conducted research on creation of evaluation mechanisms
    - 1.1.1.6.3 Chin, Diehl, Norman (1988) discuss development of Questionnaire for User Interaction (QUIS)
    - 1.1.1.6.4 Hartson & Hix (1989) discuss impact of rapid prototyping on interface evaluation
    - 1.1.1.6.5 Gormoll (1990) lay out 10 steps for observing user/computer interactions
    - 1.1.1.6.6 Shaw (1991) provides overall review of human-computer interface in information retrieval: principles, display features, modes of interaction, help/system messages
  - 1.1.2 technologies of access as they relate to the user longest tradition of research
    - 1.1.2.1.1 technology is now more widely used by individual searcher than by professional intermediary requiring more research on user interfaces, search strategies, expert systems
    - 1.1.2.1.2 uses qualitative and quantitative research – related research on user behavior [users; attitudes, levels of satisfaction], human-computer interfaces, information retrieval mechanisms, record design
    - 1.1.2.1.3 previously used methods of surveys and questionnaires [surveys measure what users know, believe, think; to report behavior], factor analysis (less generally used)
    - 1.1.2.2 on-line public access catalogs (OPACs) as replacements for card catalogs may incorporate on-line search services, electronic encyclopedia, full-text, multimedia
      - 1.1.2.2.1 Cochrane&Markey (1985) Mathews, (1986) conducted research which compares different types and features of OPACs and creates generalizations for further development
        - 1.1.2.2.2 Larson (1991) conducted research related to subject searching
          - 1.1.2.2.2.1 primary problems: lack of subject access – users fail to identify relevant information, information overload – too much information
            - 1.1.2.2.2.1.1 recommends four enhancements
              - 1.1.2.2.2.1.1.1 classification changes
              - 1.1.2.2.2.1.1.2 subject heading revisions
              - 1.1.2.2.2.1.1.3 keyword searching improvements
              - 1.1.2.2.2.1.1.4 special indexes
            - 1.1.2.2.3 Solomon (1993) conducted in-depth analysis of issues about children’s OPAC usage and information retrieval patterns
              - 1.1.2.2.3.1 three factors contribute to success:
                - 1.1.2.2.3.1.1 finding assistance
                - 1.1.2.2.3.1.2 applying search strategies
                - 1.1.2.2.3.1.3 using common terms
              - 1.1.2.2.3.2 suggested information retrieval systems for children should provide specific tools, general user mechanisms, management tools
            - 1.1.2.2.4 Dalrymple & Zweizig (19912) compared card catalog use with OPAC – group analysis found similar factors: frustration, benefits
    - 1.1.2.3 on-line search services – issues are sensitive to front-end access requirements and menu development
    - 1.1.2.4 CD-ROMs use has issues of interface diversity, front-end access
    - 1.1.2.5 there is little research on computer conferencing, email, hypertext, Internet, videotext, voice mail –
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implication for future research

- 1.1 work and use space as the environment immediately surrounding the access point is discussed in literature which is prescriptive or descriptive, exploring enhancements or barriers, rather than literature which is research oriented
    - 1.1.1 to access information, the initial choices are based on affective considerations, physical necessities, cultural preferences: sufficient writing space, disability access, screen height, chair design, flexibility of work space
    - 1.1.2 future research should focus on factors significant to users; information access, theories on person-environment fit
  
  - 1.1 building and facilities space is an area of emerging research and should consider problems in
    - 1.1.1 physical access – disabled, elderly, children
    - 1.1.2 affective impressions – friendliness
    - 1.1.3 sign systems – maps, directions
    - 1.1.4 architectural design – cultural, socio-cultural preferences
    - 1.1.5 availability of public transportation
    - 1.1.6 parking, ease of accessibility
  
  - 1.1 outside environment as geographical access is an area where additional research is called for and should consider problems affecting users
    - 1.1.1 influential factors are related to economics and class
    - 1.1.2 examination of the impact of remote access
  
  - 1 **Information** includes things, characteristics of those things, processes used to make decisions about those things [and is greatly impacted by computers/electronics; access, format, storage]
    - 1.1.1 information requires organization for storage and structure and control to provide access [access is only as useful as the information that is accessed]
    - 1.1.2 information is enhanced or restricted by public policies and private usage, relationship between the individual and the information source
    - 1.1.3 characteristics of information / types of information: textual, visual, moving, iconic [does information exist without human construction?]
    - 1.1.4 information has value, utility relevance, pertinence, acceptability – affected by economic factors [costs associated with responsibility for long-term care, storage, maintenance]
    - 1.1.5 order of presentation can affect interpretation of information [with linear presentation users come first, then access, then information]
    - 1.1.6 information is made available in four different contexts: 1) cognitive aspects of access, 2) basic content / reality, 3) reality constructed in large sets, 4) filtered by political and social constraints; filtered by the individual
    - 1.1.7 early research is more structured with focus on mathematics, linguistics, and logic representation
    - 1.1.8 more recently research is focused on searching for information, information represented as audio data, information represented as moving images
  
  - 1.1 organization of information research is focused around problems of storage and structure: user interface, database management system interface, database management system, database (Larson, 1991)
    - 1.1.1 user interface – that which the user sees, hears, touches, tries to interpret human-human interactions, human-computer interactions, human-information interactions (all media)
    - 1.1.2 database management system interface assists user interpret/translates information [reference librarian, OPAC software ], releases human searchers from routine and technical acts of searching that can be effectively automated
      - 1.1.2.1 interface is most needed by end users and novice users [end users need natural language queries translated into system language; novice users need help in learning how to search]
      - 1.1.2.1.1 Vickery & Vickery (1993) describe prototypes and operational interfaces
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- 1.1.1 database management system is a function for information retrieval
  - 1.1.1.1.1 structure of database or storage system can dictate retrieval/access functions subject to hardware limitations
  - 1.1.1.1.2 Ellis (1990) reviews Cranfield projects [retrieval programs] which developed measures / operationalizations for three dependent variables: recall, precision, relevance
    - 1.1.1.1.2.1 recall – ratio of all relevant items in a data set to the number of relevant items retrieved
    - 1.1.1.1.2.2 precision – ratio of total number of documents retrieved to relevant items retrieved
    - 1.1.1.1.2.3 relevance – judgement whether item meets search request [influenced by personal economic factors]
  - 1.1.1.1.3 after Cranfield projects and until 1980s focus is on relevance
  - 1.1.1.2 two primary research methods : 1) statistical / probability 2) cognitive
    - 1.1.1.2.1 statistics and probability research uses techniques such as automated indexing, classification, searching, abstracting, – based on matching(exact or partial) the query in light of physical representation mathematical probability, logical rules
      - 1.1.1.2.1.1 Belkin & Croft (1987) and Fidel (1987) provide overview of issues
      - 1.1.1.2.1.2 Ingwersen (1992) and Jacobs (1993) give overview of current issues
    - 1.1.1.2.2 Cognitive research creates models of users, develops expert systems, applies methods to help users match needs with systems in light of interaction of the user and the information system [to create a better representation of user requests]
    - 1.1.1.2.3 Allen (1994) conducts experimental research on relationship between users' cognitive abilities and information system features
    - 1.1.1.2.4 Belkin (1980, Belkin, Oddy & Brooks (1982a, 1982b) ASK model as an example of cognitive user modeling which looks at a network of associations between items on a database and has implications for users' decisions to search
- 1.1.2 database as information storage and structure [control/retrieval of information] is a highly technical area of research and development
  - 1.1.2.1 storage of information related to characteristics of the information [format, size, retrieval needs] as they interact with different types of information storage [information representations – subject headings, descriptive cataloging, bibliographic citations, sound bytes; original materials]
  - 1.1.2.2 methods for storage of information and original materials advance with changes in electronic technologies as mechanical access media [microfilm, microfiche] is being replaced
  - 1.1.2.3 technical considerations for information storage: length of storage, speed of access, cost of replication
  - 1.1.2.4 areas for future research include data capture, advanced algorithms, networked databases
- 1.1 information control research addresses limitations of availability which may reduce or provide barriers
  - 1.1.1.1 control is impacted by public policy, United States Government Access, proprietary interests
  - 1.1.1.2 limitations may be governmental, economic, social, cultural
  - 1.1.1.3 control may add access points, increase public awareness of information availability, or raise questions for consideration and reflection
  - 1.1.2 public policy – governmental: libraries, public information agencies
    - 1.1.2.1.1 based on ongoing policies, cultural belief systems [to provide access to all citizens]
      - 1.1.2.1.1.1 elements of public/democratic tenets
      - 1.1.2.1.1.2 local policies (hours of operation, type of access)
      - 1.1.2.1.1.3 regulatory policies - services for special needs
      - 1.1.2.1.1.4 community policies – access, hours of operation, services
      - 1.1.2.1.1.5 economics
      - 1.1.2.1.1.6 censorship issues
    - 1.1.2.1.2 Metoyer-Duran (1993a, 1993b, 1993c) describe individuals who influence information access to others [gatekeepers]
- 1.1.1 United States Government Access – 1) public information - collected or developed by the government - not classified personal or proprietary 2) private information - for use by government only - privacy right or

