The Nature of Information Science and Its Relationship with Sociology

İdris Güçlü

Tunceli Police Department, Tunceli, Turkey
idrisguclu@yahoo.com

Abstract. The aim of this study is to discuss and explain the nature of information science and its relationship with other disciplines, especially with sociology. In this context, the historical development of information science, the effects of an interdisciplinary field on the development of information science and its future direction are discussed. The results of research showed that information science is multidisciplinary. Information science is especially related to library science, behavioral science, abstracting and indexing, communications science, documentation, and computer science. Classical and contemporary sociological theories and methodological approaches are important in the development of information science, which is a new field in the process of development. It has been seen that technology is the driving force in its development. As information science matures, it will be reorganized.

Keywords: Information, information science, sociology, interdisciplinary, technology.

1 What is Information Science?

What is information science? According to Merriam-Webster [1], the American Heritage Dictionary, and other dictionaries, information science is identified as "the collection, classification, storage, retrieval, and dissemination of recorded knowledge treated both as a pure and as an applied science". However, the answer to this question is more complex because information science is not a unique concept.

One of the early definitions of information science, provided by Borko [2] and based on Robert S. Taylor's definition, was that "information science is the discipline that investigates the properties and behavior of information, the forces governing the flow of information, and the techniques, both manual and mechanical, of processing information for optimum storage, retrieval, and dissemination".

Borko's definition is credited by both Bates [3] and Saracevic [4] as it remains popular among scholars and covers most aspects of information science. Bates [3] elaborates that information science, as a meta-discipline, focuses on the subject matter of all the conventional disciplines in the storage and retrieval of human knowledge in recorded form. Bates [3] states that efforts in information science center on how information is represented and organized compared to the knowledge itself, much less

S. Kurbanoğlu et al. (Eds.): IMCW 2012, CCIS 317, pp. 164–173, 2012.

to any individual's ability to know and remember it. According to Bates, briefly, information science may be defined as the study of the storing, organizing, gathering, disseminating, and retrieving of information, which is close to Borko's definition. However, Bates adds that information science has other important elements as well. For Bates, besides systems, information science is interested in user applications and research.

On the other hand, Saracevic [4] takes a different approach. For him, information science is identified by the problems that it handles. The definition of these problems is the main factor for fostering the development of information science for the next few decades. Information science has to deal with these problems. Saracevic [4] states that the debates related to the proper definition of information science are useless, recommending instead a broad definition.

In order to understand the boundaries of the field, Saracevic lays out the general characteristics of information sciences. Some of these characteristics can be shared with other fields, such as sociology. To Saracevic [4], information science is an interdisciplinary science with three characteristics. First, it is a multidisciplinary field interconnected to two or more disciplines. Second, information science is directly related to current information technology. Finally, it has a human dimension in addition to the technological dimension.

Finally, as Saracevic noted, the definition of information science is a complex issue. Even though a definition is necessary for understanding the boundaries of subjects that are covered by the field, it cannot help to deepen our understanding of it. Taking into account the nature of information science, it is difficult to agree on a proper and common single definition. However, the attempts to provide a definition are helpful for the progression of the discipline. Taken together, all above definitions and discussions indicate that the debate regarding the definition of this field will go on for a long time.

2 Interdisciplinary Nature of Information Science

In order to understand the nature of information science, it is better to talk about the conceptual ambiguity of information apart from the definition. Information is the defining point of this issue. There is no consistent definition of information. Wersig and Neveling found 17 distinct definitions [5]. Similarly, Schement [6] mentioned 22 unique definitions of information in his writings. As a result, various definitions of information developed to stand for a variety of concepts.

One important definition of information is identified by Shannon and Weaver [7]. It explains the term information through mathematical communication theory. A signal or message is information that is transmitted from a source to a destination. However, Bates [8] points out that information is not totally covered by entropy. According to Bates [8], "information is the pattern of organization of the matter of rocks, of the earth, of plants, of animal bodies, or of brain matter". Information can also be tangible. That is, it refers to the pattern of energy which exists in the air.

On the other hand, like other schools Buckland [9] also emphasizes the difficulty with the definition of information. Instead of a specific definition of information, he identifies three different principles of the term: information-as-knowledge, information-as-process, and information-as-thing. Wilson [10] also focuses on the difficulty of having no specific definition of information. Accordingly, the main difficulty is related to the multiple uses of information that bring about confusion among researchers. Wilson states that "researchers are often unclear about which sense they are referring to and sometimes do not clarify between different senses". Therefore, the problem regarding the definition of information doesn't stem from the lack of an appropriate definition of the term, rather, it is related to inaccurate, incomplete, and multiple uses of the term. In this sense, the ambiguity of information shapes the nature of information science.

As noted, information science is one of newest fields among the sciences. Therefore, it is more open to development, having a dynamic nature. In addition, it is strongly related to various other disciplines. Borko [2] underlines the interdisciplinary characteristic of information science that interacts with linguistics, mathematics, psychology, library science, management, engineering, behavioral science, logic, and other related fields.

According to Saracevic, one of the important characteristics of information science is its interdisciplinarity. Saracevic [4] presents two dimensions of being interdisciplinary. First, some problems cannot be solved only by one approach and/or one discipline. However, information science as an interdisciplinary field can provide the richness of other disciplines and approaches for solving a problem. Second, he states that "interdisciplinarity in information science was introduced and is being perpetuated to the present by the very differences in backgrounds of people addressing the described problems". To Saracevic, information science has a special connection with information technology.

Herner [11] mentions the development of information science. He states that information science has a common ground with computer science, library science, communication science, behavioral science, and various other similar disciplines. Therefore, each field has a significant contribution in the emerging field of information science.

The discussion of information science among scientists indicates that information science is more closely related to some disciplines than to others. As noted, library science is a very similar field regarding the preservation, use, and organization of information. Labels like the Department of Library and Information Science also suggest this. For Saracevic [4], the relationship between information science and library science is strong since they have a common goal: "sharing of their social role and in their general concern with effective utilization of graphic and other records, particularly by individuals". However, in this author's point of view, as information science has developed, its separation into multiple sciences was inevitable. Besides library science, communication, computer science, and education are also strongly related to information science.

Computer science is very closely related to information science. The common ground between computer science and information science is based on the application

of computers, networks, retrieval systems, related products and services (providing nearly all of the technology that information science currently relies on). An example is where a library uses information science to create and utilize a digital library and how information science uses that digital library to access information for further research. According to Saracevic [4], information science has commonality with computer science through a computer network's ability to process, search, organize, utilize, and present information.

Bates [3] argues that the fields of information science, education, and communication are "the conventional academic disciplines". Each one of them plays a distinct role in transmitting human knowledge. Bates' example shows information science providing storage and retrieval of information; education passes information on to the next generation, and the media discover and transmit that information. This situation is also called "content" disciplines.

Based on its interdisciplinary characteristic, information science has a huge commonality with various disciplines regarding perspectives, theories, models, and methodological approaches. In this sense, Bates [3] evaluates information science as a meta-discipline which takes its place under conventional disciplines. It assists conventional disciplines in the storage and retrieval of human knowledge in recorded form.

3 The Relationship of Information Science with Sociology

Information science also shares multiple aspects with sociology. Both fields share theoretical perspectives from other fields such as computer science, psychology, linguistics, philosophy, communication, and information technology. It is obvious that information science, to some extent, is comparable not only to sociology but also to most social sciences. For example, Wilson [12] states that "The recipient of information, his information-seeking behaviour (which involves social acts), his information-exchange activities and his use of information are also areas for sociological research". He further states, "Sociological studies in this area range from all-embracing theories in the sociology of knowledge to small-scale studies of collaboration in the writing of scholarly papers". Sociology is related to the dissemination of information: the availability of information at the micro level such as agency or the macro level such as the social structure. Sociology provides a theoretical background to information science.

The studies in both disciplines are utilized for proposing solutions to improve policy for the general public. The science of sociology deals with society; it is the study of society and is a very broad field. Sociology has two main components: social systems and social actions. While the study of social systems covers institutions and structures, the study of social actions is interested in processes. Since the subject matters of sociology range from the micro level (agency-interaction) to the macro level (social structure), several subject matters create a common goal for both fields.

The existence of technology and its effect on individuals and society is one of the main interest areas of both disciplines. The concept of social informatics is an

example. Kling [13] examines the relationship between technical and social systems arguing that there is a strong interrelationship between technologies and social change in order to explain the term “social informatics”. Similarly to Kling [13], Sawyer and Rosenbaum [14] also define Social Informatics as an interdisciplinary study that examines the interactions between information technologies and communication technologies, including their design, uses and consequences within both institutional and cultural contexts.

Kling utilizes symbolic interactionism for understanding “the social structure of the computing world” [15]. Symbolic interactionism is a part of mainstream sociology, and also a sociological perspective. Similarly, Gusfield [16] said that "We didn't think symbolic interaction was a perspective in sociology, we thought it was sociology". Therefore, Kling embeds the social cultural aspect of knowledge into the nature of information science and communication technology.

Thus information science and sociology converge in information technology. The function of technology varies regarding the interaction of human beings with technology. For example, in terms of the social development of society, the development of societies and the changes during development are strongly dependent on technological advancement [17]. That is, technology has influenced all aspects of social life and has been an important player in the development of the information society [18]. Using this approach, Lenski indicated that technology influences, guides and brings about social change and development. Similarly, Robert Pool [19] explained how society was shaped by technology through positivism by linking technological knowledge with the development of society. Brown and Duguid [20] also emphasized the relationship between society and technology in an article titled “A Response to Bill Joy and the Doom-and-Gloom Technofuturists”. They stated that “technological and social systems shape each other” [20].

The impacts of information technology today are seen more often in every aspect of social life. In other words, technology alters not only the behavior of individuals but also of organizations. It is viewed as an exogenous force, suggesting that neither the individual actor nor the organization has control over their actions. Pfeffer [21] explained the impact of information technology on organization through the situational control perspective. According to Pfeffer [21], "In this view, action is seen not as the result of conscious, foresightful choice but as the result of external constraints, demands, or forces that the social actor may have little control over or even cognizance of".

Similarly, Markus and Robey [22] also stated that “Organizations would recentralize, levels of middle management would disappear, and top management elite would emerge”. Perhaps more concretely, Simon [23] argued that computers would not decentralize decision making, but rather the organizational structure becomes more complex and requiring more lateral interaction. Markus and Robey [22] argued that information technology brings about environmental uncertainty in organizational structure. Therefore, changes appear to merge unpredictably concerning the interaction between people and information technologies.

Another relationship between information science and sociology is human behavior. While sociology conducts studies of human behavior at societal and agency

levels, information science focuses on human information behavior and does not distinguish between societal or agency levels. Sociology has a holistic approach when examining human information behavior comparing to information science. As noted above, many theoretical assumptions can be derived within one field, (such as psychology) yet are later shared by two disciplines. It is obvious that an interconnective relationship exists in the two disciplines.

Both information science and sociology share practical implications. The subject matters of information science – such as information system management, and information retrieval systems – have significant value to sociology. The two fields are complementary to each other through theoretical and methodological validation, as well as within techniques employed in practical daily life. Therefore, scholars may employ tested practical implications in both information science and sociology.

Taken together, there is a strong relationship between information science and sociology. A huge amount of theoretical background in information science is based on sociology, owing to the social side of information science. The most influential theorists such as George Herbert Mead, Charles Cooley, and Herbert Blumer (symbolic interactionism), Bruno Latour (Actor-Network theory), Manuel Castells (networked society), Pierre Bourdieu (habitat-capital theory), Daryl Chubin, and Harriet Zuckerman (social constructivism), Robert Merton (Matthew effect), Harold Garfinkel (ethnomethodology), and Anthony Giddens (structuration theory) are the most cited sociologists in the studies of information science [15]. Their theories and methodological approaches have an important contribution to the development of information science.

4 Is Being Interdisciplinary Advantageous or Disadvantageous?

As an interdisciplinary science, information science has advantages and disadvantages in terms. We can say that it may be advantageous since some problems handled with information science cannot be resolved by a unique approach or constructed from a single discipline [4]. That is, considering the complexity of human information behavior, only the interdisciplinary relationship of information science can deal with and explain the many factors related to information behavior.

In the same fashion, Cronin [15] states that “the chunky concepts make up our field’s intellectual core (e.g. knowledge, information, communication, representation)”. Therefore, for Cronin [15], the interdisciplinary relationship of information science contributes to broadening its intellectual enrichment due to its interaction with other disciplines. Cronin [15] enumerates some of the disciplines from which information science takes perspectives and approaches: linguistics, computer science, psychology, philosophy, sociology, cognitive science and human–computer interaction.

However, there is one disadvantage to information science’s being interdisciplinary: it is difficult to define the borders of the field. Information science’s multiple relationships with other disciplines force its re-evaluation more than others’. Likewise, Saracevic [4] also points out that the advancement of technology expands information science. He states that “a technological imperative is compelling and constraining the evolution of

information science, as is the evolution of a number of other fields, and moreover, of the information society as a whole". Developments in related disciplines add to the growth of information science, a growth that is all the more rapid because it is compounded by this interdisciplinary relationship. In addition, the core terms of information science are still under discussion due to the ambiguity brought about by its interdisciplinary nature.

As noted, several perspectives and approaches originating in other fields cause information science to contract. In other words, borrowing from many theories and using the assumptions from them to examine a problem within information science may lead to contradictions. Therefore, it can bring about confusing deviations and problems in theory or research within information science. The separation of information retrieval from information seeking perspectives would be a good example of that disadvantage.

5 Historical Development of Information Science

Information science is one of the latest modern sciences. Many scholars provide a brief look at the history of information science [24], [4], [25]. They indicate that information science has existed since World War II. After the Second World War, the information explosion pushed forward expanding information technologies and technical publications [4], [26].

Vannaver Bush's [27] article was a milestone in the history of information science. His influential article defined the problem as "the massive task of making more accessible a bewildering store of knowledge" and proposed a solution [4]. Saracevic called it "the problem of information explosion". As to the solution, Bush [27] mentioned a machine, the "Memex". He described the memex in his most influential article "As We May Think" as a storage device for mechanically recording and containing books, records, communications, etc. for future reference that is both highly flexible and quickly accessed [4]. His idea regarding the 'memex' has been considered by some scientists as a stepping-stone for the development of the internet. According to Buckland [28], the "Memex" was also seen as an escalator for development of information retrieval, computing, and hypertext. Therefore, some scholars accept Vannaver Bush as the "father of information science" owing to his contribution to the development of information science [29].

Another significant event was the change of name of the American Documentation Institute to the American Society for Information Science in 1968. After that, the term information became more articulate than before, and refers to both the discipline and the profession [2]. The emergence of Shannon's information theory in the 1940s also kept the discussion of information among scientists [26].

Saracevic [4] takes a historical perspective when explaining information science. He focuses on the origin and social background of information science. He suggests three powerful ideas that shaped the historical development of information science: information retrieval, relevance, and interaction. The emergence of information retrieval in the 1950s created a formal logic base for the development of information science. Its relevance is more directly related to human information needs. The idea of

interaction emerged in the 1970s. This idea is based on the relationship involving exchanges and feedback. The relation between the information retrieval process and systems was also important for the development of information science [4].

Finally, information science came out of the aftermath of World War II as a field of research. It is a new discipline. As mentioned above, several factors have contributed to the development of information science since then, technology being the driving force.

6 Future Direction of Information Science

The nature of information science makes it more open to development than any other science. We can enumerate several reasons but the following two are important to review before continuing. First, information science is an interdisciplinary science, and second, developments in technology, computing and computer networking have direct and indirect effects on information science. Many studies in information science research evolving systems and networks centered within and around this technological advancement.

Rayward [30] highlighted the importance of computer technology for information science. He argued that computer science directly interacts with information science. This interaction covers all computer applications, products, networks, and related services. In addition, the prominence of information science among other fields is increasingly made stronger by means of research regarding organizing, searching, filtering, and presenting, using highly complicated machines and networks, and this trend will continue for at least the next three decades [4], [30]. For example, Saracevic pays attention to digital library research because it attracts not only the attention of computer scientists but also professionals in many other disciplines.

The industrialized society is turning to the information society. Nowadays, the effects of information are seen more clearly in society. According to Beniger [31], individuals have the ability to make changes in the behavior of how information is processed and communicated. The activities of information and communication are parts of the control function in terms of both individual and society level [31]. That is related to information technologies. The advancement of technology also brings about problems relating to storing and retrieving information. The tremendous amounts of circulating information make it difficult to control and organize them. In addition, with the further development of technology, the problems become more complicated and multifaceted. For example, in order to control the flow of data, some supportive systems are needed. From this perspective, studies regarding information retrieval systems become more important and researchers will focus more on them in the future. In this respect, information science becomes more important.

Additionally, the effectiveness and efficiency of technological advancement is also based on the issues of information systems management. This is an important sub-consideration under information science. Finally, as noted above, the interconnection of information science with other disciplines makes the field more valuable. Information science as an interdisciplinary science will also continue to contribute and provide various valuable opportunities to other fields over the coming years.

7 Conclusion

It seems obvious that information science will become increasingly more important to general academia over the next few decades. The characteristics of information science, such as its connection with technology, the rapid evolution of information, and its interdisciplinary nature, are considered the main reasons for this increase due to the growing need to research information problems.

Information science is an interdisciplinary science. There are both positive and negative aspects to this interdisciplinary characteristic. Based on the varying theories, perspectives, methodological approaches, practices, and interests of the related disciplines, the definition of information can vary widely from one discipline to another. Researchers from different disciplines propose different definitions for the same term. Thus, the lack of a common definition of information may be seen as a major problem among scholars. However, in this author's point of view, this does not undermine the importance of information science. On the contrary, the interdisciplinary characteristic of information science strengthens other fields. Finally, taken all together, information science has an essential role and strategic importance in our modern society in the coming decades.

References

1. Merriam-Webster Online Dictionary, http://www.merriam-webster.com/dictionary/information%20science
2. Borko, H.: Information Science: What is it? American Documentation 19, 3–5 (1968)
3. Bates, M.: The Invisible Substrate of Information Science. Journal of the American Society for Information Science 50, 1043–1050 (1999)
4. Saracevic, T.: Information Science. Journal of the American Society for Information Science 50, 1051–1063 (1999)
5. Wersig, G., Neveling, U.: The Phenomena of Interest to Information Science. Information Scientist 9, 157–187 (1975)
6. Schement, J.R.: Communication and Information. In: Schement, J.R., Ruben, B. (eds.) Information and Behavior, New Jersey, New Brunswick, vol. 4, pp. 3–33 (1993)
7. Shannon, C.E., Weaver, W.: The Mathematical Theory of Communication. University of Illinois Press, Urbana (1949)
8. Bates, M.J.: Fundamental Forms of Information. Journal of the American Society for Information Science & Technology 57, 1033–1045 (2006)
9. Buckland, M.K.: Information as Thing. Journal of the American Society for Information Science 42, 351–360 (1991)
10. Wilson, T.D.: On User Studies and Information Needs. Journal of Documentation 62, 658–670 (2006)
11. Herner, S.: Brief History of Information Science. Journal of the American Society for Information Science 35, 157–163 (1984)
12. Wilson, T.D.: On User Studies and Information Needs. Journal of Documentation 37, 3–15 (1981)
13. Kling, R.: Learning about Information Technologies and Social Change: The Contribution of Social Informatics. The Information Society 16, 217–232 (2000)

14. Sawyer, S., Rosenbaum, H.: Social Informatics in the Information Sciences: Current Activities and Emerging Directions. Informing Science 3, 89–95 (2000)
15. Cronin, B.: The Sociological Turn in Information Science. Journal of Information Science 34, 465–475 (2008)
16. Gusfield, J.R.: Preface. In: Fine, G.A. (ed.) A Second Chicago School? The Development of a Postwar American Sociology. University of Chicago Press, Chicago (1995)
17. Lenski, G.E.: Power and Privilege: A Theory of Social Stratification. University of North Carolina Press, Chapel Hill (1966)
18. Guclu, I., Sevinc, B.: The Impact of Information Society on Terrorism and Counterterrorism: A Case Study of Turkey. IOS Press, Amsterdam (2011)
19. Pool, R.: Beyond Engineering: How Society Shapes Technology. Oxford University Press, New York (1997)
20. Brown, J.S., Duguid, P.: A Response to Bill Joy and the Doom-and-Gloom Technofuturists (2000), http://www.aaas.org/spp/rd/ch4.pdf
21. Pfeffer, J.: Organizations and Organization Theory. Pitman, Marshfield (1982)
22. Markus, M.L., Robey, D.: Information Technology and Organizational Change: Causal Structure in Theory and Research. Management Science 34, 583–598 (1988)
23. Simon, H.A.: The New Science of Management Decision. Prentice Hall, New Jersey (1977)
24. Hayes, R.M.: Information Science and Librarianship. In: Wiegand, W.A., Davis, D.G. (eds.) Encyclopedia of Library History. Garland Publishing, New York (1994)
25. Buckland, M.K., Liu, Z.: History of Information Science. Annual Review of Information Science and Technology 30, 385–416 (1995)
26. Summers, R., Oppenheim, C., Meadows, J., McKnight, C., Kinnell, M.: Information Science in 2010: A Loughborough University View. Journal of the American Society for Information Science 50, 1153–1162 (1999)
27. Bush, V.: As we May Think. The Atlantic Monthly (1945), http://www.theatlantic.com/doc/194507/bush/4
28. Buckland, M.K.: Emanuel Goldberg, Electronic document retrieval, and Vannevar Bush's Memex. Journal of the American Society for Information Science 43, 648–657 (1992)
29. Lilley, D.B., Rice, R.W.: A History of Information Science 1945-1985. Academic Press, San Diego (1989)
30. Rayward, W.B.: The History and Historiography of Information Science: Some Reflections. Information Processing & Management 32, 3–17 (1996)
31. Beniger, J.R.: The Control Revolution: Technological and Economic Origins of the Information Society. Harvard University Press, Cambridge (1986)