Compatibility of Information Science with the Concept, Characteristics, and Criteria of Interdisciplinarity[1]

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ABSTRACT

Creation, knowing nothing about existence, found mystery, amazement, and a drive toward discovery to continue. Trial and error were the systems to be relied upon. And over time and with the formation of ancient civilizations independent of each other, they try to search and investigate, but in an organized manner, to reach different facts and disciplines, opening doors for the establishment of sciences, which almost all agree on interest in mathematics, numbers, engineering, and medicine. Those were reflective of their needs and documented in their architecture and life. The sciences were complementary to each other, gathering them in the knowledge of several scholars who knew about them. Sciences then began as integrated knowledge, interdisciplinary domains in nature without specialization. Gradually, human knowledge expanded and societies became more complex leading to a shift toward Specializations. This shift allowed for the in-depth study of specific subjects and practical applications. Moreover, The continuous movement from simplicity to complexity has allowed the boundaries between disciplines to become transparent due to the need for collaboration in addressing complex research activities.

Information science is one of the disciplines that witnessed this growth to be integrated in cooperation with other disciplines. The question here is whether the specialization, as an integrated program, proceeds toward applying the principle of interdisciplinarity in a way that enhances its sustainability or loses its identity.

The current paper aims at defining the characteristics and criteria of interdisciplinary process to find out the extent to which the field of information science is qualified to be an interdisciplinary field.

INTRODUCTION

Creation existed on Earth and had zero systemic knowledge. Life was not clear to man. He relied on his sense and intuition to discover. And all this to defend his existence and search for his immediate needs only. Accordingly, the discovery of knowledge was a result of the experience of right or wrong without explanation. The discovery of knowledge was just a process driven by human being's curiosity and experiment with no effort of understanding why. Curiosity has pushed him to make more effort and to be associated with basic survival activities that centered on hunting and forming social groups for better-defended continuity. Up to now, relied on trial and error observations reminding each other's when navigating their movable environments. Hence, since agriculture and hunting were among their priorities at the time, the search for what would help them in that was the first intuitive knowledge that they naturally turned to. Progressively, sophisticated stone tools, for instance, hand axes and scrapers were innovated for multi-hiving purposes, that is to utilize their environment.

Moreover, to share their initiations and innovations, language and communication were the second developmental need. They found it necessary to convey their discoveries among group members as well as from one generation to the next. Cooperation and social belonging generated large communities and social values. Human has begun investigating the environment, observing around, and making sense of the world. Sciences have begun to be initiated systematically, leaving valuable civilizations and systematic knowledge. Mesopotamia, the civilization of Sumerians, Babylonians, and Assyrians left behind them very momentous contributions to the evolution of many sciences such

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as astronomy, mathematics, and early medical approaches. In ancient Egypt, the sciences of engineering, architecture, and mummification were among their most important feature. Ancient Greece, on the other hand, was directed toward Western sciences and focused on rational thinking, logic, and systematic inquiries. The acquaintances of the scientists of that civilization, such as Plato and Aristotle, were the beginning of the development of many disciplines, such as mathematics, physics, ethics and metaphysics. Back again to the Ancient civilization of India and their thinkers' efforts in mathematics that led to the decimal numeral system, algebra and astronomy. While Ancient China witnessed the development of many fields such as mathematics, astronomy, agriculture, and medicine.

All these scientific thinking of the Ancient civilizations were oriented towards the understanding of nature through wondering, however, those can be considered as the groundwork for the foundation of today's sciences. Generally, they were characterized by:

1. Focusing on direct observation of nature.
2. "Tends to have a comprehensive perspective which includes a wide range of components, including myth, religion, beliefs, ethics, literature, and theories of nature." ("Ancient Philosophy," 2023). There was no separate discipline.
3. Based on that, individual scientists possessed a broad range of skills and knowledge across various domains, but rather a philosopher looking at phenomena in search of an answer to a question or clarity of the mystery of things and why they happen. Hence scientists were cooperative and ideas exchanging to reach facts.
4. To do so, in their investigations, they employed deductive reasoning for deriving conclusions from general principles, all to understand nature.
5. Therefore, their thinking was often intertwined between practical and applied knowledge, and they did not realize this distinction, but rather they were working and drawing conclusions according to experience, intuition, meditation and accumulated knowledge they had.
6. Accordingly, no scientist specialized in a specific field, rather there was a philosopher who searched for phenomena in search of an answer to his question or clarity of the mystery of things and the reason for their occurrence. (knowledge of a man with multi-domains.)

In summary, sciences began as interdisciplinary domains in nature without specialization. The main purpose was to reach the possible answer or to remove ambiguity. The reason is clear, that the phenomena were simple and purely exploratory. The doors of complex cases were only gradually opened. The phenomenon may need to focus on one domain far from others. The continuity of this depth and complexity of research was behind the fact that there are disciplines and specialized scientists.

However, as we live in a fast-changing world, which at present depends mostly on science and technology, it becomes very hard for disciplines to remain isolated and hide their knowledge away from each other. Though, it appears that for any isolated discipline, outcomes and achievements are negatively affected and might disappear. interdisciplinarity is no longer self-evident but is directed according to analytical studies and inter-relationships, specifically within academic faculties and research organizations leaving behind interdisciplinary collaborative programs.

In any case, we would not ignore the many domains of knowledge that are characterized by their inherent nature and the impact of technical developments in particular on their growth and expansion. They focus on interrelated concepts from many disciplines to constitute interdisciplinary fields, such as environmental studies and information studies.

WHY FOR INTERDISCIPLINARITY?

Interdisciplinarity, to many, simply refers to the integration of scientific collaborative activities, methodologies as well as perspectives from multi-related domains. It is then the complexity that presents today's problems which are characterized by being multifaceted. Accordingly, there was a need to cross the boundaries between disciplines and bridge the knowledge gap. The initiation of collaborative research activities has been the solution to overcome limited thinking and restricted visions. Within this matter, Filler and Stem (2007) concluded that "scientific advances are most likely to arise, or are most easily promoted when scientists from different disciplines are brought together and encouraged to free themselves from disciplinary constraints." (Feller, I., & Stern, 2007). Reamer justify boundary

crossing among disciplines as an acceptable phenomenon and "it is not inherently unethical, it is just a fact of life, and it requires skillful management of those boundary issues." "(Reamer, 2021).

Braun and Sehubert (2003) responded to the question of why a discipline is interdisciplinary in that:

1. Many research problems are inherently multi/interdisciplinary, and addressing only one or a few of the component disciplines will result in fragmented or perhaps misleading results due to neglect of discipline interdependencies.
2. It is becoming increasingly evident that there are common underlying themes across many research fields. For example, the same equations are used to model phenomena in some very diverse disciplines, such as the modeling of chaotic behavior.

In summary, several factors contribute to the shift from specialization to interdisciplinarity Mostly the complexity of problems, specializations aim to bridge gaps between traditional disciplines leading to new insights and solutions, the comprehensive understanding of some phenomena, and the continuous technological advancements which incorporate dissolving boundaries among single disciplines.

The following graph summarizes and describes the natural movement between specialization and interdisciplinarity:

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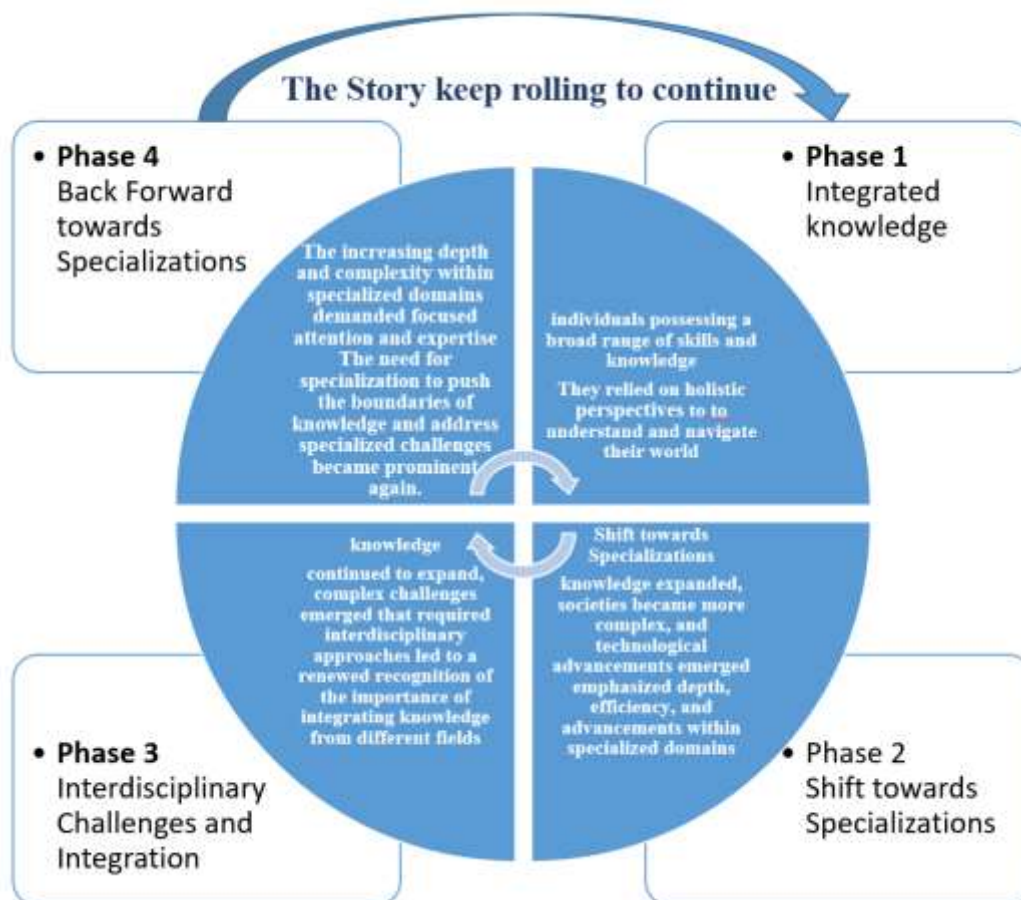
THE STUDIED PHENOMENON

Information science is the name that gradually changes from library science, documentation, archives, library and information science, information studies, and other titles. All have revolved around service content related to collecting, organizing, and providing information services. More than that, it is the specialty that has been greatly influenced by information technology since the early eighties. Accordingly, its programs have been subject to continuous updating to face challenges in preparing specialists capable of carrying these challenges that threatened the profession's sustainability. Change crept towards several disciplines, the closest of which are technology and computer science, then management, communication and statistics. Other departments have tried to change even their link from the humanities to computer science. Experiences and attempts to promote information science, which is considered an interdisciplinary field in the content and integrated science in its applications.

In other words, specialists began to borrow knowledge from other disciplines and train themselves to integrate the new with the previous knowledge they have. Then take another step towards research and co-authoring by fragmentation in preparation, not cognitive integration, sharing roles. With all the efforts and attempts, does the information science field conform to the concept, characteristics and criteria of interdisciplinarity as it is currently known? What needs to be done to comply with and enhance its sustainability in the face of the great challenges of our time?

Objectives of the study:

The current paper aims at defining the characteristics and criteria of interdisciplinary process to find out the extent to which the field of information science is qualified to be an interdisciplinary field.

A framework of the study:

To achieve the above objective, the literature related to information science as an interdisciplinary field was reviewed, the characteristics and criteria of the interdisciplinarity process were determined, and then the conclusion was derived from analyzing the current situation as reflected in the related literature and the writer's experience.

1-   **Information science as an interdisciplinary field**:
•   Specifically, based on the previous studies, the nature of interdisciplinarity in information science is simply collaboration more than integration. In this matter, Dudzikowa et al (2012), mentioned that interdisciplinarity "is not in the combination of theories and methods from various disciplines, but in the synergy emergent from that combination, resulting in a comprehensive understanding of complex problems and proposing coherent solutions to them" (Dudzikowa et al., 2012, 9). More specifically, Sosińska-Kalata (2020) and Szosta, (2013) considered the interdisciplinary approach used in information science can be interpreted as research collaboration for a better understanding of some complex topic. (Sosińska-Kalata, 2020 and Szostak, 2013)

•   Other studies concluded that information science, by its nature, is considered an interdisciplinary field. These conclusions were based on several indicators derived from measuring interdisciplinarity through,
-     Research-based analysis to measure the interdisciplinarity characteristics in information science. (Zeng, Cao, Chen, Pan, & Cai, 2023)
-     Citation analysis to measure interdisciplinarity, particularly through direct citation and co-authorship analysis, (Chang & Huang, 2011, (Astrom, 2010)
-     using the Science Citation Index to measure the frequency with which the terms interdisciplinarity and multidisciplinarity crop up in the title of journal papers published across a comprehensive range of scientific disciplines.   (Braun & Schubert, 2003)

The above-mentioned studies and many others, whose steps were adopted in the analysis, focus on the concept of the collaboration trends between specialists from several fields in the preparation of their studies. Coordination and collaboration, then have been considered as the basic characteristic of interdisciplinarity but not interdisciplinarity as a process. Collaboration trends show the top authors and their affiliations as compared to top keywords and sub-disciplines from which they emerge. (Chua & Yang. 2008). However, Frodeman (2017) emphasized that

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interdisciplinarity is not just collaboration, in sum it constitutes "an implicit philosophy of knowledge not simply an epistemology." (Fredeman, 2017)

- Many departments of information science have moved towards the diversity of backgrounds of researchers working in this field. They are very diverse, but the actual contribution of the disciplines to the development of information science is also very varied. So far library science and computer science have had the greatest impact on the development of the research agenda for information science. Tefko Saracevic (1999) justified this movement based on the aspects of information science's relationships with other disciplines. Firstly, research problems of information science that relate to effective transfer of knowledge in modern information society are inherently complex and multifaceted, and thus cannot be solved with the use of approaches and concepts developed in one discipline only.

2-   **criteria of interdisciplinary science**:

In 2001, William Newell describes an "interdisciplinary process as a specific series of steps designed to allow the creation of new outcomes and insights that could not otherwise be achieved."(Newell, 2001). Although the vision is clear, still, the application needs consideration and awareness. Thus, for interdisciplinarity to be a successful boundary crossing, it requires conditions:

1. disciplinary depth and breadth of interest, visions and skills, integrated within research groups.
2. institutional commitment and research leadership with clear vision and teambuilding skills
3. communication among people from different backgrounds.

Rascão (2018) limited interdisciplinary to the criteria of "research and teaching method susceptible to make two or more disciplines to interact with each other; This interaction can go from simple communication of ideas to the mutual integration of the concepts of epistemology, the terminology, methodology, procedures, data and research organization".(Rascão, 2018) Braun and Schubert (2003) declared that

"bringing together of distinctive components of two or more disciplines in research or education, leading to new knowledge which would not be possible without this integration." (Braun & Schubert, 2003)

3-   **Characteristics of interdisciplinarity**:
- The essence of interdisciplinarity in science is not in the combination of theories and methods from various disciplines, but in the synergy emergent from that combination, resulting in a comprehensive understanding of complex problems and proposing coherent solutions to them (Dudzikowa et al., 2012, 9).
- Klein (2004), linked the concept of interdisciplinary to that of complexity. The convergence between these two ideas has significant consequences for understanding the nature of knowledge, the solution of scientific problems and the mutual interchange between the sciences and the humanities
- In sum, interdisciplinary experiences have three basic characteristics: Lara (2005)
  1. approach to the solution of specific problems.
  2. Sharing of methodology
  3. Generation of new disciplines after cooperation and fusion between the field

CONTENT ANALYSIS AND CONCLUSION

1. Library and information departments overcame the challenge of fear in the early 1980s. At that time, there was a wave of technological and computer science trends toward libraries, in which they found distinguished laboratories for the application of their programs, especially in the field of databases and information storage and retrieval systems. The specialization has overcome its nightmare by moving towards other departments such as communication, computer sciences and statistics. Their movement was fostered with the aim of cooperation and knowledge integration to enhance specialization. Thus, this was the clear modern phase of the specialization to face the challenge. With this stage, the specialization began not only to change the content of its programs but also the change included the names of the program, heading towards information and information specialists instead of libraries and librarians.
   From this statement, a conclusion can be derived that specialists tend towards studies, co-authorship, and digging into topics in which knowledge from other fields contributes. Accordingly, and according to the

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above-mentioned analytical studies, we can say that the specialization is characterized by interdisciplinary cooperation.

2. More developments continue to create another challenge to information science, technology and digitization. Another group of individuals sought to market their digital content of huge systemized databases and information systems. Sources were organized and described by metadata that facilitate searching and retrieval. The challenge arises, here, concerning technical procedures, which are considered basic knowledge of the profession. Information programs have continued the process of integration to continue their importance and sustainability as well. Electronic publishing, compilation and metadata became part of the courses' content. Note that those who teach and train on this knowledge are mostly the same staff in information science and not from related fields.

3. Today, the specialization faces a new challenge in front of artificial intelligence (AI), when the intelligence robot assumes (ChatGPT) the role of an interdisciplinary specialist who feeds from various knowledge and builds for him an interdisciplinary knowledge that enables him to respond to questions with textual content and summaries of studies in various fields. New modification is required then concerning AI knowledge and applications.

The available studies seem to support the following conclusions about the favorable conditions for interdisciplinary science (Klein, 1996; Rhoten, 2003; National Research Council, 2005b):

- Successful interdisciplinary research requires both disciplinary depth and breadth of interests, visions, and skills, integrated within research groups.

- The success of interdisciplinary research groups depends on institutional commitment and research leadership with clear vision and teambuilding skills.

- Interdisciplinary research requires communication among people from different backgrounds. This may take extra time and require special efforts by researchers to learn the languages of other fields and by team leaders to make sure that all participants both contribute and benefit.

- New modes of organization, new methods of recruitment, and modified reward structures may be necessary in universities and other research organizations to facilitate interdisciplinary interactions.

- Both problem-oriented organization of research organizations and the ability to reorganize as problems change facilitate interdisciplinary research.

- Funding organizations may need to design their proposal and review criteria to encourage interdisciplinary activities.

We, from our side, and according to the above-mentioned characteristics and criteria of interdisciplinarity, that for information science to be a conceptually interdisciplinary field, new structures and concepts should be applied. First reconsidering the formation of knowledge in which it integrates and merges with it to enable the program to perpetuate and continue to provide services. Secondly, specialized staff should be representative of that knowledge, each of them in-depth to complement as integrated staff. Integrated knowledge and specialized inter-related staff will create a truly interdisciplinary specialization and produce professionals who derive in-depth knowledge and not an epistemological culture.

REFERENCES

1. Ancient Philosophy. (2023). In *New world encyclopedia*. Retrieved from https://www.newworldencyclopedia.org/entry/Ancient_Philosophy#:~:text=First%2C ancient philosophy tends to,cosmology%2C and theories of nature.
2. Åström, F. (2010). The visibility of information science and library science research in bibliometric mapping of the LIS field. *The Library Quarterly*, *80*(2), 143-159. https://www.jstor.org/stable/10.1086/651005
3. Borko, H. (1968). Information Science: What Is It? American Documentation, 19(1), 3–5. https://doi.org/10.1002/asi.5090190103
4. Braun, A., & Schubert, A. (2003). A quantitative view on the coming of age of interdisciplinarity in the sciences. *Scientometrics*, *58*(1), 183–189. Retrieved from

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Aquantitativeviewonthecomingofageofinterdisciplinarityinthesciences1980-1999.pdf

5. Chang, Y. W., & Huang, M. H. (2011, September 30). A study of the evolution of interdisciplinarity in library and information science: Using three bibliometric methods. *Journal of the American Society for Information Science and Technology*, *63*(1), 22–33. https://doi.org/10.1002/asi.21649

6. Chua, A. Y., & Yang, C. C. (2008). The shift towards multi-disciplinarity in information science. *Journal of the American Society for Information Science and Technology*, *59*(13), 2156-2170. The_shift_towards_multi_disciplinarity_i.pdf

7. Dudzikowa, M. (2012). Sytuacja problematyczna interdyscyplinarności w naukach społecznych i humanistycznych (z kryzysem w tle). In: A. Chmielewski, M. Dudzikowa & A. Grobler (eds.). Interdyscyplinarnie o interdyscyplinarności. Między ideą a praktyką (10–37). Kraków: Impuls.

8. Feller, I., & Stern, P. C. (2007). Progress in Science - A Strategy for Assessing Science. In *NCBI Bookshelf. Progress in Science - a Strategy for Assessing Science*. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK26378/#:~:text=Analysis.,important type of scientific progress.

9. Feller, I., & Stern, P. C. (2007, January 1). *Progress in Science - A Strategy for Assessing Science - NCBI Bookshelf*. Progress in Science - a Strategy for Assessing Science - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK26378/#:~:text=Analysis.,important%20type%20of%20scientific%20progress.

10. Fredeman, R. (2017). *The Oxford handbook of interdisciplinarity* (R. Frodeman, R., Klein, J. T., & Pacheco, ed.). Retrieved from The Oxford Handbook of Interdisciplinarity - Google Books

11. Klein, J. T. (2004. "Interdisciplinarity and complexity: an evolving relationship *." *Emergence: Complexity and Organization*, vol. 6, no. 1, Jan. 2004, pp. 2+. *Gale Academic* document (2).pdf

12. Lara (cited in)*The-Interdisciplinarity-of-the-Information-Science*. Available from: https://www.researchgate.net/publication/350895894_The-Interdisciplinarity-of-the-Information-Science [accessed Jul 12 2023].

13. Newell, W. H (2001). A theory of interdisciplinary studies. Issues in Integrative Studies, 19, 1-24. A_Theory_of_Interdisciplinary_Studies.pdf

14. Rascão, J. (2018). *The Interdisciplinarity of the Information Science*. 267–302. https://doi.org/10.4018/978-1-5225-7265-7.CH015

15. Reamer, F. G. (2021). What is Boundary Crossing? *Continued*. Retrieved from https://www.continued.com/social-work/ask-the-experts/what-is-boundary-crossing-89#:~:text=A boundary crossing is typically,that is a boundary crossing.

16. Saracevic, T. (1999). Information Science. Journal of the American Society for Information Science, 50(12), 1051–1063. https://doi.org/10.1002/(SICI)1097–4571

17. Sosińska-Kalata, B. (2020). Interdisciplinarity of Information Science Research: Introduction. *Zagadnienia Informacji Naukowej - Studia Informacyjne*, *58*(1A), 9–23. Retrieved from https://www.researchgate.net/publication/348111870_Interdisciplinarity_of_Information_Science_Research_Introduction

18. Szostak, R. (2013). The State of the Field: Interdisciplinary Research. Issues in Interdisciplinary Studies, (31), 44–6

19. Zeng, J., Cao, S., Chen, Y., Pan, P., & Cai, Y. (2023). Measuring the interdisciplinary characteristics of Chinese research in library and information science based on knowledge elements. *Aslib Journal of Information Management*, *75*(3), 589–617. https://doi.org/10.1108/AJIM-03-2022-0130/FULL/XML

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