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The Element of Uncertainty in Information Seeking

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Abstract:

Information is the basic need of every society. Accurate and reliable information plays an important role in the development of society; however, misinformation or unreliable information leads towards misguidance/destruction of society. Also, misinformation generates uncertainty among society members. So, each member of the society must identify the level of uncertainty to accept or reject the information. Although less uncertainty in information may lead information seekers towards decision making. This research paper explores uncertainty, elements of uncertainty, and levels of uncertainty during information seeking by reviewing the relevant literature. Also, make suggestions for guidance of information seekers that how to meet their required information easily and effectively. The studies also recommend information searching strategies to reduce the level of uncertainty during information seeking.

Keywords: *Information Seeking Behaviour (ISB), Uncertainty in Information, Ambiguity in Information, Information Searching Process (ISP).*

Introduction:

Systematic and organized data always convey a well understandable message to its targeted population which is known as Information. Without information, we cannot live nor participate in any event and even not operate anything for the first time. If the data is not formatted systematically, it causes uncertainty and the targeted population doesn't well understandable as per the aim of the message. So it becomes useless if it does not convey a targeted message to its population. The person who searched the information is known as an information seeker while the process to seek the information is known as the information seeking process. The whole world's technologists are working to develop the systems through which the required information is searched easily without wasting time during the searching process. The aim of designing/developing the information systems is to reduce uncertainty during the searching process. It is mandatory for information seekers to get authentic, accurate, and required information within a very short or limited time interval. It is only possible if the uncertainty is removed/ reduced within the search process of information. Our target is to search for the

required information but the element of uncertainty is always found within information during its retrieval. This research work aims to explore the uncertainty, level of uncertainty, and elements of uncertainty during the information seeking and also to identify the ways through which this uncertainty in information seeking can be controlled.

Streit, Pham, and Brown (2008) discussed that the information uncertainty modeling technique is used to provide confidence in results as well as an indication that how much confidence must be built in the result. Uncertainty has a different meaning, but here the context of uncertainty means the authentication, correctness, and validity of information, which is the true value of information. The uncertainty is produced by things such as prediction, error or imprecision in measurement, linguistics ambiguity, and insufficient or lacking information.

Statement of the Problem:

Information is the most integral element for each society member. Today's world becomes a global village due to the rise in the use of Information Communication Technology (ICT) tools and the Internet. The high use of ICT tools and applications and the availability of the Internet cause information explosion; which causes uncertainty in information. It also creates problems for information seekers during the selection of information from the information hub. The decisions based on uncertain information become complex for information seekers and hence resulted in a delay in decisions. Therefore, it is necessary to know about the uncertainty in information, levels, and elements of uncertainty in information during information seeking; that will help information seekers in quick and correct decisions.

Objectives of the Study:

1. To examine the uncertainty, levels of uncertainty, and elements of uncertainty during information seeking.
2. To propose strategies for reducing uncertainty in information seeking.

Methodology:

The study is based on reviewing the relevant literature to understand the background of the study objectives. Different keywords such as: "uncertainty in information seeking", "elements of uncertainty", "uncertainty and information-seeking behavior", "levels of

uncertainty”, and “elements of uncertainty” were searched in Google scholar. The searched results titles were reviewed to make a selection or rejection of the studies to address the study objectives. After the selection was made based on titles; abstracts of those studies were reviewed for further selection that helps to select more relevant studies. After the selection of studies based on reviewing abstracts, finally, the selected studies' full text was reviewed to make a final selection for the inclusion of the studies in the final review. Also, Google Scholar helps in the selection of relevant databases that is further explored to search for the targeted research materials.

Uncertainty:

Uncertainty is an unpleasant situation, which causes to motivate the person to communicate well to reduce the uncertainty. Uncertainty has an inverse relation with information and can be produced as shown in Figure 1:

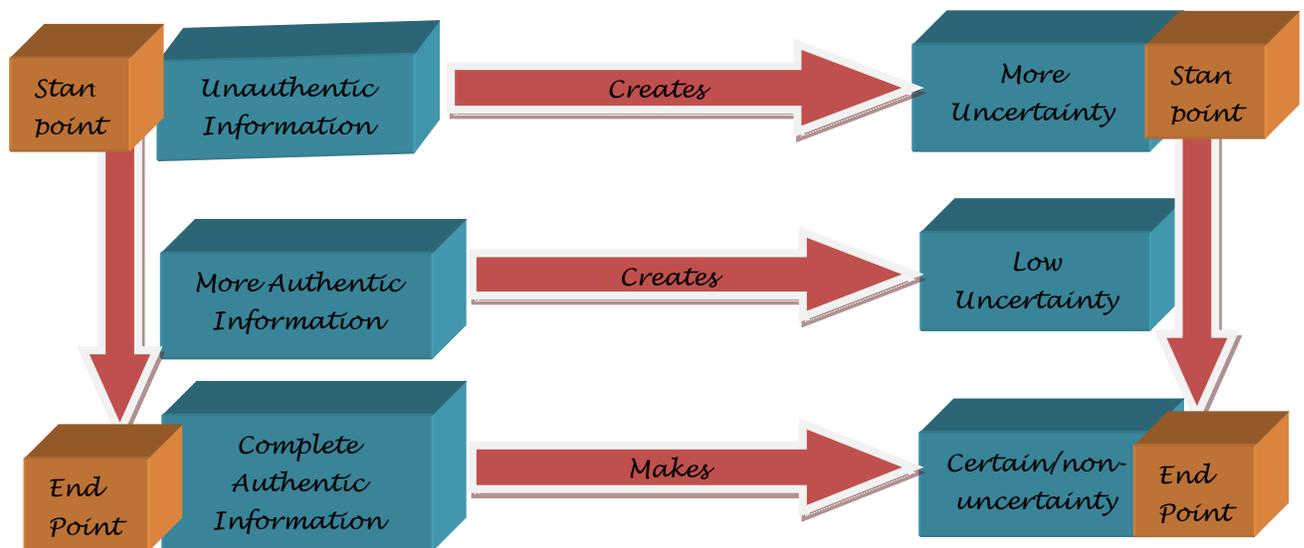


Figure 1: Relationship of Uncertainty with Information

In the first two cases, we see that if one item increases so the other item decreases and vice versa, i.e., that is an indirect proportion between uncertainty and authentication of information.

Berger and Calabrese (1975) discussed stages of relationship development in the context of uncertainty of information. They discussed the relationship development stages in three levels which are: **a) Entry b) Personal and c) Exit.**

At the entry level, the demographic information about the participants like age, sex, education level, job nature, etc, is obtained. At the next level, more information about attitude, beliefs, values, and more personal data through conversation is collected and at point, the personal level begins. At this level during the conversation with each other, they developed a comfortable relationship and share information easily without any hesitation. After this level, the third and last level starts, that is the exit level in which the communicator decides future interaction plans with each other. They may discuss whether to negotiate more ways to allow the relationship or not. However, at this level, a particular conversation reaches the end and hence it is called the exit level. This prototype particularly occurs when a person meets with new people or when new topics are introduced in a relationship. The above discussion is shown below (Figure 2).



Figure 2: Levels of Information Seekers

High levels of uncertainty exist when there is no communication among the concerns; however, the uncertainty is decreased by making communication among concerns.

There are two main levels of uncertainty, which are given below:

- i. **Source Uncertainty:** This level of uncertainty is often available in scientific labs, in which results vary from lab to lab due to the procedures adopted during their testing. Source uncertainty can be further classified as:
 - a) random: that cannot be predicted, and
 - b) systematic: that is related to personal, procedural, or instrumental uncertainty.
- ii. **Content Uncertainty:** It is that uncertainty caused by the contents, e.g. the uncertainty created by contents from the different documents with conflicted reasoning. So it is known as content uncertainty. It is further classified into two types:
 - a. Co-relational Uncertainty: the uncertainty produced by mutual relationship.
 - b. Evidential Uncertainty: the uncertainty produced by evidence or proof.

Information:

Wildbur and Burke (1998) defined information as “any difference which makes a difference” (p-6). Valid Information causes a reduction in uncertainty. If a person is invited by his friend to a dinner for the first time and he lost the apartment number in a building containing four floors with each floor contained eight apartments. Now the person asked there from someone who told him that his friend’s apartment is on the fourth floor. So the uncertainty becomes low from thirty-two to eight only. This shows that correct information reduces uncertainty. The whole World is working on information to store it and retrieve when it is required. But the information explosion is too high and at each second much information is produced that creates uncertainty and causes anxiety for the information seekers during seeking their required information. Many systems are introduced for information retrieval to reduce the uncertainty of information seekers around the globe.

Information Seeking:

The process of searching for information is known as information seeking. The researchers are always trying to search for much more relevant information that helps them during their research projects or activities. Information seeking is a basic process for every researcher to identify the basic information to start or complete their research work/ project. Now information is produced in many thousands of bits each second. The information production ratio is too high; which causes many problems for researchers during the information searching and retrieving process. Sometimes the flow of information creates confusion for information seekers to decide about the authenticity of the information. Let explain the situation with help of the Dewey Decimal Classification (DDC) scheme which is used within libraries to organize library collections for quick and easy access in the libraries. If a library user does not aware of the DDC system, so he/she will face problems during searching the library materials within the library. So every information seeker must understand and learn about different systems, schemes and strategies for information searching and retrieving physically before going to start the assignments.

Uncertainty in Information Seeking:

Different models and systems are developed by scientists and system developers for information searching, saving, organizing, retrieving and accessing. They discussed the processes and stages involved during the searching process in detail. All these models and systems are designed and developed to reduce the uncertainty during searching or seeking information. Uncertainty in information seeking is critical while achieving the targeted goals. Two important concepts related to this subject discussed by Berger and Dibattista (1992) are: the first one is *Goal Clarity* and the second one is *Goal Ambiguity*.

Goal clarity permits the staff members to be more focused on the assigned task which is result-oriented, rather than spending the time to consider correct actions with accurate direction. If the worker considers information for the completion of the task, both the worker and the employer are benefited. While in the case of unclear information, a worker first works to clarify the information before he/she starts the assignment. It causes a delay in work due to clarifying the information first and hence the result may also be late due to the process started lately. In the end, the worker is responsible for the completion of the assignment lately; it has also created question marks on the abilities of the worker; however, the messenger does not convey a message. This is the essence of goal ambiguity. However, goal ambiguity is a very volatile concept. It can display both negative and positive effects. Goal ambiguity can be negative because of the “lag” time that it creates, as discussed previously. Positively, ambiguity can affect goals for employees because of the different nature of goals. Goals are set for workers to measure their process and productivity. So, if a goal appears ambiguous to the worker, the worker may not achieve targeted results on time due to uncertainty in the target goal. Therefore the worker must receive clear instructions instead of ambiguous instructions; that will help the worker in meeting their goals timely. Clear communication has a key role in passing information accurately. However, collecting information is a complete process that is necessary for information seekers to understand before starting any assignment.

Uncertainty in information seeking is the most important element and many researchers, scientists, system engineers working on the development of information searching processes or information seeking processes. The main purpose of these researchers, system developers,

scientists and system engineers are to make information more valid and authentic and to remove the element of uncertainty of information seekers. The main purpose of information seeking is to search for more authentic information to decrease the uncertainty and in the case of known information there is no/ less uncertainty and hence it needs no information to seek or to search. It simply shows that the information-seeking process has an indirect relationship to uncertainty and vice versa. If one value increases the other may decrease and vice versa.

Information seeking α (1/uncertainty)

Or

Uncertainty α (1/Information seeking)

Where ' α ' is the sign of proportionality.

The information searching is initiated when uncertainty is more or no understanding with the development of information. Let take an example of a person who is not known to us. Uncertainty is at its peak, but when we start talking to that person and try to know him/her more and more, so automatically the uncertainty becomes down and at the end, uncertainty is reduced and at that end-stage, no further information is required to us.

Johnson and Meischke (1993) discussed in Johnson's Comprehensive Model of Information Seeking (CMIS) given in Figure 3:

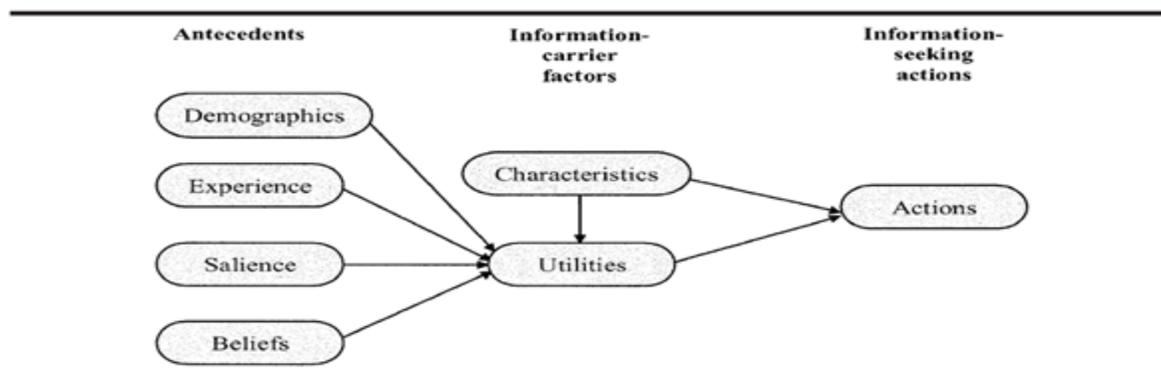


Figure 3: Johnson's Comprehensive Model of Information Seeking (CMIS).

The whole process shown in Figure 3 focuses on information-seeking actions that are based on the information, carrier factors consist of characteristics and utilities. The utilization is based on antecedents like demographics, experience, saliency, and beliefs. This antecedent helps in the utilization of the whole process during information seeking and the action taken in the process

of information seeking based on the utilization of antecedents information used. The whole process guides the information seekers. If the guidance is not provided to the information seekers, they will be affected by uncertainty during their information seeking and hence it causes difficulties for them to reach or retrieve their targeted information within a limited or scheduled time.

Belkin (1980) discussed the idea about information seekers, that sometimes experts of the system are not able to retrieve the required information. He called this “Anomalous States of Knowledge” (ASK). In that context, the uncertainty generates the step of information seeking.

The information search process (ISP) model proposed by Kuhlthau (1991) is shown in Figure 4. In her model, the information search process is divided into six stages: task initiation, topic selection, prefocus exploration, focus formulation, information collection, and presentation. Kuhlthau identified these six stages in terms of feelings, thoughts, actions, strategies, and moods. She proposed the “uncertainty principle” in information behavior, i.e., “uncertainty due to a lack of understanding, a gap in meaning, a limited construct initiates the process of information seeking”. Now the whole process shows that uncertainty is the basic foundation for the information search process as well. Furthermore, it is decided that it is the state of cognition, which causes anxiety or stress, and starts initiation. The initiation may call uncertainty due to which the process of information searching is started. Thus Kuhlthau’s information search process model and uncertainty principle draw attention to the human information behavior as a process and understand it as cognitive and affective components, and influencing the human information behavior.

| Stages in ISP | Feelings Common to Each Stage | Thoughts Common to Each Stage | Actions Common to Each Stage | Appropriate Task According to Kuhlthau Model |
|------------------------|--|--------------------------------------|--|---|
| 1. Initiation | Uncertainty | General/Vague | Seeking Background Information | Recognize |
| 2. Selection | Optimism | | | Identify |
| 3. Exploration | Confusion/Frustration/Doubt | | Seeking Relevant Information | Investigate |
| 4. Formulation | Clarity | Narrowed/Clearer | | Formulate |
| 5. Collection | Sense of Direction/Confidence | Increased Interest | Seeking Relevant or Focused Information | Gather |
| 6. Presentation | Relief/Satisfaction or Disappointment | Clearer or Focused | | Complete |

Figure 4: Kuhlthau's Information Search Process (1991)

Shah and González-Ibáñez (2010) made the discussion based on Kuhlthau's Information Search Process model in which they studied a group of 42 pairs and demonstrate their information search process into two sessions with mapping it at different stages. In particular, they discussed that there is a logical progression from uncertainty to the collection of information among the participants; and that is the lack of clear segmentation between stages of formulation, information need, exploring information, and collecting information.

Huurdeman and Kamps (2014) discussed the information needs of information seekers and studied many models of Information Search Processes and mainly focused the Kuhlthau's ISP model which divided the search process into multiple stages. To make the searching easy and convenient to information seekers; they focused on developing a single interface for searching that may be a simple one or a complex one. The main purpose of designing a single interface for information searching is to decrease uncertainty during information seeking.

Wilson (1997) model consist of the elements that are started from the context of the information need to the activating mechanism (stress/coping theory) towards intervening variables (like psychological, demographic, role-related environment, and source characteristics) then it goes towards activating mechanism next stage (containing the risk/reward theory, social learning theory/self-efficacy) and then it goes to the next element of information-seeking

behavior (containing the stages like passive attention, passive search, active search, and ongoing search) then at the end, the next element is information processing and use, which leads a person towards the context of information through a person in context. Going through the Wilson model, all the elements are involved to reduce the uncertainty and finally to meet the required information. The complete process of the model is shown in Figure 5.

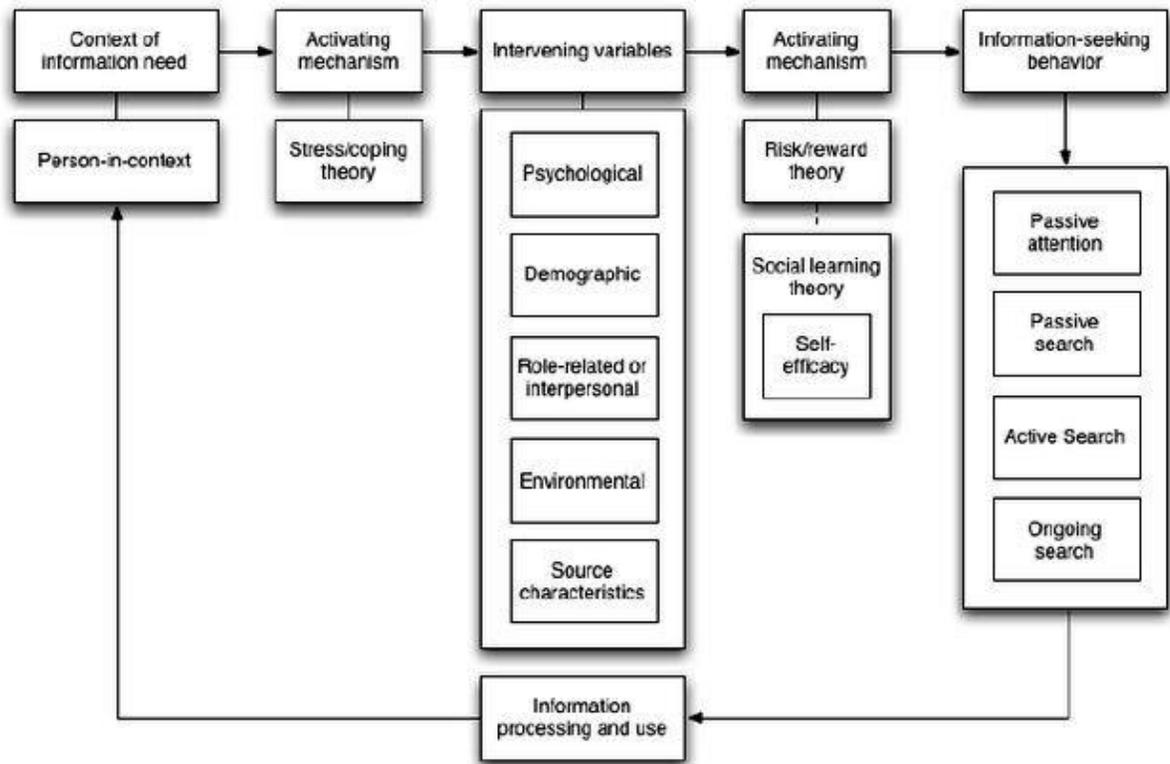


Figure 5: Wilson's General Model of Information Behavior (Wilson 1997)

Anderson (2006) associated the uncertainty with the threat in a positive manner, that the uncertainty in information seeking broadens the area of searching and exploring the required information, and hence it motivates the information seekers during information seeking to introduce new areas as well. Thus it is the uncertainty, which contributes to creative thinking and makes a new way towards innovation. She further discussed that uncertainty is a complex feature of human nature, which performs between desired and undesired forms of uncertainty. It also motivates the information seekers during their information research process due to finding new and unexpected results from searching.

Warren (2007) discussed the hybrid uncertainty in information with different models working for the lower level of information into higher-level measures for decision making. Further explained that there are various forms of uncertainty present in the models including hybrid uncertainties. After reviewing already available approaches for higher-order uncertainty in information, a new approach is presented to enable more trustworthiness of uncertainty representation with more reliable calculations of uncertainty management.

Khan (2018) assessed Taylor's Information Use Environment theory by reviving the studies which applied the theory to different groups. Findings of the study revealed that fresh professionals have more uncertainty than experienced professionals. The reason for high uncertainty in fresh professionals during information searching is the less knowledge about the sources of information and the culture of the organization and hence they use traditional ways of searching their required information. However, experienced professionals think beyond the traditional resources as they target to complete the assigned task instead of trying traditional resources.

Rafiq, Ali, and Khan (2020) conducted a study on information literacy instruction in university libraries of Pakistan. The study finding revealed that academic libraries situated in Lahore are mostly delivering information literacy sessions to train the fresh graduates to reduce their uncertainty while searching their required materials or solving their assignments. They prefer to deliver such information literacy sessions in computer labs to train library users practically. The continuous information literacy sessions arrangements showed that the academic librarians considered the condition of the uncertainty of the graduates while searching or solving their assignments/projects.

Suggestions to Reduce Uncertainty in Information Searching Process:

First of all, it is necessary to measure the information seekers' level of understanding and awareness about the task or work that they wish to start. To judge the level of understanding of information seekers, it is suggested to prepare a basic questionnaire consist of four to five questions. These questions may be designed for a basic level of understanding of information seekers. However, other questionnaires of intermediate level and Advance level should be designed to know about the level of expert information seekers. In this way, the level of

uncertainty of information seekers towards their targeted information may be identified easily and hence the training or orientation program may be designed easily to guide the targeted information seekers.

The information seekers may be guided to search through different tools such as your personal computer, smartphone, and other mechanical devices. They should also search from the office computer without logging into their Google/ Microsoft account or they must use computers or laptops for searching any queries. So it will provide different results which may help the information seekers towards their choice of information or solving their query or problem.

The information seekers must know the different terms or names or synonyms for the searching query. Sometimes the information seekers searching the query may not be found in that particular type or name. So information seekers must know their targeted query in-depth before going to start any particular search etc.

It is also necessary for information seekers to know the purpose and context of their query to select the right information. Also, the context of the problem should be clear for information seekers to report well and on time.

Conclusion:

It is concluded based on overall revived studies, that the element of uncertainty in information seeking is always available but the quantity of the uncertainty may vary from process to process. The uncertainty affects the overall process of information seekers during information seeking. More uncertainty causes more discussion or searching to make it certain or nearer to non-uncertainty. Information seekers always focus on searching for their required information and the purpose of information seeking is to reduce the uncertainty and to achieve their targeted information promptly to complete their tasks. However, fresh information seekers face more uncertainty while solving their tasks and expert information seekers face less uncertainty while solving their assignments.

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