

Models of Knowledge Translation

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Abstract: *The purpose of this paper is to present some conceptual models for the knowledge translation process in its extended semantic dimension. Knowledge translation is usually understood through its primary meaning of translating from one language into another language. However, knowledge translation is a concept with a larger semantic universe that has been used in the last years in many research domains, especially in healthcare systems. The basic idea is to maximize the knowledge transfer between a sender and a receiver understanding the knowledge deficit and the absorptive capacity of the receiver. The method used in this paper is a functional analysis of different types of knowledge transfer and of searching for their critical elements. Based on this functional analysis, the paper presents a series of knowledge translation models and some basic competencies needed for the people who initiate knowledge translation. Findings show the complexity of the expert knowledge translation and the need to transform the direct linear process into a series of several processes linked in a cascade. For each sequence, there is a smaller knowledge deficit than the initial one, such that the absorptive capacity of the receiver can accept it.*

Keywords: absorptive capacity; knowledge; knowledge dynamics; knowledge deficit; knowledge translation; expert knowledge translation model.

Introduction

Knowledge translation is a generic process we can find in almost all communications when the source and the target or the sender and the receiver of the messages have significant differences between their semantic universes. Thus, the translation process should not be considered identical to a communication one. A translation process implies communication between two actors, but communication does not necessarily imply a knowledge translation. The communication associated with knowledge translation is totally different from the mathematical communication theory created by Claude Shannon (1948). For Shannon, messages sent along a communication channel have no meaning. They are only groups of electrical signals without any attached semantics (Bratianu & Bejinaru, 2023). From the knowledge management perspective, communication is based on messages with meanings for both the sender and the receiver. Also, the communication process, and thus the translation process, implies data, information, knowledge, and knowledge dynamics (Bratianu, 2023).

Recently, *knowledge translation* received some extended interpretations and has been used as a research topic in the healthcare systems literature (Cobianchi, Dal Mas & Angelos, 2021; Dal Mas et al., 2020). It is considered as the process able to bridge the gap between research and practice in the healthcare systems (CIHR, 2004, 2016). Although it is a rather large semantic extension, the concept stimulated a lot of research and publications in the last few years. However, we consider that knowledge translation should be adequately understood, defined, and used. From this point of view, the literature shows an important gap, and the purpose of this paper is to reduce it by

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critically performing a semantic analysis of the concept and its interpretations. We may formulate the following research question:

RQ: What are the critical elements of the conceptual model of knowledge translation?

The rest of the paper is structured as follows. After this brief Introduction, we present a literature review looking for the most significant aspects of knowledge translation. Then we explain the methodology and present the results of our conceptual research. Finally, we present the conclusions and limitations of the paper.

Literature review

Baumbusch et al. (2008) consider knowledge translation as a process aiming to bridge the gap between science and practice in the medical domain. It is a gap between knowing and doing. In this extended perspective, there are several knowledge translation processes with different actors and different knowledge deficits. The first process is knowledge translation from the medical research field toward medical practice in clinics and hospitals. Medical doctors learn how to perform their activities using the newest results from research and using new technologies with better performances. The second type of process is that between physicians and their patients. That is sometimes more difficult because many patients have a low absorptive capacity, and physicians should be aware of the knowledge deficit. Then, it is the reverse process of knowledge translation between patients and physicians when patients should explain their health problems in non-medical terms. Finally, there are many translation processes between physicians from different areas of medical practice. It is evident that knowledge translation implies communication, but it cannot be reduced to it.

The Canadian Institute of Health Research (CIHR) supports this encompassing perspective of knowledge translation between research and practice. Most researchers adopted the definition formulated by CIHR within this perspective and became one of the most quoted definitions. Knowledge translation is “The exchange, synthesis and ethically sound application of knowledge with a complex system of interactions among researchers and users – to accelerate the capture of benefits of research for Canadians through improved health, more effective services and products, and a strengthening health care system” (p. 2). Later on, CIHR (2016) elaborated another definition, saying that knowledge translation includes almost all knowledge processes, from knowledge creation to knowledge transfer down to knowledge application. However, trying to integrate all processes which are specific to knowledge management and put them under the label of “knowledge translation” cannot be a solution we can agree with. Knowledge translation is one of the many processes which are specific to knowledge management and not vice versa (Liu, 2020; Massingham, 2020; Nonaka & Takeuchi, 1995, 2019).

World Health Organization (WHO, 2004) explains knowledge translation in the following way: “The exchange, synthesis and effective communication of reliable and relevant research results. The focus is on promoting interaction among the producers and users of research, removing the barriers to research use, and tailoring information to different target audiences so that effective interactions are used more widely” (p. 5). It is the same extended interpretation of knowledge translation to cover the whole gap between research and its application.

Estabrooks et al. (2006) suggest that the closest model to explain knowledge translation is *the diffusion innovation model* developed by Rogers (2003). The metaphor taken from chemistry and physics suggests that innovation needs time to be communicated through different channels to be known and applied by an increasing number of people. To understand the whole process, one should consider at least four main elements: innovation, communication channels, time, and a social system. Making a parallel between innovation diffusion and knowledge translation, we may find some similarities

but not enough to use the diffusion model for supporting knowledge translation (Davison, 2009).

Colquhoun et al. (2010) show in their scoping review of knowledge translation that most published works in health care systems consider that the concept reflects all necessary processes to bridge the research with its application in hospitals by physicians. "Studying optimum strategies or interventions to close this gap is the science of knowledge translation" (Colquhoun et al., 2010, p. 271).

Methodology

This is a conceptual paper. Based on a critical literature review and a cross-discipline analysis, we use the method of model creation, and we will present three significant models to explain knowledge translation for three different contexts. Also, we present the most important competencies necessary for the actors involved in knowledge translation. The basic hypothesis is that to bridge the gap between the research and applications, people need to use several knowledge translation models, not just one.

Results and discussion

The language translation model

The oldest and probably the most known model for knowledge translation is that of performing a translation of a book from one language (A) into another language (B). The process is centered on the *translator*, who knows both languages A and B and is able to interpret the text written in language A and transform it into a text expressed in language B. The whole process is asynchronous because the writer and the reader enter the process at different times. The situation is changed when instead of working with a written text, the translator acts on a verbal text of a present speaker addressed to a present receiver. The process is synchronous, and the translator is usually called *interpreter*. The Standard ISO 17100: 2015 defines a translator as being "a person who translates" (p. 12), and the process of translating means "to render source language content into target language content" (p. 12). An interpreter is a person who "render spoken or signed information from one language to another language in oral or signed form" (p. 10). The time dimension is important because, for a translator, there is usually enough time to search for the best formulation of the new text, while for an interpreter, such time does not exist. The interpreter must follow the speech and translate it immediately without the necessary time for reflection. Figure 1 presents an illustration of the language translation model.

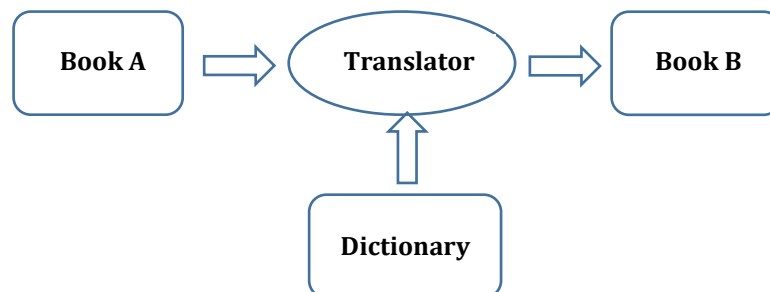


Figure 1. The language translation model
(Source: Author's own research)

Each book is written in a different semantic universe that contains a specific alphabet, a specific logic for writing words, sentences, and phrases, a specific grammar that contains rules for structuring sentences and paragraphs, and meanings associated with

each concept. Some languages, like the Chinese and Japanese ones, do not use alphabets composed of letters as we use in many countries, but ideograms or ideographs which represent ideas. Thus, knowledge translation when one language is based on using an alphabet and the other language is based on using ideograms constitutes a real challenge for the translator who must master both languages and know very well both cultures. Another translation challenge is when the books are written in a certain technical, business, or medical domain where people use jargon. If the translator is not familiar with the jargons, the translation result may contain some semantic errors (Bratianu, 2018; Bratianu et al., 2021). Holden and Glisby (2010) studied some of the most frequent errors made in translations in the domain of knowledge management, especially in interpreting the meaning of the concept of "tacit knowledge" in different languages and cultures. Moreover, there are semantic errors even in translating the expression "knowledge management". For instance, some authors translated "knowledge management" in Romanian as "management of knowing," which converges toward philosophy and not to management, where "knowledge" refers to intangible resources and not to the philosophical search for truth.

There are three different situations when the language translation model can be applied: a) the writer or the speaker knows both languages, and he can perform the translation; b) the reader or the listener knows both languages, and he can perform the translation; c) the translator is a third party in this process, a situation that is frequently used. The first two situations appear only as limiting cases. Thus, when we discuss the language translation model, we think at the third case.

The communication model

Knowledge translation has in its structure a communication framework. Figure 2 presents an illustration of a generic communication model.

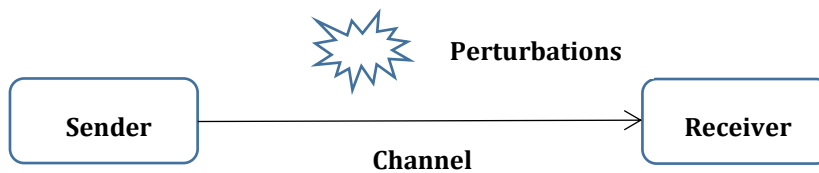


Figure 2. The communication model
(Source: Author's own research)

The communication model represents a synchronous knowledge translation model. It is composed of a sender, a receiver, a communication channel, and perturbations coming from the environment. The sender and the receiver have different semantic universes, and they may belong to the same culture or to different cultures. There is a knowledge translation if and only if there is a knowledge deficit between the sender and the receiver. This deficit is defined as a difference between the levels of knowing between the endpoints. The knowledge conveyed from sender to receiver is limited by the absorptive capacity of the receiver. If that capacity is very low, the receiver cannot accept a good part of the knowledge sent and thus it is lost. The sender should be aware of that limitation, and he should adjust his communicating knowledge to that absorptive capacity. Perturbations represent the negative influence of the environment on the communication process; they can distort the messages sent along the channel and make it difficult to understand the correct meanings by the receiver. In order to reduce the effect of perturbations, many senders use redundant messages.

It is important to underline the fact that in this translation model, both actors should be aware of the field composition of knowledge and of its continuous dynamics (Bratianu, 2022; Bratianu & Bejinaru, 2023). That means being aware of the role of communicating

emotional knowledge through body language, especially in Asian cultures. In the communication model, it is assumed that both the sender and the receiver speak the same language, and the translation is done from the source semantic universe into the target semantic universe. Think about a professor who teaches students and translates some of his knowledge for the students at their level of understanding.

The expert knowledge translation model

Expert knowledge refers to a high level of knowledge in a specific research domain. Trying to communicate this knowledge is not so easy when there is a large knowledge deficit between the sender and the receiver. The main barrier is the receiver's absorptive capacity. If the sender is not aware of this situation, a good part of the knowledge is lost or misunderstood. Think about a physician who explains to a patient what to do for his sickness but at a high medical level for which the patient has no ideas. The result is far from being acceptable or useful. Therefore, the physician should translate his expert knowledge into a lower level without the medical terms hard to be understood by common people and medical scientific logic. He should use instead a metaphorical thinking and usual concepts low educated people could understand.

The solution for making functional the expert knowledge translation model is to break down the whole process into several processes characterized by smaller knowledge deficits. Thus, we can obtain a *cascade translation model*. Figure 3 presents an illustration of an expert knowledge translation cascade composed of three stages aligned in a linear sequence.

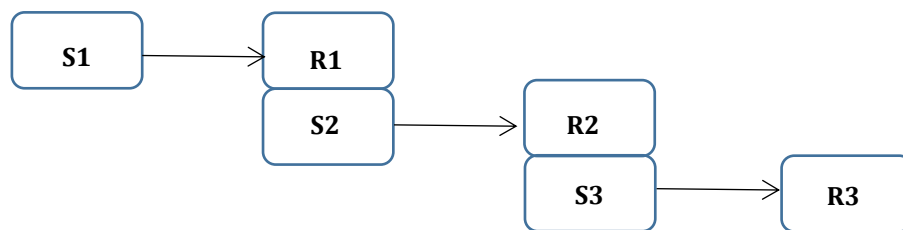


Figure 3. The knowledge translation cascade model
(Source: The author's own research)

In this example, the whole process has been broken into three stages, such that for each stage, the knowledge deficit is smaller than the initial one. In stage 1, sender S1 translates his knowledge to the receiver R1 that has an absorptive capacity large enough such that most of the transferred knowledge to be understood. In stage 2, receiver R1 becomes sender S2 and translates the new knowledge to the receiver R2. In the third stage, receiver R2 becomes sender S3 and translates his knowledge to the final receiver R3. It is important to remark on the fact that the division of the initial knowledge deficit into three parts is not linear. Each knowledge deficit must accommodate the level of absorptive capacity of the respective receiver. Moreover, the three components should not be equal from a semantic point of view. Using this model, we optimize the whole process and reduce the risk of knowledge loss (Bratianu, 2018). A good example can be seen in the medical domain, where the initial knowledge deficit is measured between the scientific knowledge level and the level of understanding of common people without a minimum medical education level. R1 is a researcher, and he would like to implement his new results in practice. If he would like to translate his findings directly to a patient, there is a high risk the patient not to understand those findings because the knowledge deficit is too large and the patient's absorptive capacity is too low. Thus, the whole process is broken into three stages. In stage 1, the researcher (S1) from a research laboratory translates his knowledge to a researcher (R1) from a hospital. In stage 2, the receiver R1 becomes the sender S2 and he translates his new knowledge to the physician (R2). In stage 3, the physician becomes sender S3 and translates the new knowledge to

one of his patients (R3). In this way, each translation stage bridges a fraction of the initial knowledge gap, and thus the risk of knowledge loss is reduced significantly. The expert knowledge translation in cascade can be applied in a domain where the initial knowledge deficit is very large.

In all of these knowledge translation models, those who create knowledge and want to translate it to other people should develop a series of competencies in order to improve the effectiveness of the whole process. The following are some of the most important competencies for knowledge translation.

The linguistic competence

The translator should master both languages of the source and of the target messages. The focus is on the semantics and on the contexts of using the concepts. As Pinker (2007) remarks, "Semantics is about the relation of words to thoughts, but it is also about the relation of words to other human concerns. Semantics is about the relation of words to reality – the way that speakers commit themselves to a shared understanding of truth and the way their thoughts are anchored to things and situations in the world" (p. 3). If knowledge translation is done in the same language, then we discuss two different semantics universes, one of the sender (S) and the second one of the receiver (R). The sender should be able to guess the semantic universe of the receiver and his absorptive capacity based on the education level or the previous experience of that individual. The process is more difficult when the language gap (i.e. the sender and the receiver belong to different cultures) converges with an expert knowledge gap. This is the case for a patient from one country going for medical treatment in a foreign country.

The translation competence

The translator should be able to understand the meaning encapsulated in a given text and only then perform the translation, which implies choosing the best meaning for each expression. It is not a mechanical translation but one based on thinking and cultural experience. That is especially important when one of the languages is based on ideograms, like the Chinese language. In this situation, the context becomes important in choosing the most adequate expressions. The logic of communication should not be ignored. For instance, in the USA, the logic of communication requires the messages to be clearly formulated and based on keywords. In Japan, the logic of communication is somehow opposite. The messages should be fuzzy such that the receiver becomes a part of the dialogue trying to get the right meaning of those messages. Also, the grammar of these two languages is quite different. It is extremely difficult to use grammar with different forms of verbs for different time situations and then to translate sentences into another language whose grammar has only one form of verbs for any time situation, that of the present time. In this second case, the past and the future are guessed from the context. For instance, to translate the English sentence "I shall come to you next week" into a language that has no future for verbs it would be "I come to you next week", and we decode the future from the adverb "next week". Sometimes it could be even much more difficult to translate in the other way, from a language with only one form for verbs (i.e. for the present time) into a language with many forms of verbs. For instance, this is a difficult stance for a Chinese individual to learn the Romanian language. This example can be further explained in the next section.

The cultural competence

Cultural competence occurs when the writer and the reader belong to two cultures that are quite different, like American culture vs. Japanese culture. In this case, the translator should be aware of the differences between those cultures and how to correctly use the mapping function from language A to language B. In the literature, research on cultural intelligence increased significantly in the last years due to the globalization of business and the need of leaders with a high level of cultural intelligence (Bratianu & Paiuc 2022,

2023). Therefore, to the language gap we should use also the cultural gap that implies different sets of values and principles. For instance, in Western countries, "Thank you" is a simple language expression, eventually associated with a large smile. But in Japanese culture, just saying "Arigato" (i.e. the rational translation of "Thank you") means nothing. The person who wants to thank should bend his body in front of the other person and then say "Arigato". Therefore, in the Japanese culture, rational, emotional, and spiritual knowledge are integrated altogether in thanking. That is a real barrier to knowledge translation in a multicultural environment.

The domain competence

The translator should be able to understand very well the activity domain in which the translation is made. It is one thing to translate a novel and another one to translate a text of mathematics, physics, or philosophy. There are many concepts that have specific meanings in different activity domains. For instance, the word "string" in physics has a different meaning than that used in everyday language. Another example could be the concept of "information," which is totally different in the mathematical theory of communication created by Shannon (1948) than its use in the knowledge management theory and practice (Bratianu & Bejinaru, 2023). In the Shannonian theory of communication, the concept of "information" is void of any meaning. It is a pure mathematical concept used to represent a probability distribution within a set of electrical signals. In knowledge management, "information" is data with meaning. It indicates factual events or stances. Not knowing this basic difference creates many difficulties to the researchers in knowledge management using the concepts of "information" and "information entropy".

The learning competence

Knowledge translation is using natural language for communication. But language is a dynamic system, and some of the words may change their meanings in time or acquire new meanings, especially when they are used in other scientific domains. Therefore, the actors involved in knowledge translation should learn the new meanings of those words in order to understand properly the new knowledge. For instance, the concept of entropy was introduced in physics by Clausius in 1865 as a measure of irreversibility (Bratianu, 2019) and a key new concept to explain the transformation of mechanical energy into thermal energy. In 1948, Shannon used this concept for his mathematical theory of communication, defining the concept of *information entropy*. Due to its semantic power, the concept was adopted in many other domains getting new meanings related to order and disorder (Chaldize, 2000). Learning should support knowledge translation and knowledge dynamics.

The problem-solving competence

The translation process may create new situations for which there is no known solution or there is ambiguity between different possible solutions. These are non-standard problems, and translators should be able to create new solutions based on their knowledge and creativity. Solving problems implies an open mind and the ability to imagine a set of potential alternatives for the best answer. For instance, in the expert knowledge translation model, the sender does not and has no measure to help him in evaluating from the beginning the absorptive capacity of the receiver. Therefore, it is rather difficult to measure the knowledge gap. The sender should look for several characteristics of his receiver and guess his level of understanding and its associated absorptive capacity. That is a frequent situation when problem-solving is a necessary competence. The educational system should develop problem-solving competence, but there are many educational systems based on linearity and deterministic logic which

ignore such kinds of competencies. The result is that people are always expecting clear, well-formulated, and linear problems for which there are well-known solutions.

The semantics competence

Semantic competence is closely related to linguistic competence, but it includes the whole spectrum of knowledge (i.e., rational, emotional, and spiritual) and non-verbal languages. In direct and face-to-face communication, the sender should always look at the body language of the receiver and understand from his facial expression if he understands or not the knowledge received. This emotional feedback can help the sender in adjusting his level of knowledge expertise in order to avoid knowledge loss. Moreover, semantics competence implies a good knowledge of the culture of the receiver to get a better understanding of the meanings associated with the words and their structure. For instance, in Japan, silence is considered in communication as important as spoken words. The ability to de-coding silence is a part of the semantics competence.

The social competence

Knowledge translation is always performed within a given social context. Understanding that specific context is very important for choosing the adequate behavior and mindset for the sender. Social competence involves the ability to understand and create social relations. It is based especially on emotional and spiritual knowledge fields (Gladwell, 2005; Goleman, 1998).

The digital competence

In the last decade, *digitalization* has become a global phenomenon that influences all aspects of our work and living. Using computers, smartphones, tablets, or intelligent robots implies a good understanding of digital literacy (Bratianu et al., 2021; Garcia-Perez et al., 2020; Hadad & Bratianu, 2018). Recently, the advance made by the family of ChatGPT software using artificial intelligence requested new aspects of digital competence, which should be a part of the knowledge translation processes. Also, actors involved in knowledge translation should be aware of the power of machine translation programs but also of their limitations.

Conclusions

Knowledge translation can be considered a generic process in our work and social life. Although the interest in it increased almost exponentially in the healthcare systems, we should be aware of its importance in all activity domains. Understanding knowledge translation and its different characteristics can help us in using it more effectively. The present paper focuses on its qualitative dimensions and proposes three generative knowledge translation models. We call them generative because they can be identified and used in many research and social contexts.

We propose and explain the language translation model, the communication model, and the expert knowledge translation model. For each model, we describe its main components and their functionality. We underline the importance of estimating the knowledge deficit and understanding the absorptive capacity of each receiver in order to avoid the phenomenon of knowledge loss. For the expert knowledge translation, we suggest breaking down the initial knowledge loss and constructing a knowledge translation cascade composed of several smaller knowledge translation processes. Also, we identify a series of competencies people involved in knowledge translation have.

The paper is conceptual and based on a literature review and metaphorical thinking. Thus, an important limitation is the lack of any study cases to demonstrate the usefulness of the knowledge translation models proposed and explained in this paper.

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