

TECHNOLOGY ADOPTION. ELEMENT OF DIFFUSION THEORY

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Abstract: The end result of the technology diffusion process is the adoption, implementation and institutionalization of a certain technology. An organization or individual [1] adopts an innovation by making a decision; [2] implements diffusion through testing and implementation; [3] The institution implements technology through full support and its incorporation into the daily routine. Adoption theory focuses on the individual and the choices he or she makes about accepting or rejecting a given invention. In this article, the authors propose a synthesis of knowledge on the theory of technology adoption and highlighting the most important aspects that practitioners in the field must consider. Maximizing the adoption rate is a responsibility of those involved in innovation. Examination of adoption and dissemination theories reveals a number of distinct issues that influence an individual's decision to accept a technology. Finally, the adoption and dissemination processes have the broad characteristics of a theory of development - change takes place relatively slowly and in an orderly manner. Individual qualities, innovation characteristics and individual abilities influence the final decision and affinity for a technology.

Keywords: technology adoption; theory of diffusion of innovations; technology; process;

1 INTRODUCTION

In this paper, we aimed to synthesize the models of technological diffusion existent in the specialty literature. We believe that this article may represent a starting point for anyone who is interested in this process, given the present context in which more and more practical uses

of the theory of the diffusion of technology have begun to emerge.

The application of novel concepts in commercial settings, which in turn motivates the creation of cutting-edge technology and goods, is one of the key drivers of economic expansion.

The success of every company requires a healthy dose of innovative thinking and creative

output. Therefore, making investments in this field is quite crucial if you want to acquire a competitive edge and keep up with the latest developments in this fast shifting industry. As a result, in a market that is highly competitive, it is crucial for businesses and entrepreneurs to constantly look for new possibilities and make the necessary preparations for transforming those chances into new goods and services.

Why does one person choose to accept a technology while another chooses to resist? What effect does social environment have on the choice to adopt? Adoption of new technologies is a complicated and intrinsically social developmental process. Individuals develop distinct (but adaptable) conceptions of technology, which impact the adoption process. Facilitating the adoption of technology requires addressing cognitive, emotional, and contextual problems.

We are able to have a better understanding of the aspects that play a role in the implementation of interorganizational systems by applying the institutional theory (IOSs). The Iacovou, Benbasat, and Dexter model (1995) investigates the properties of IOSs that impact companies' decisions to embrace new forms of information technology. The examination of these models takes into account both the empirical literature and the distinction between variables that are independent and those that are dependent.

Both the diffusion on innovation (DOI) framework (Rogers 1995) and the technology, organization, and environment (TOE) framework will be discussed in this article (Tornatzky and Fleischer 1990)

2 INNOVATION DIFFUSION

The creation of a new product or service, the provision of a new service, or the introduction of a new method, new ideas, or new phases within an organization are all examples of innovation. It is important to put new ideas through rigorous

testing before bringing them to market so that one may fully understand both the benefits and drawbacks of any concept.

Economists have come to the conclusion that boosting wealth and raising living standards can be accomplished primarily via innovation, which may be defined as the invention and acceptance of new business models, products, and services. As a result of the upheaval brought about by global competition and technological pressures, associations are being forced to investigate more effective ways to reinvent themselves.

According to Peres et al. (2010), the term "diffusion of innovation" refers to a social influence-driven process of new goods and services penetrating existing markets. This definition comes from the perspective of business. In addition to this, it was noted that "diffusion is the process that takes place over time with antecedent circumstances and adoption and consequent features."

Diffusion of innovations illustrates how a population responds to an innovation and provides three important insights into the process of social change, including the following:

- What characteristics does an innovation spread make?;
- The significance of user-to-user communication and peer-to-peer networks;
- Understanding the requirements of a variety of user subgroups.

Adoption theory investigates the person and his or her decision to adopt or reject a given invention. The diffusion theory examines the dissemination of an invention through time from a macro perspective. There is no one paradigm for comprehending the steps an individual takes before to embracing a new invention. Historically, adoption has been understood in terms of behavior modification. Rogers's innovation diffusion theory (1995) gives a basic knowledge of adoption theories.

Adoption and diffusion theories examine distinct elements of behavioral modifications. The majority of people feel that adoption is not a single occurrence. Over time, beliefs and attitudes are established, which can then impact decisions.

There are typically three sorts of factors that impact the acceptance and/or spread of an invention. Individual characteristics are state- or trait-based distinctions that incline an individual to embrace or reject change. Innovation features are unique to the innovation in question.

Regarding the dissemination of technological innovation, Inman (2000) asserts that innovation neither removes nor adds anything, yet has a significant impact. The chain relationship process of invention, innovation, and dissemination is what drives technological development. These are the three phases that make up the process (fig. 1).



Figure 1. Technological change process

An invention is a product that has been created by applying unique knowledge and ideas to create what is sometimes referred to as "breakthrough" technology.

Diffusion is the process by which technological information is disseminated across a variety of economic activities with the goal of widening the space for more creative endeavors and magnifying the effect of a chain mechanism that consists of invention, innovation, and diffusion. Innovation is the pivotal interaction in the chain since it both inspires invention and motivates dissemination, and because of this, both invention and diffusion have some characteristics in common.

Okpara (2007) uses the phrase "the confluence of creativity and understanding that leads in the production of social and economic value" to define innovation. Knowledge, persuasion, and choice are the three stages of the adoption-decision process that are associated to a new invention's degree of innovativeness.

During the phase of the innovation-decision process that entails the collection and processing of information, individuals are compelled to clear up any confusion that may exist regarding the advantages and disadvantages of a proposed innovation. The steps that make up the innovation-decision process are as follows: (1) Knowledge, (2) Persuasion, (3) Decision, (4) Implementation, and (5) Confirmation.

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Individuals are capable of learning not just from their own experiences but also from those of their peers. One of the fundamental ideas of social cognition theory is the capability of humans to learn vicariously. Social learning has two possible functions in terms of adoption and dissemination. Self-efficacy refers to a person's confidence in his or her ability to plan and carry out the actions necessary to achieve specified goals. It is distinct from self-esteem and self-confidence.

3 FACTORS IMPACTING THE DIFFUSION OF INNOVATION

Understanding the elements that influence adoption is the first step in increasing the rate at which innovations are implemented.

Uncertainty is a significant barrier that prevents the acceptance of innovations, according to Sahin (2006).

The repercussions of innovation could give rise to unpredictability. The change that occurs in a social system or in a person as a direct result of the acceptance or rejection of an invention is referred to as its consequences.

It is important for a person to be informed about the repercussions of adopting a child in order to lessen their level of uncertainty.

Consequences are characterized as:

- good & undesired;
- direct & indirect;
- foreseen & unplanned.

Communication channels are the ways and procedures through which knowledge about a certain invention is transmitted from person to person. This can be achieved through direct dialogue, indirect observation of peers and models, or even mass media influence. The extent to which a person has access to an innovation influences the dissemination process.

It is a crucial aspect for both the generation of value and the maintenance of a competitive edge for businesses operating in high-dynamic and complicated environments. Companies that are open to new ideas and changes in their surroundings, as well as those who are willing to build new capabilities that will allow them to achieve better levels of performance, will be very successful.

Rogers's research on adoption and dissemination is contextualized by time. Early adopters often had a higher socioeconomic position, greater access to communication tools,

greater social mobility, and a higher likelihood of literacy.

Innovativeness is connected to person (leader) traits, internal organizational structure features, and external organization factors, according to the DOI theory at the firm level (Rogers, 1995). Individuals are perceived to have varying degrees of desire to embrace innovations; hence, the proportion of the population adopting an invention is often observed to be about regularly distributed.

The foundation for the TOE was laid in the year 1990. Tornatzky and Fleischer (1990) It describes three aspects of the environment in which a business operates that have an impact on the manner in which the business decides whether or not to accept and adopt a technical breakthrough.

These aspects are as follows: The firm's technological background includes both the technologies it has developed in-house as well as those it has acquired from outside sources. The phrases "organizational scope" and "organizational size" are examples of descriptors that fall under the umbrella term "organizational context."

The TOE framework, in its original form (figure 2), which was subsequently modified for use in adoption studies, provides a helpful analytical framework that may be used for the purpose of researching the adoption and assimilation of various kinds of innovation. This framework may be used for the purpose of researching the adoption and assimilation of various kinds of innovation.

This framework is aligned with the DOI theory, which emphasizes individual traits in addition to the internal and external aspects of an organization. Rogers (1995) is the author of the DOI theory. The environmental setting offers both limitations on technological innovation as well as potential avenues for its advancement.

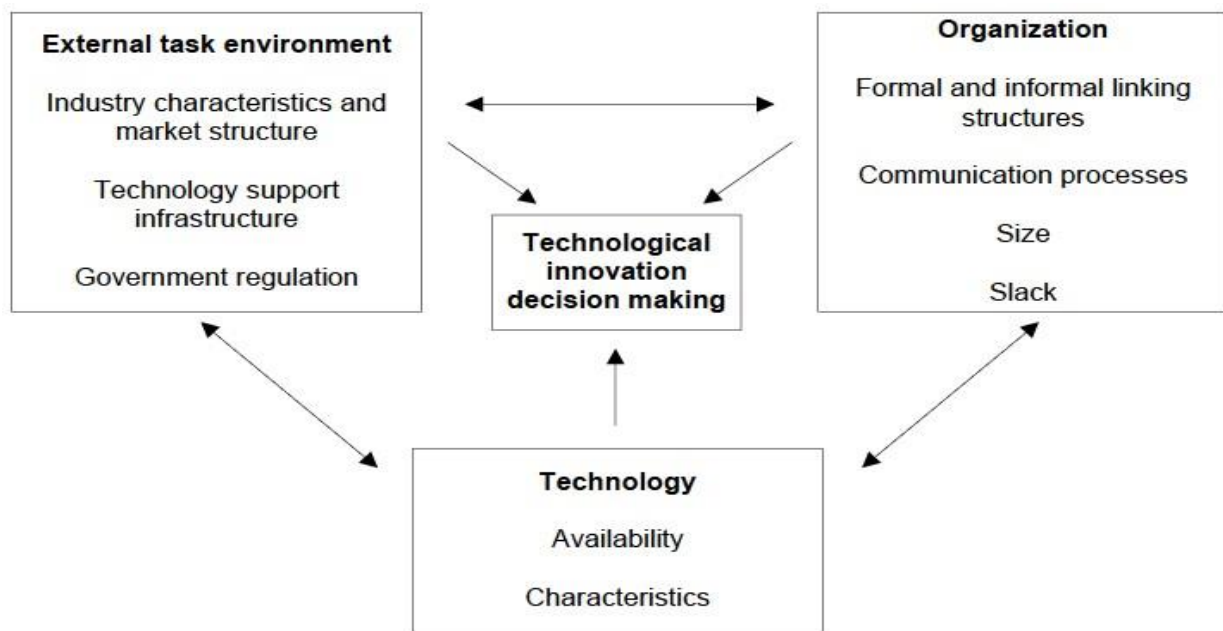


Figure 2. Technology, organization, and environment framework (Tornatzky, Fleischer, 1990)

It is common knowledge that the mimetic, coercive, and normative institutional forces that are present in an environment that has been institutionalized have the potential to impact the propensity of organizations toward an interorganizational system.

When companies imitate the practices or innovations of their competitors, a phenomenon known as mimetic pressure can be noticed. The term "coercive pressures" refers to a collection of formal or informal forces that are applied to organizations by other organizations that the first group of organizations depends on for their survival. Companies that have dyadic interactions with one another and exchange certain information, rules, and standards are a source of normative pressure.

4 ADOPTION OF INNOVATION

Companies have been working to improve their skills, particularly over the

course of the past several decades, in order to keep up with the rapid changes that are occurring in both the global market and technology. Consequently, people who are responsible for innovation should ensure that it has a high rate of adoption, and the first step in the process of increasing the rate of adoption of innovation is to get an understanding of the elements that influence adoption.

The acceptance of a new technology does not involve a snap judgment but rather a process that unfolds over time. During this process, an individual goes through the following stages:

- 1 - first gaining information of the innovation,
- 2 - forming an attitude toward the innovation,
- 3 - deciding whether to reject or embrace the innovation,
- 4 - putting the new concept into action,
- 5 - confirming this choice.

The understanding of principles encompasses the concept of functioning, which explains why and how innovations are successful. Even in the absence of information, inventions may be implemented, but their misuse would likely result in their abandonment. During the stage of persuasion, people's perspectives on innovation might either be favorable or unfavorable.

However, the possibility of being rejected exists throughout the entirety of the decision-making process. According to Sahin (2006), there are two distinct sorts of rejection:

- 1 – Rejection made consciously
- 2 – An indirect kind of rejection.

Individuals that engage in inactive rejection test out the invention and entertain thoughts of adopting it, but ultimately decide against doing so.

Individuals who take the viewpoint of passive rejection do not make any effort to incorporate the innovative idea into their lives. The sequence is knowledge, then persuasion, and then choice. After that comes the step of implementation, which is when a new idea is put into action. The sequence is information, then persuasion, and finally choice. The following step is the stage of implementation, which is when an invention is put into action.

However, innovations bring about newness, and with that comes an element of uncertainty, especially when it comes to their spread. Therefore, in order to lessen the impact of the uncertainty, the implementers require the change agent's aid in a technical capacity. Implementation is an essential step since it is typically where re-invention takes place, making it an important stage. The act of coming up with new ideas or finding them is referred to as innovation, whereas the process of putting an old concept to use is referred to as innovation adoption.

According to Sain (2006) and Stephenson et al. (2017), innovations that have increased simplicity, compatibility, relative benefit,

observability, and trialability are more likely to be accepted quickly. The pace at which an innovation is adopted is contingent on a number of variables, including the innovation-decision, the qualities of the innovation, the structure of the social system, the medium of communication, and the promotion activities of change agents. Rogers identified five innovative characteristics (shown in table 1) that impact its acceptance. Individuals are more likely to embrace innovations that align with their current knowledge or schema.

Table 1. Innovation characteristics

Innovation Characteristics that influence the Rate of Adoption		
1	Relative Advantage	How much the invention looks to be superior than existing items.
2	Compatibility	The extent to which the invention aligns with the individual's ideals and experiences.
3	Complexity	The degree to which the invention is difficult to comprehend or employ.
4	Divisability	To what extent the invention can be tested on a modest scale.
5	Communicability	The extent to which the positive effects of usage may be observed or described by others.

According to MacVaugh and Schiavone (2010), there are three key stakeholders that are present in any innovation diffusion system. These players are the innovative market or industry, the users community (which has technology that is categorically similar), and the individual (possible) users.

The rate at which an innovation gets accepted is dependent on a variety of different aspects, such as the choice to implement the innovation, the characteristics of the invention, the structure of the social system, the medium of communication, and the promotion efforts of change agents.

The implementation of a novel concept is challenging, despite the fact that it presents clear benefits; consequently, the availability of these advancement variables speeds up the cycle of dispersion that underpins progress.

In their review of the literature, Peansupap and Walker (2006) identified ten phases of innovation diffusion: (1) the idea's inception; (2) its dissemination; (3) its matching; (4) its evaluation; (5) its acceptance; (6) its adoption; (7) its execution; (8) its confirmation; (9) its routinization; and (10) its infusion. According to Peansupap and Walker (2006), adoption and its implementation in companies go through the following six stages: Initiation, adoption, adaption, acceptance, routinization, and infusion are the first six steps. They think there are six phases to adoption and its implementation within businesses.

This stage model, which is based on the features of each stage, has been applied for the purpose of estimating the evolution of innovation reception.

In the first step, known as initial adoption, the emphasis is placed on the dissemination of innovation at the organizational level. This stage is made up of three separate processes, which are information awareness, persuasion, and adoption decision, respectively.

In the second stage, which is the actual implementation, the emphasis is placed on individual and group acceptance as well as diffusion.

In addition to the aforementioned factors, Neudorfer (2004) cited perceived risk as an important aspect of product quality. The risk that is associated with pursuing this invention is outlined by this criteria. The adaption hypothesis investigates why people react the way they do to new experiences, whereas the diffusion theory investigates how new ideas spread throughout a society over the course of a given amount of time. Therefore, the study subject of interest in diffusion is the rate of innovation acceptance across time.

5 CONCLUSIONS AND DISCUSSIONS

An object, an idea, or a practice that a person or adopting unit identifies as novel is what has been judged to be an innovation as a consequence of the study that was conducted on the aforementioned literature.

This novelty is applied in commercial application with a focus on people, technology, structure, new behavior, and culture with the aim of fostering economic growth.

Analyzing and synthesizing different ideas, as well as coming up with new concepts and ways of thinking that did not exist before, are all aspects of innovation. Because innovation refers to the process of effectively building a competitive advantage, it is essential to entrepreneurial endeavors.

It is not required for anything to be new in order for it to qualify as an innovation; rather, it must be considered to be novel by those who may adopt it. An idea, a new manufacturing process technology, a new product or service, a new program or strategy concerning members of the organization, or a new administrative system that is integrated and regarded to have value can all be

considered to be examples of innovation rather than any mechanical development.

It is only when an idea is shared across a wide range of people in a social system that it can truly benefit everyone involved. Productivity growth is the most accurate indicator of the economic effects of innovation, and economists have come to the conclusion that innovation is essential to the process of boosting economic growth and elevating living standards.

This paper does not aim to give a final answer regarding the model of technological diffusion which must be implemented by the machinery industry. We believe, nevertheless, that due to the particularities of the industry and of the market on which it operates, more complex models are preferred to the detriment of the classical ones.

We consider that in order to acquire a deeper understanding of the phenomena of adoption, it is necessary to combine more than one theoretical model, particularly in cases involving the adoption of increasingly complicated new technologies. Due to this fact, a comprehensive review of the ToE framework was carried out.

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