

# Analyzing Digital TV through the Concepts of Innovation

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## ABSTRACT

Innovation has been discussed intensively in the academy, government and in the market. The capability for innovation in a country or territory flourishes in the relationship between economic, political and social actors. To foster the dissemination of the innovation represented by Digital TV is a challenge in Brazil, and demands understanding of innovation and the characteristics involved in innovation processes. This article aims to analyze Digital TV based on the concepts of innovation, and provides a bibliographical review. The conclusions present important technical, economic and institutional factors, both to stimulate the adoption of Digital TV technology and to restrict its use. By looking at the impacts of Digital TV in the Brazilian economy it is possible to realize that major changes are to come in the future especially regarding economic and social issues.

## Categories and Subject Descriptors

A.1 [Introductory and Survey].

## General Terms

Management.

## Keywords

Innovation, Digital Television, Brazilian Scene.

## 1. INTRODUCTION

The process of digitization of TV signals is due to the natural course of technological evolution. Along with forecasting a better image and sound quality, Digital TV provides the viewer with the possibility to have a more participatory position with the TV, through the adoption of interactive features. In addition, future viewers will have more channels available in their programming schedule, credited to the implementation of multiprogramming.

In this new scenario, Digital TV can be considered as an innovation as it decisively influences the direction of the industry in which it is inserted. It is an innovation that offers changes to the way products and services will be distributed to users.

Such technological innovation will almost certainly produce innovations in business processes. This means more activities and added value on services and products received by customers. Regarding Digital TV, these changes require a more dynamic view of business processes mainly due to the inclusion of new actors and stakeholders to the new business model.

This article aims to understand Digital TV as an innovation and discuss the implications and impacts of using such a concept related to this technology.

To this end, Section 2 addresses the path from idea to innovation. Section 3 describes the types of innovation according to the Oslo Manual. Section 4 explains the degree of novelty inherent to innovation. Section 5 presents the diffusion process and the factors that induce technological change. Section 6 deals with the analysis of Digital TV from the concepts of innovation and, finally, in section 7, the conclusions of the work are shown.

## 2. FROM IDEAS TO INNOVATION

Ideas move the world. Simple or complex, the ideas begin with the recognition and understanding that, at some point, there is a gap to be explored [1]. The ideas come from the creative capacity of individuals.

Creativity is understood by Silva [2] as the potential to generate ideas that appeal to preferences, establish smart strategies, modify products, seek solutions to problems, avoid the conventional and, therefore, to differentiate themselves. Creativity is the element that adds value and brings competitive advantage to organizations.

According to Prahalad and Hamel [3] the real sources of competitive advantage resides in the core competencies of organizations, as reflected in “the ability to consolidate corporate technology and production skills into competencies that can enable individual businesses to quickly adapt to constantly changing opportunities”.

In this sense, we can say that idea is the product of creativity; it is the engine of innovation [1], which does not mean that every idea necessarily results in innovation. As highlighted by Silva [2], countless brilliant ideas are forgotten at the bottom of the drawer. “The idea is only transformed into innovation as it is executed, achieved.” The issue is to know how to choose the right ideas and actually implement them [1].

Silva [2] states that the path from idea to innovation passes through four sequential phases, namely: identifying their problems, challenges, opportunities and dreams; generate ideas; evaluate ideas; and make it happen. Therefore, to explain this process, the author works with the representation of concepts linked to each letter of the word “ideia” (idea in Portuguese): I (initiate, anticipate the future), D (define what you want), E (explore your ability to think differently), I (imagine), A (act).

But what is innovation? Innovation is the ability to use knowledge to improve or create new products, processes or services bringing a competitive advantage to an organization. It is creating new opportunities through a combination of knowledge put into practice [4] [5].

According to Tidd Bessant and Pavitt [5], innovation occurs from the ability to detect opportunities, establish relationships and

make the best use of them. This can be considered the fundamentals of the dynamic capabilities of innovative companies, such as the ability of perception, capture and transformation.

Tidd, Bessant and Pavitt [5] point out that one of the problems of innovation management is that innovation is often mistaken for invention. While invention relates to the creation of a process, technique or a new product, innovation occurs with the effective practical application of an invention. Thus, there is no innovation without invention [6].

And why innovate? Silva [2] argues that as well as obtaining competitive advantage, companies who dedicate to innovation can increase their margin of profit, improve performance, take advantage of opportunities, obtain better returns, and help the development of the economy and job creation.

The limits to innovation are nothing more than the barriers we find to express our ideas. The main obstacle is that many companies look at innovation as something complex. Among the many barriers created for innovation, fear, lack of knowledge and negative associations are considered the three most frequent [2].

### 3. TYPES OF INNOVATION

The Oslo Manual [7], which is the conceptual and methodological reference most applied to analyze the innovation process, monitors four types of innovation:

- **Product innovation:** refers to significant changes in the potentialities of products/services that a company offers and they may be completely new or improved from existing products.
- **Process innovation:** refers to significant changes in how the products/services are produced and distributed.
- **Organizational innovation:** refers to changes in the company's management structure and organizational methods.
- **Marketing innovation:** refers to changes in marketing methods, including changes in product design and packaging, in product promotion and placement, and methods of pricing goods and services.

#### 3.1 Technological Innovation vs. Business Model Innovation

Frequently when we talk about innovation, people usually think of technological innovations. According to Reis [8], the technological product and process innovation focuses on activities of Research and Development (R&D) and can be defined as the implementation of new technological knowledge, which results in products, processes or services which are technologically new, or significant improvement in some of their attributes.

Nevertheless, business model innovation is almost as important as technological innovation. Business model innovation focuses on strategic activities presenting reflections on commercial ventures and also in industry. According to Davila, Epstein and Shelton [1], business models define the way an organization creates, sells and transfers value to its customers. For the authors, the successful innovator is one who knows how to change, the models of business and technology, individually and in a group. The innovation matrix, illustrated in Figure 1, displays the interaction between technological innovation and business model.



Figure 1 – Innovation Matrix [1].

According to Davila, Epstein and Shelton [1], the success of an innovation depends on the integration of technological change and the business model. The concentration in only one of the two aspects will not produce a successful innovation or have a perspective of continuity.

The authors work with six levers, areas in which change can guide the innovation of technology and business model, shown in Figure 2, and highlight that innovation requires improvements in at least one of them.



Figure 2 – Levers for change [1].

The definition of each of the levers involves [1]:

- **Value proposition:** what is sold and released in the market;
- **Supply chain:** how it is created and brought to the market;
- **Target customer:** who receives the transfer of value;
- **Products and service offerings:** the product/service itself;
- **Process Technology:** production and delivery of better, faster and less costly services;
- **Enabling Technology:** faster strategy execution and better leverage time.

### 4. DEGREE OF NOVELTY INVOLVED

Not all innovations are treated equally. By definition, every innovation must contain a degree of novelty, which may be incremental (for the company), semi-radical (for the market) and radical (for the world), as discussed below.

#### 4.1 Incremental innovation

According to Davila, Epstein and Shelton [1], incremental innovation seeks to make minor improvements through changes in both, technology and model of small business, in products and services that already exist in order to sustain market share and profitability of the product for a longer period of time. This type of innovation is also characterized by the OECD [7] as an innovation for the company, because it can utilize an organizational method of production, processing or marketing that may have been used by other companies, being new to the company that is using it now.

## 4.2 Semi-radical innovation

The semi-radical innovation involves substantial changes in one of the two fronts, technology or business model of an organization. This type of innovation depends on a set of core competences and leverages crucial changes in the competitive environment, which are not allowed by incremental innovation [1]. Semi-radical innovation is characterized by OECD [7] as innovation for the market, because it emphasizes the fact that the company is the pioneer introducing such innovation in its market, which may include a territory or a line of product.

It may happen that the change in one dimension depends on the change in another, although this concomitant change may not be as revolutionary as the first [1].

## 4.3 Radical innovation

Radical innovation often results from architectural changes and is characterized by presenting significant changes that affect both the technology and business model of a company. Radical innovation usually causes significant impact on the competitive landscape of an industrial sector. It has greater impact on and inherent risk degree to the organization than the incremental and semi-radical innovation [1].

This type of innovation is characterized by the OECD [7] as an 'innovation for the world', as the company is the first to introduce the innovation in all markets and industries, nationally and internationally. When successful, radical innovation has the potential to rewrite the rules of competition in the industry [1].

## 5. DIFFUSION OF INNOVATION

As well as the degree of novelty involved, there is the way by which an innovation is disseminated in the economy, from its first introduction to the different public (consumers, countries, regions, sectors, markets and companies). Without diffusion, an innovation has no economic impact [7].

For Tigre [6], when evaluating the process of diffusion of technological innovation, it can be understood as the course of the adoption of this technology in the market, focusing on their technological characteristics and other elements that condition pace and direction.

Thus, this diffusion process can be examined from four factors to induce technological change [6]:

**Direction or course of the technology:** refers to the technical choices made during the evolution of the technology. In the case of process innovation, this course may present:

*Incremental technological changes:* the most basic level of technological change, including improvements in design or the quality of products and processes, new organizational and logistical arrangements.

*Radical technological change:* usually results from R&D, being discontinuous in time and sectors. Such change disrupts the existing paths and commences a new technological route.

*Technological system change:* involves the transformation of one or more sectors due to the emergence of a new technological field. The innovation is accompanied by organizational change both within the company as well as in its relationship with the market.

*Changes of Techno-economic paradigm:* embraces technology innovation and innovation in the social and economic fabric in

which they are inserted. Although they do not occur often, their influence is pervasive and long-lasting.

**Diffusion rate or diffusion speed:** refers to the speed in which the society adopts the technology, measured by the number of adoptions over time within the potential universe of users.

**Conditioning factors:** refers to factors that can both stimulate the adoption of technology or restrict its use. They may be of a technical (regarding the degree in which the innovation is considered hard to be understood or used), economic (related to the costs of the acquisition or implementation of the new technology) or of an institutional nature (regarding the social stratification, culture, religion, regulation, laws of the sector or country, including the availability of human capital and support institutions).

**Economic, social and environmental impacts:** refers to changes in the industrial structure, the quantity and quality of work and the relationship between technology and environment.

According to Tigre [6], the diffusion process leads to greater economic impacts than innovation itself, in that it "represents the effective adoption of a new technology by broader segments of society". In fact, the exact pattern of adoption of an innovation is directly related to the interaction of factors associated with supply and demand [5].

## 6. ANALYZING DIGITAL TV FROM THE CONCEPTS OF INNOVATION

Digital TV can be considered an innovation in that it definitely influences the direction of the industry in which it operates. Its diffusion brings positive and negative consequences to different sectors of the economy and society.

From the moment we interpret Digital TV as a technological innovation process – which offers significant changes in how the products/services are produced and distributed to customers (in this case, the viewer) – we understand that it is important to discuss the course of adoption of this technology in the market, as well as other factors that influence its pace and direction.

As said by Davila, Epstein and Shelton [1] it is very rare for a technological innovation not to produce innovations in business processes. The opposite is true. These innovations go together and should be considered as well as implemented as a whole.

Santos [9] points out that the model of Interactive Digital TV, in general, brings significant changes in traditional business processes, created for the analogue environment. When applied to the digital environment, these changes require a more dynamic view of the business processes mainly due to inclusion of new actors and stakeholders to the new model.

In this context, we characterize the degree of novelty brought by Digital TV as radical, according to the Innovation Matrix proposed by Davila, Epstein and Shelton [1]. This classification is due to the fact that both the technology and business model have different characteristics from that of the one currently used, being therefore new.

Specifically when it comes to technological innovations, Reis [8] argues that the inclusion of such technology will not necessarily lead to the complete abandonment of earlier technology. This is exactly what is happening with Digital TV.

Tidd, Bessant and Pavitt [5] say that the velocity of the diffusion of a technological innovation is usually drawn in an "S" curve,

with phases of introduction, growth, maturity and decline. First, the adoption rate is relatively low, and the “innovation is restricted to those so called ‘innovators’. The next to adopt are the ‘early adopters’, followed by the ‘late majority’ and finally the curve falls, and only the ‘laggards’ remain”.

The direction or technological course of Digital TV is embedded in changes in the technological system. The natural evolution from the analogical to digital television system brings a new emerging field of activity.

Analyzing the economic, social and environmental impacts, the diffusion of Digital TV in the Brazilian economy presents great changes, especially regarding the economic and social impact. From an economic viewpoint, there are several possible impacts on the devolution of the communication industry. The digitalization of TV facilitates the entry of new companies in the market as it removes the exclusivity of the broadcasting companies (open or closed) in providing television content.

Moreover, when the Internet and other telecommunication companies enter this scenario, multiplying the program schedule and eliminating the limitations presented by the current allocation of the frequency band for analogue transmissions, new business models will be established and a new course of innovation will come into the market [6].

Given the importance that the conditioning factors have, since they are both stimulating adoption of technology and restriction of its use, we will explore in more detail each one of their natures: technical, economic and institutional.

## 6.1 Technical Condition

Regarding the technical conditioning, on risk analysis, certainly the adoption of a new technology is the factor that impacts the most on its success, especially when it comes to a technological transition such as the one that is currently occurring with Digital TV.

One of these risks is usability. Television is considered as a well-known device by the population; it is very familiar and is easy to use. With Digital TV, the remote control, which was previously only used to change channels, turn on and off and control the volume, is appended with new features, such as accessing the interactivity available in a given program.

In this case, one runs the risk of users being unable to fully use the technology. Such users may not grasp the features of the convergence between TV, internet and phone in one device.

The main challenge of Digital TV will be of offering this accessibility to the handicapped, elderly and children who spend much of their time watching television. For this reason it is important to identify and offer content ensuring that all users are able to use the interactivity with autonomy.

When it comes to interactivity, this feature will offer interactive content directly on the television. But to make this possible, it is necessary for converters with Ginga middleware to be available on the market at an affordable cost for the population.

When thinking of interactivity, we find that since the television would be for common use, there is a complicating factor when one of the group members wants to interact with the program because it will disturb others who want to passively watch the program. To resolve this problem, Costa, Moreno and Soares [10] propose the usage of multiple devices.

Software available on multiple devices such as tablets and smartphones offer interactive content related to the program the user is watching, via set-top-box or the connected TV. For instance, users can watch their favorite program and, using a tablet, they can purchase some of the products announced during the show.

Thus, the user will be modifying the way to watch TV, but not the experience of watching TV. The secondary screen to allow individual interaction promises to be a new way to use the TV, as a vehicle for integration and communication, and this is already happening.

However, despite the presented scenario, interactive applications for Digital TV are still in testing and are still restricted to small niches, such as sports. Withal, to expedite this process and provide the consumer with an innovative product, the TV manufacturers were able to envision a business model for interactivity before the broadcasters. It is Connected TVs also known as Broadband TV, which combine the Web and television.

## 6.2 Economic Condition

The implementation process of Brazilian Digital TV requires investment by both television stations and users. The television stations will invest substantially in the digitalization of broadcasting with the purchase of cameras and digital editing stations, as well as transmitters and amplifiers. While the users, to receive digital signals and use the new services, should purchase a set-top-box with embedded Ginga middleware or a TV with this equipment already internally installed.

Currently in Brazil, there is a lack of public policies that favor the industry that produce converters, prepared for interactivity, available for sale in the market at an affordable cost for classes C and D of the population. There are still no incentives for the development of an industry of local and regional content, stimulating researches that have as their objective the production of content and services for education, electronic government, entertainment and news, using, in this case, the structure of transmission of channels of Public, College and Community TV.

Moreover, the population does not know exactly what Digital TV is, how to install it, what equipment is needed and what can be done with such technology. There is a lack of intense and permanent clarification campaigns in the general means of communication, public transport, airports, among others, giving citizens the possibility to assist the government in determining the fate of Digital TV in Brazil.

## 6.3 Condition of an institutional character

The society needs to benefit from the implantation of Digital TV. Otherwise it does not make sense to purchase a set-top-box to have access to the digital signal. This benefit can occur in three ways: improving the quality of audio and video, increasing the number of channels, and the possibility of interactivity. The first item is intrinsic to the digitalization process, but the other two lack public policies to materialize.

Public policies should be thought of as incentives for content production in disadvantaged communities, which promotes identity preservation, increased self-esteem, as well as employment opportunities.

In order to implement these policies, there is need for graduate and postgraduate courses, encouraging dialogue between different

areas considering the demand for generation and dissemination of knowledge and innovation in television.

In addition, professors and students need to be trained beyond the area of engineering and computer science, getting involved in research and production of content and interactive services. In this context, the benefit of Digital TV for the people includes the understanding of what interactivity is and how to use it in an attractive and easy way.

## 7. CONCLUSION

The aim of this paper was to understand Digital TV as an innovation and from that, consider all the conditioning related to this concept. Considered as technology process innovation, Digital TV features significant changes in its business processes, especially considering the presence of new actors in the supply chain. In this regard, there are several factors that work both to stimulate technology adoption and restrict its use.

The importance of discussing the process of the adoption of Digital TV in Brazil is due to the feeling that there are many factors that are cluttering up the process.

The diffusion of Digital TV is affected by the political and economic factors addressed in this article, but also by the perceived level of complexity, the ability for experimentation, the compatibility with the values, experiences and needs of users and by the degree to which the innovation is perceived as better than the product it replaces.

It is observed that to have the full diffusion of innovation provided by Digital TV and minimize the difficulties involving the implementation of new technology there is the need for public policies that address the issue more objectively.

The wait for the advancing of the technology and the perceived lack of government commitment is delaying research and the provision and adoption of the benefits offered by this new technology for users.

## 8. REFERENCES

- [1] DAVILA, Toy; EPSTEIN, Marc J.; SHELTON, Robert. *As regras da inovação*. Porto Alegre: Bookman, 2007.
- [2] SILVA, Antônio Carlos Teixeira da. *Inovação: como criar idéias que geram resultados*. Rio de Janeiro: Qualitymark, 2003.
- [3] PRAHALAD, C.; HAMEL, G. The core competencies of the corporation. *Harvard Business Review*, mai-jun, 79-91, 1990.
- [4] NORTH, Klaus. *Gestão da inovação*, 21-24 de mar. de 2011. Notas de aula.
- [5] TIDD, Joe; BESSANT, John; PAVITT, Keith. *Gestão da inovação*. 3rd. ed São Paulo: Bookman, 2008.
- [6] TIGRE, Paulo Bastos. *Gestão da inovação: a economia da tecnologia do Brasil*. Rio de Janeiro: Elsevier, 2006.
- [7] OCDE. *Oslo Manual: guidelines for collecting and interpreting innovation data*. 3rd ed. Paris: OECD Publishing, 1997. 184 p. Available on: [http://www.finep.gov.br/dcom/brasil\\_inovador/arquivos/manual\\_de\\_oslo/prefacio.html](http://www.finep.gov.br/dcom/brasil_inovador/arquivos/manual_de_oslo/prefacio.html). Accessed on: 22 jul. 2011.
- [8] REIS, Dácio Roberto dos. *Gestão da inovação tecnológica*. 2nd. ed. Baurer: Manole, 2008.
- [9] SANTOS, P. M. *Modelagem de processos para disseminação de conhecimento em governo eletrônico via TV Digital*. Dissertação de Mestrado. Departamento de Engenharia e Gestão do Conhecimento. Universidade Federal de Santa Catarina, Florianópolis, Brasil, 2011.
- [10] COSTA, R. M. D. R.; MORENO, M. F.; SOARES, L. F. G. *Ginga-NCL: Suporte a Múltiplos Dispositivos*. *Simpósio Brasileiro de Sistemas Multimídia e Hiperímídia*. Anais do XV Simpósio Brasileiro de Sistemas Multimídia e Hiperímídia. Fortaleza. 2009.