RECOMMENDATIONS FOR THE DEVELOPMENT OF INTERACTIVE APPLICATIONS OF DIGITAL TV IN ELECTRONIC GOVERNMENT FIELD IN BRAZIL

ABSTRACT

The resources provided by the Brazilian Digital TV model can give rise to several applications for the E-Government. Based on the study of various proposals and products in the global scenario of t-Government, it was identified the main characteristics and contributions of each of them through a SWOT analysis, determining the critical success factors and recommendations that establish guidelines for the development of DTV applications in the area of t-Government in Brazil.

1. INTRODUCTION

The Brazilian model of open Digital Television, still in implementation, brings resources that revolution the traditional model, not only by its better image and sound characteristics, as well as by the possibility of interaction and by its mobility. The technological improvements brought by the new model expand the characteristics of the Japanese model from which it is derived, adding to it new functionalities, turning it the more modern model among the existing ones.

Despite the interactivity resources are not yet completely implemented and adjusted, their technical characteristics allow the conception of many applications of the Digital TV model in many knowledge areas. One of the main applications of Digital TV resources is in the Electronic Government field, mostly if it is considered the big penetration of television in Brazilian homes and the tendency of Set-Top boxes fall of prices, which will allow the use of the current television sets on the new digital system, enabling the digital inclusion.

In the present article, it is done an exploration of the main Digital TV applications in worldwide scenario, identifying their main characteristics and peculiarities and applying an analysis of strengths, weaknesses, opportunities and threats (SWOT), as well as to identify the critical factors of success, in order to establish recommendations for the conception of Brazilian Digital TV applications in the electronic Government field.

2. DIGITAL TV IN BRAZIL

As occurred in other countries, the digitalization process of the television system finally becomes visible in Brazil. Its implementation arises as a promise of opening citizenship horizons, reducing the cultural and social differences, through digital inclusion.

In order to effectively occur this, the change caused by the system migration must have, as a final product, something that attends the needs and expectations of different audiences, propitiating new ways of expression and promoting social mobilization.

Besides the improvement on the audio and video quality, Digital TV will give to users the possibility of transforming them in active participants, within the process of watching TV.

Connected to a Set-Top box, the Digital TV will allow the interaction with many programs and also allow access to many information and services. The interactivity, which is undoubtedly Digital TV *trump card*, did

not appear yet, and lives on the expectation of those who look forward for it. It is the key for the access of those who, till then, mere receptors, to the world of production and content sharing through television. It is the interactivity that will allow the spectators, at last, make part of a collaborative net of knowledge construction.

It is a priority for Brazilian Government to make available to the population a tool that offers contents and services that aim to make easy to the citizen the access to public organisms in a fast, free and democratic way, strengthening the relation between them and giving more transparency to the administrative processes.

3. ELECTRONIC GOVERNMENT

The electronic government, also called e-gov, aims to transform the relation between the governments, citizens and companies, especially in terms of process agility and transparency. According to Sanchez (1996), e-gov aims the fomentation of democratic values, such as participation, transparency, attention to human dignity, representation and control, by the society, over the public agents.

E-gov is based on the usage of information and communication technologies in order to turn democratic the access to information, increase discussions and stimulate the public services focusing the efficiency and effectiveness of governmental functions.

With the same objective as *e-Government,* the *t-Government* arises as an "evolution" from the previous initiatives. The *t-Government* has as an advantage the non requirement of any knowledge in dealing with computers, since the information and services of public interest are available through digital television.

According to Pagani and Pasinetti (2009), the first countries in Europe to promote the use of *t-Government* were: Italy, England and Scandinavia. According to the authors, the main application areas of *t-Government* services include: access to public information, online forms and services aimed to citizens (education, mobility, health and mail services).

4. METHODOLOGY

The methodology used in the elaboration of this work can be summarized in Figure 1. Taking as a starting point the current panorama in worldwide scenario, it were analyzed applications (proposals and products) where Digital TV is used as a access tool to Government (information, products and services). After, it was done a SWOT analysis, identifying the strengths, weaknesses, opportunities and threats. From the SWOT analysis, it were raised the main Critical Success Factors (CSF), creating recommendations that must be taken into account when developing Digital TV applications in *t-Government*.
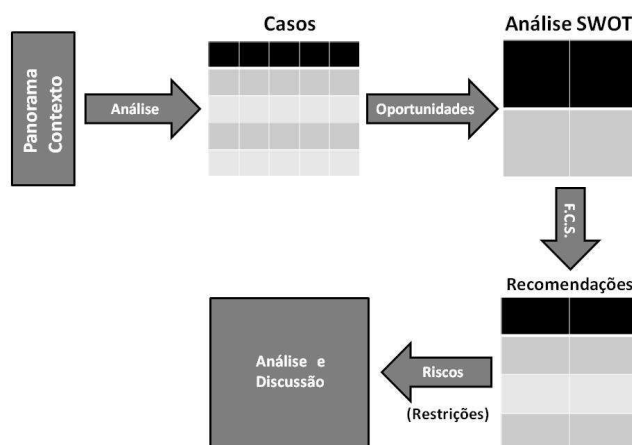

Figure 1. Methodology of this work

5. DIGITAL TV APPLICATIONS FOR GOVERNMENT

It were researched in the main theoretical referential all existing proposals (to be developed) and products (already functioning) for Digital TV, specific for the Government Field. The application found is referenced in Table 1.

Table 1: Applications for t-Government

Application	Description	Country	Situation	Return channel	Classification
Virtual Jury	Jurors participate on the session, vote and have access to Jury information from TV	Brazil	Proposal	Necessary	Transactional
Communication between citizen and City Hall	Citizen can give opinion regarding some City Hall achievements, helping in the decision-making process of municipal authorities.	Brazil	Proposal	Necessary	Interactive
Income Tax	Nontaxpayer citizens can do tax exemption through remote control	Brazil	Product	Necessary	Transactional
Property credit Simulation	Citizen can do, through filling up his/her personal information, a simulation of property credit at Caixa Econômica (Brazilian bank that grants property credit)	Brazil	Product	Not Necessary	Interactive
Medical appointments	Citizens can book medical appointments in the attendance offices through remote control	Brazil	Proposal	Necessary	Interactive
Access to tests	Citizens can do tests through television in order to verify the symptoms of certain diseases.	Brazil	Proposal	Not Necessary	Interactive
Information about Parliament	Channel makes available information regarding the daily work at the Finland Parliament and encourages people to understand and learn more about democracy	Finland	Product	Not Necessary	Informative
To make regional content available	The channel makes available regional content from London to Scotland, Wales, Northern Ireland citizens and for different regions of England	Scotland, Wales, Northern Ireland, regions of England	Product	Not Necessary	Informative
Interactive services	Channel makes available interactive services linked to the programs	England	Product	Necessary	Interactive
Creation of Communities	3 local channels help on the creation of virtual communities	France	Product	Necessary	Interactive
Information and contact with authorities	Channel provide information regarding local services and allow the citizens to contact authorities	England	Product	Necessary	Interactive
Information about Maternity	Channel provide information regarding maternity services and allows some interaction	England	Product	Necessary	Interactive
Information and interactive services	Interactive services available in many areas, as well as information regarding social services, Jobs, tourism and health	Italy	Proposal	Necessary	Interactive

These applications were classified according to the necessity of technical requirements, in accordance with the proposal made by Bertini (2005): **Informative**, which does not need a return channel (superteletext, EPG and information); **Interactive**, which needs a return channel (information request, online bookings and

appointments); **Transactional**, which beyond the return channel, it is needed the incorporation of a safety system (private data exchange and payments).

6. SWOT ANALYSIS

From the analysis of the environment of human and technological interaction in the process of *e-Government* and from the opportunities created with the implementation of Digital TV (*t-Government*) it can be highlighted as relevant, six evaluation approaches on the actuation scenario: cultural, behavioral, economic, related to market, social and technological.

Taking into account these components, it was created a SWOT matrix from the observation of the Brazilian scenario about the BSTD-TV (Brazilian System of Terrestrial Digital Television), identifying the strengths, opportunities, weaknesses and threats as well as the combination of its relations referring to leverages, limitations, vulnerabilities and problems. This SWOT analysis is of great importance for the understanding of questions to be worked and the proposals of guiding the implementation model of products and services directed to *t-Government* in Brazil. This evaluation is represented in the SWOT matrix summarized in Figure 2.

STRENGHTS
S-1 Culture of TV usage
S-2 Penetration Amplitude
S-3 Continental Integration
S-4 Available resources for investments
S-5 Technological Model
S-6 Formation of Human Resources

OPPORTUNITIES
O-1 Amplification of products and services
O-2 Use of similar technologies
O-3 Access amplification to communities, companies and governments
O-4 Integration with Internet and mobile telephony

LEVERAGES

VULNERABILITIES

LIMITATIONS

WEAKNESSES
W-1 Different culures and languages
W-2 Low technological matureness
W-3 Competition with Internet and mobile telephony
W-4 Incipient participation from players
W-5 Incipient capacitation of Human Resources
W-6 Low Internet penetration

THREATS
T-1 Existence of different technological models
T-2 Diverse cultural reactions
T-3 Costs involved on the model
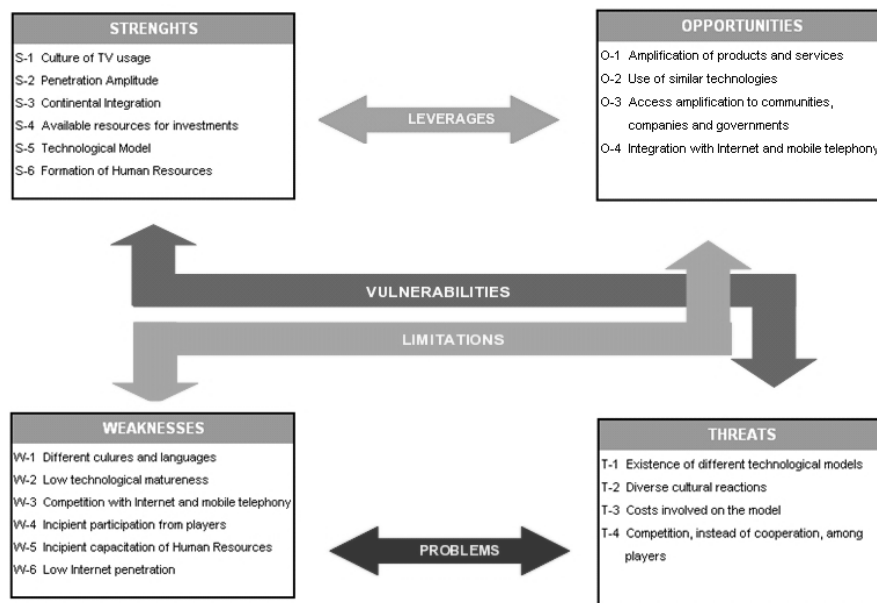T-4 Competition, instead of cooperation, among players

PROBLEMS

Figure 2. SWOT Matrix

In SWOT analysis the potential leverages can be deduced by means of crossing strengths with opportunities. The identified strengths are primordial for making possible the following opportunities: products and services increasement; usage of similar technologies replied from different solutions in market; increasement of access to attended communities (digital inclusion), rendering of public and electronic commerce services; and integration with Internet and mobile telephony.

For purposes of *t-Government*, the development of models, frameworks and applications construction and usage, yonder qualifying programs of human resources in *t-Government* configure optimizing actions, or rather the leverage components allowed for this technology.

The vulnerabilities are identified when crossing strengths with threats. The strengths already identified in the model face itself with the following threats: existence of different technological models in the global market; risks of cultural and behavioral reactions diverse in different markets; costs involved in the implementation of a different model; and competitive behavior instead of cooperative behavior among technological players.

The vulnerabilities are directed to combat actions such as: effort of replication and adaptation of models in different communities and encouragement for developing partnerships and global consortia.

The next step at the SWOT analysis is about identifying limitations, by means of crossing opportunities with the following weaknesses: different cultures and languages in many applications; low technological maturity of the Brazilian model (BSTD-TV); competition among Digital TV, mobile computing and Internet; incipient participation of global players; incipient qualification of human resources (developers and users); and low penetration of Internet in Brazilian population.

The actions of optimization and combat to vulnerabilities already identified are the antidotes needed for the accelerated evolution of the implementation of *t-Government* in Brazil.

Concluding, when crossing weaknesses with threats it is confirmed the problems observed in limitations and vulnerabilities, forwarding the issues on qualification of human resources in the development of technical solutions, in applications production and in content generation and diffusion for *t-Government*. On the other hand, the low penetration of Internet in Brazilian population caused by the high adhesion costs, the low technological maturity of the model still in development and the incipient qualification of human resources require the development of specific public policies and solutions for digital inclusion in poorer social layers and in specific communities such as youngsters and elders, for instance.

7. CRITICAL SUCCESS FACTORS

At the end of the SWOT matrix analysis process, applied to the scenario of the Brazilian project of Digital TV implementation, it was developed, as a complement, the Critical Success Factors (CSF), aiming to direct the following usage recommendations of Digital TV technologies in *t-Government*:

Table 2: Critical Success Factor and Recommendations

Critical Success Factor	Recommendations
Commitment of international and regional organisms	To involve the international regulator and foment organisms, in order to guarantee aspects of research financing, integration and interoperability of the technologies applied in the different global models, besides the concern of inclusion of poor communities and poor/developing countries
Development of models, frameworks and common standards	To make possible the amplification of products, services and competitive applications and applications of global penetration, reducing costs, increasing the offer and reducing the absorption time by the market.
Mobilization of research, education and foment institutions	To foment the creation of models, lines of credit and the formation of labor specialized in building models, standards, products and services, in generation and diffusion of iDTV contents.
Technological integration among Internet, iDTV and mobile telephony	To develop the digital convergence necessary to the application and use of different medias for the process of t-Learning in a dynamic and integrated way.
Incentive to the amplification of iDTV attendance in poor communities	To develop policies and models of digital inclusion of excluded communities through models of community use and equipment financing and interactivity processes in iDTV.
Partnerships and alliances between technology and content providers	To stimulate the involvement of software, hardware, communications, education and broadcasting companies to accelerate the divulgation, amplification of offer and use, by the Brazilian society, of iDTV interactive technologies.
Adjustment of public policies	To regulate the development of models, frameworks, computer applications, besides the protection of author rights and use of iDTV content.

A SWOT matrix analysis complemented with the determination of Critical Success Factors (CSF) and the recommendations lead to the identification and development of projects and public policies that make

possible the application of solutions in *t-Government* using Digital TV interactivity. More than an alternative of additional channel for services based on internet (information and rendering of services to citizens), the Digital TV has a potential for transforming the relations with citizens, especially in social participation interactive processes (plebiscites, health services, education and public security).

8. RECOMMENDATIONS AND FURTHER WORKS

Santos considers that potentially the Electronic Government will achieve a bigger part of the population with the usage of interaction in Digital TV rather than with computers, since they are present in only 12% of homes, an amount lower than television, present in more than 90% of residences, as indicated in researches done by IBGE – Brazilian Institute of Geography and Statistics, in 2004. Another optimization factor is that *t-Government* is developed making use of experiences acquired from years of research in Electronic Government applications, due to the media convergence. According to Santos, this convergence tends to promising results, because it eliminates the need that *t-Government* users have to interact with totally new concepts in *t-Government* applications and use all the years of learning they have in research development on Electronic Government. With this purpose, the media convergence must be characterized by the adaptation of strategies existing in Electronic Government for Digital TV environment, which presents some diverse characteristics such as high video quality, low availability of resources, interaction through remote control and many availability scenarios of the return channel.

The main difficulty and the limiting factor found in adaptation actions of Electronic Government applications, according to Santos, is that many functionalities present in computers will not be available in Web navigators for Digital TV, such as input and output devices (keyboard and mouse), the size and resolution of the screen where the data are visualized, among others.

Santos also indicates that with Digital TV, the user needs to interact with television, becoming an active element in the communication process, as occurs in Electronic Government programs. The interactivity is a concept that does not exist in traditional analogical systems. In such case, Brazilian population is not used to interaction with the television, representing a limiting obstacle for the successful implementation of *t-Government* programs.

Taking into consideration the technological aspect, other limitations must be observed. Despite the fact of the STB (Set-Top-Box) present computational resources, it can not be confounded to a computer. In general aspects, its processing power and input and output devices are limited when compared to computers (it will be generally used the remote control) and to screen, that will be the television already existing in Brazilian homes and that presents an inferior resolution if compared to computer screens.

Despite the incipient usage of Electronic Government technologies in Digital TV and of low interactivity in European and North American models, according to what was presented in the cases shown in this work, the BSTD-TV model has, from its interactivity purpose, a very interesting potential of evolution and development of applications and services. As a referential contribution to this process, it is had in Electronic Government models applied nowadays, modeling and implementation of new applications and services for Digital TV. One of the critical factors that are important for this process is the equation of models and public policies related to bidirectional interactivity by Brazilian Government.

The use of a SWOT matrix analysis allowed identifying that the leverage of results depends on the continuous investment on developing models, standards, frameworks, applications and use of Digital TV in Electronic Government and in the development of resources for infrastructure and qualification of human resources. With the purpose of minimizing vulnerabilities it is proposed the effort of replying and adapting models existing in other systems or markets and the encouragement of developing partnerships and global consortia. As a complement, in order to reduce the identified limitations, it is proposed the development of specific public policies and solutions of digital inclusion of poorer social layers and specific communities.

The amplitude of Digital TV implementation process in Brazil depends on the synchronism and integration between the fomenter organisms, the development of public policies, encouragement of developing partnerships of content technology suppliers, mobilization of innovation and research institutes, integration and technological convergence and increasement of interactivity technologies penetration in digitally excluded layers.

The cases presented show the technological possibility of application of interactivity solutions of Digital TV for Electronic Government. The SWOT matrix and Critical Success Factors work in an environment of integration mechanisms of these technologies with population day-by-day.

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