

Public Policy and Technology Decisions' Ripple Effect

—A View from Entailed End Users' Position

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How to cite this paper: Erosa, V. E. (2023). Public Policy and Technology Decisions' Ripple Effect. *American Journal of Industrial and Business Management*, 13, 672-723. <https://doi.org/10.4236/ajibm.2023.136038>

Received: May 17, 2023

Accepted: June 27, 2023

Published: June 30, 2023

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Abstract

This paper displays major results of a research project undertaken in a single country unit to address the relevance of the implementation process of a given Technology-based initiative derived from a Public Policy set at an unforeseen event environment, on social needs' attendance. Being a topic of key interest for its time, immersed in a Technology Rippling Effect atmosphere, attention is centered first, in the last wave of Technology Ripple Effect' reactions, visible as attitudes at individual level when entailed on the implementation of a political action powered by Technology, and second, in their derived effects' back over the Public Mandate that activates them. Technology Based-Education Provision Services' process shaped and compelled by two years World Health-lockout period, turn to be instrumental as study setting to address the characteristics of the delicate tension between Technology and their individual End Users, which come to the surface as political action powered by Technology implies a foremost social structural transformation. Based on Grounded Theory processes, supported by data generated through an Observational Study, analysis' results reveal individual polarized attitudinal response to Technological stimuli, produced in divergent and paradoxical contexts, rising a red sign identified as Public Policy effects on social benefit goals and public expenditure being, both of them, challenges to attend when enabling massive Technology Change and Technology Utilization strategies are defined. Featuring a Theory formulation' Logic Diagram, these findings may be a valuable input for Public and Corporate decisions related to conditions of massive Technology' Operational Knowhow Processes Transmission, such as the ones required to operate public E-Government processes and on line Taxation duties procedures, as well as in the private arena for Global Supply Chain integration and/or to incentivize commercial paradigms' change as in the case of E-Commerce and B2B' expansion models.

Keywords

Technology Ripple Effect, Technology' Operational Knowhow Transmission Process, Technological Change, Technology Based Education

1. Introduction

Technology Effect' analysis based on an economic standpoint is a subject matter identified to dwell in the business playground rather focusing on investment decisions (based on risk analysis, ROI, obsolescence and other financial criteria), productivity improvement (processes improvement, cost/distance/time reduction and issues of the operational kind) and/or competitiveness' concerns (for instance product innovation/improvement, market development and strategic interests' enabler). This view led to the perception in which Management of Technology' related research initiatives mostly set on the Supply-side while the Demand-side' attention is hardly ever found within the marketing agenda, specifically through the Consumer' domain topics (as segmentation, behavior, distribution and/or location), with comparatively little awareness to the complexities of the transmission process directed to an uneven technology-literate group of end users. At the Public Policy' Arena, Technology Effect' analysis has been on the spotlight either from the Theories of Regional Development and Economic Growth whose view underlines the importance of Technology based industry' setting on regional basis to gain economic benefits' growth (Perroux, 1950; Kaldor, 1966), as from the Social Cost-Benefit method used for assessing economic efficiency of Public Policies or social applied actions' expected outcome, *as it compares the values of all benefits from the action under consideration and the costs associated with it* (OECD, 2005). Following this notion, the method redefines the priorities scale of the expected benefits of a Technology investment purpose by addressing needs of social groups and measuring benefits in terms of social gains or losses (Pearce & Howarth, 2000; Dasgupta & Pearce, 1972), operating this criterion, the highest cost-benefit ratio obtained by a certain initiative will take priority over others (United Nations, 1997). Given that a social structure is configured by individuals is reasonable to consider that when dealing with Technology-based initiatives is the Human Factor the one that primarily becomes either the targeted beneficiaries or the entailed final *Technology Users*.

The sketched scenario suggests that immerse—veiled in plain sight—among social projects' technical components, correspondent public policies and operational requirements, the introduction of a Technology Based initiative springs an implicit Ripple Effect—a structural dynamics concept applied to a chain of events or situation in which a single event produces downward, continuous and accumulative disturbances which spread and produce further effects (Cambridge Dictionary 1; Merriam-Webster Dictionary; Dolgui, Ivanov, & Rozhkov, 2020),

sparked off when Technology Investment decisions' impact propagates downstream causing a second expansive wave of operational processes' implementation that flows to a third ripple shaped by the required managerial actions to bring about (Erosa, 2018: p. 12). As represented in Figure 1, beneath them follows on a fourth undulation—the extensive of all—where the Ripple Effect reach the key player: the Technology' End User (TEU) who by means of direct interaction is expected to receive and craft Technology benefits by embedding—until use' normalization—the related Technological resources and know how into a certain routine. Given the nature of a selected Technology initiative this wave could expand up in two different sorts of entities: one configured by *internal* Technology' Final Users (running operational processes to be used or not by a third party) and a second formed by direct *external End Users* being this the essential activity identified as the individual use for personal benefit of an individual, referred to in Marketing as ultimate or personal consumer (Schiffman & Lazar, 1991: p. 5). So, it is reasonable to consider this as the last tier of Technology decisions' Ripple Effect in a Social Public Policy environment.

Following this order of ideas, Technology User' analysis view bring in research interest into Management of Technology' sphere—presented in the block at the right side of Figure 1—as it connects Technology-Knowhow Transmission phase of Technology Transfer Strategy and Technology Change Strategy—set at Organizational grounds—into the core procedure of *individual* Technology Adoption in either the type of Final and Technology End User. This is noted to be a topic of multicausal nature, being for that reason expected that effects of the

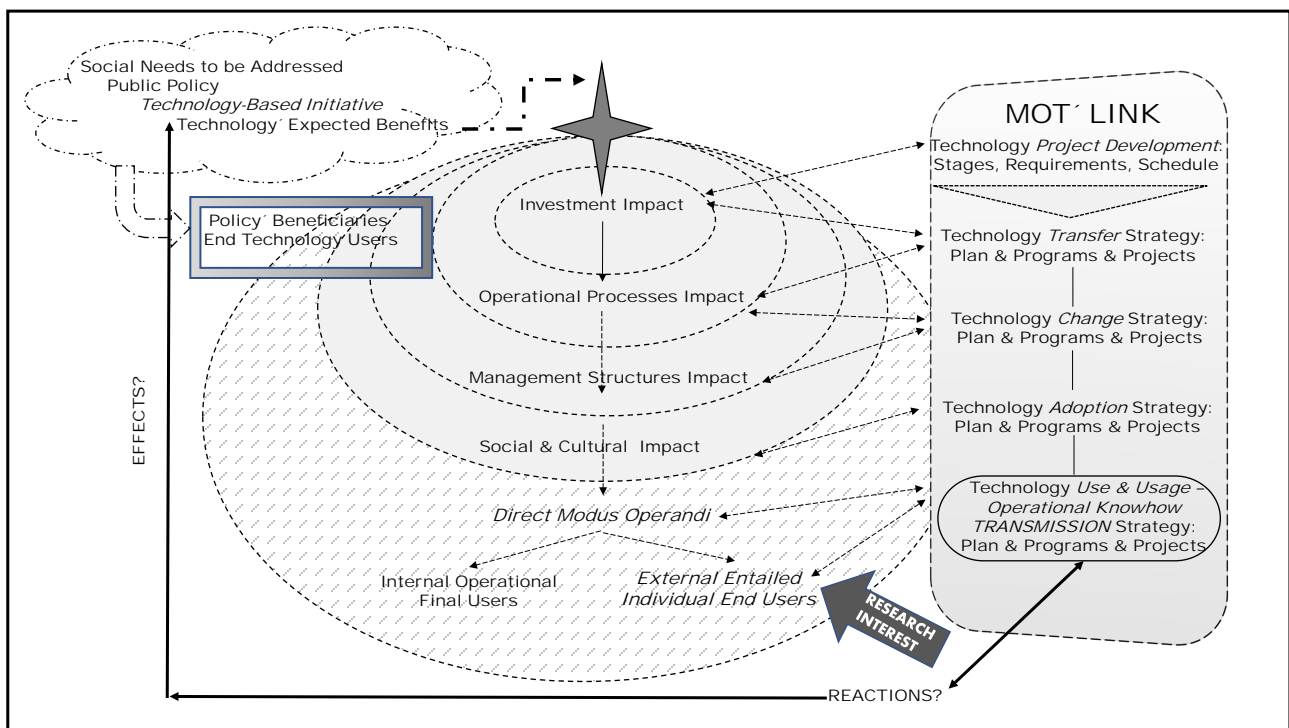


Figure 1. Technology' Ripple Effect in Public Policy' Context & Management of Technology (MOT) Link. Research Interest Setting.

kind on individual users could be widely interpreted as the analytical context or disciplinary lens diverges. MOT’ perspective incorporation on the research forum aims to provide a novel and unique contribution by framing the analysis on the connection of the Public Policy’ key enabler component—Technological Operational-Knowhow Transmission Process—to the Public Policy’ key instrumental subject: the individual Technology **End User** (TEU).

As enabler support for Technology Based Initiatives’ set up, within a Technology Ripple Effect environment, introduced in **Figure 1**, MOT’ components explained in **Figure 2** settle on a combination of plans of action referred to as *Strategies* aligned among them around a common purpose achievement: to reach general stated objectives (Erosa, 2020a). Upon this view, a Technology based initiative advances through legal, technical and managerial environments occurring inward the organization’ domain of control. However, on the other side of the coin, once that Technology based initiative’ *Operational Process* has been activated, the moment of truth emerges: Technology’ know-how *utilization* in the working activities—routines—are to be set in motion by a particular component identified as Technology End User in reference to the ultimate unit of the last layer of the transference’ endeavor, the Technology Operational Know How Transmission Process’ active receivers.

An insight into the Technology Adoption phase takes to a key analytical component as it involves individual’ sense of belonging built around the own

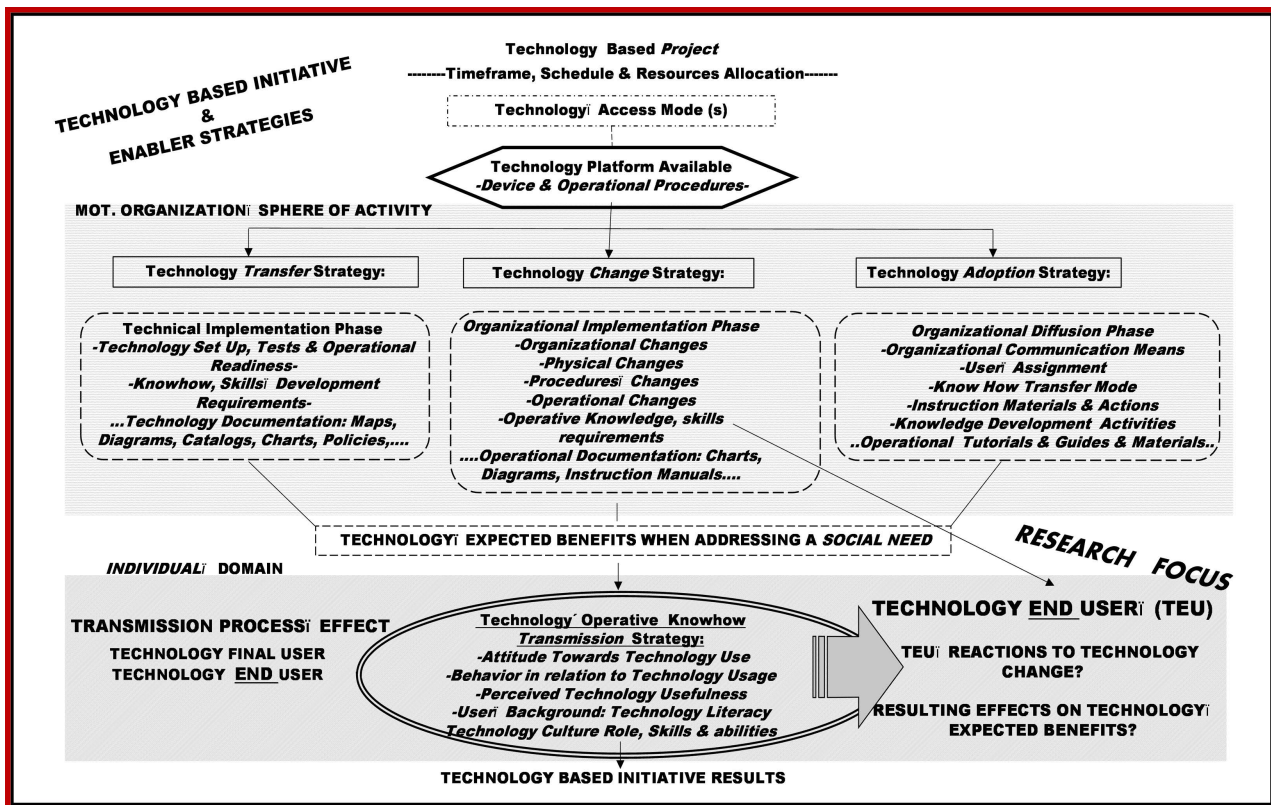


Figure 2. Management of Technology (MOT). Operational Connections. Research Focus.

person's social and cultural layers assembled by a nuclear family structured by parents and children living in the same household (Barkan, 2011: ch6), a social group with which the individuals identify themselves ((Open Education Sociology Dictionary; Sumner, 1906: p. 13), a country culture referring to a group's way of thinking (Henslin, 2013: p. 40), a corporate culture as basis of tacit order of an organization (Melewar & Jenkins, 2002; Groysberg et al., 2018) as well as a given technical-labor-profession's culture acknowledged as an activity that *constitutes an area of social life into a field* (Larson, 2005). The introduction of this Social View on Technology's Effect Analysis seems to be consistent with Weber's (1949: p. 56) thought when considers that *a problem of social policy lies in the domain of general cultural values*. A note of caution is marked here as Technology Adoption in a crucial Public Policy context is not a matter of end users' decision choice, but rather a matter of involvement.

To gain understanding of the relevance of a given Technology based project's contribution on the needs' attendance analysis along the length of a context of emergency, fine tune is essential by moving the attention from the general view of a non-differentiated beneficiaries' whole to the individual Technology End User's reactions and their further effect on results. Specifically, the effects of such intervention on their attitude and behavior turn a priority to learn about when Technology Transfer Processes are on sight as well as when enabling Technological-knowhow Transmission models; Technology Change and Technology Adoption Management strategies are being defined. This interconnected-processes frame grants a reason to highlight the core importance of Management of Technology (MOT) view's inset in interventions of unexpected nature in which Technology and groups of society are encompassed, taking on, in consequence, the interest to explore the characteristics of the delicate tension between Technology and their individual end users that come to the surface as political action *powered* by Technology implies a major social structural transformation compelled by an urgent situation to deal with.

Research Focus

Aware of the entangled Theoretical net around the phenomena under analysis, a start is made by the subtle basic semantic differential among the words *Transfer* related to the *act of* moving something or someone to another place (Oxford Dictionary 1), *Transference* denoting the process of being transferred to (Oxford Dictionary 2) and *Transmission* in reference to an act or process of spreading, passing along or send out—for instance knowledge—from one person or place to another (Cambridge Dictionary 2). Taking into account that operational know-how capability is regarded as a necessary condition for a given Technology be set in motion, then seems reasonable to assume that a process of direct operational technology know-how's transmission to Technology End User's population is a suitable notion to be distinguished as the Technology's Operational Knowhow Transmission Process, standing out among other variables in the context of a

multicausal nature phenomena, as a necessary condition if the expected Public Policy' outcome is to be achieved. Thus, may be predictable that if a Transmission Process of the kind is out of alignment, poorly implemented-monitored-considered tacit knowledge, or is just taken for granted, both the Technology based initiative' implementation and the Public Policy' expected outcome could be badly affected, the *process* to be conducted for this purpose turns to be a key operational component to reach the greater number of Public Policy beneficiaries at individual Technology End User' level. Being a theme of the kind far-off the forefront in most of the related literature, at the midst of this multilayered and multivariable environment the research interest is *focused* on the reactions and effect' themes given a context of response to an urgent situation, by means of the research' conceptual frame operationalization as:

RQ. 1 = How does the last wave of Technology Ripple' Effect *reacts* at individual level when entailed on the implementation of a political action *powered* by Technology?

RQ. 2. = What *effect* does Technology End Users (TEU) reactions' creates over the expected Technology benefits?

The How and What type of questions put forward the quest of an understanding of 1) the main attitudinal *reactions* of Technology based process' direct End Users in response to a well-ordered change event of the kind, and 2) the changes that results—*effects / consequences*—of an all-encompassing Technology based *modus operandi* implementation action upon the individual end user' engagement on the newly experienced processes. Both those simple questions are about to unfold complex even so not definite answers. As in the note about the semantic differences among the words Transfer, Transference and Transmission, the distinction between Technology *Final* User and Technology *End* User (TEU) is a basic matter to make clear that the position of the research' interest is in the last layer of Technology' Ripple Effect, and—to avoid confusion—that here the *research focus is set on the Technology' End User* figure, identified to be a third party located on the external Demand-Side environment of Technology Transfer conception' sphere.

2. Theoretical Referent. Mapping Interactions

Considered as a challenge for a Grounded Theory research *the need to set aside, as much as possible, theoretical ideas or notions So the analytic, substantive theory can emerge* (Creswell, 1998: p. 58), present research focus characteristics' grant reason to build a Theoretical Referent as instrumental frame to first support the configuration of a body of knowledge addressing the context around the phenomena under analysis and secondly to build up research' theoretical boundaries needed for findings' comparison and for specific theory' components identification as a central phenomenon, its causal conditions, strategies and context (Creswell, 1998). Being aware of the presence of an extensive conceptual continuum to be identify-extract-analyze and further apply along the research

development, the resulting Theoretical Referent is organized into two categories: the broad angle—to explore the contextual theoretical connections among them—and the inner lens hosting the conceptual net involving the phenomena of interest' driver, the entailment process and the reaction at individual level. The Broad Angle perspective identified, frames the research focus on the logic of the concept of Social Benefit aimed to gain greater good for the greater number, while the Inner view is developed at the individual-receiver dimension.

This double vision applied to the Theoretical referent is introduced because in a Technology based initiative environment fostered by Public Policy decisions triggered by unforeseen events, recognizing individual differences and learning about individuals' attitude when facing the actions exerted towards them as means of implementation, emerges as a central building block to prevent failure due to unevenness of demographics profile on a given receivers' population to be served. Under this internal environment' clear understanding, the stated research questions to be operationalized call for the configuration of a theoretical referent suitable as analytical enabler along two dimensions in correspondence 1) to individual' reactions to a given technological change implemented at country level to deal with a crisis, as well as 2) to those reaction' effects back on the triggering Public Policy domain. From this view, a unique of the kind two-dimensional non sequential Theoretical net frames both Research Questions enabling the analytical immersion in an array of participating different knowledge fields whose interconnected web is assembled as a two dimensional Theory' Referent Network whose points of incidence' interaction build up links that act as threads connectors of a Theoretical tissue strongly tied among them to configure a unique bidimensional pattern. **Figure 3** displays an inner operational theoretical structure implanted in a Public Policy Frame rooted in an Ethics view as response to an emergent crisis, shaping a map of interactions that set the course of the research' operational activities as a general representation of the text containing the descriptive articulation of the research focus' Theoretical Referent Network.

2.1. The Broadest Angle: A Public Policy' Mandate Environment

Building upon a multi-theoretical frame, as a necessary component of a proper explanation regarding the phenomena under analysis' nature, attention should be given to the broadest angle covering the Ethical perspective from the standpoint of economic rationality. The chain of events activated by a Public Policy reveals an opening connection to the Teleological branch of Ethics Theory centered on ends to be achieved (*Britannica Encyclopedia 1*). A Public Policy definition is stated by *Dimock (1937)* as *...deciding at any time or place what objectives and substantive measures should be chosen in order to deal with a particular problem*. The term evolved gaining in precision as found in general dictionaries referring to Government decisions oriented to favor the public (*Britannica Encyclopedia 2*) as well as in specialized ones in terms of using resources strategically to alleviate national (*Chandler & Plano, 1988*) and in reference to the adoption of the best course of

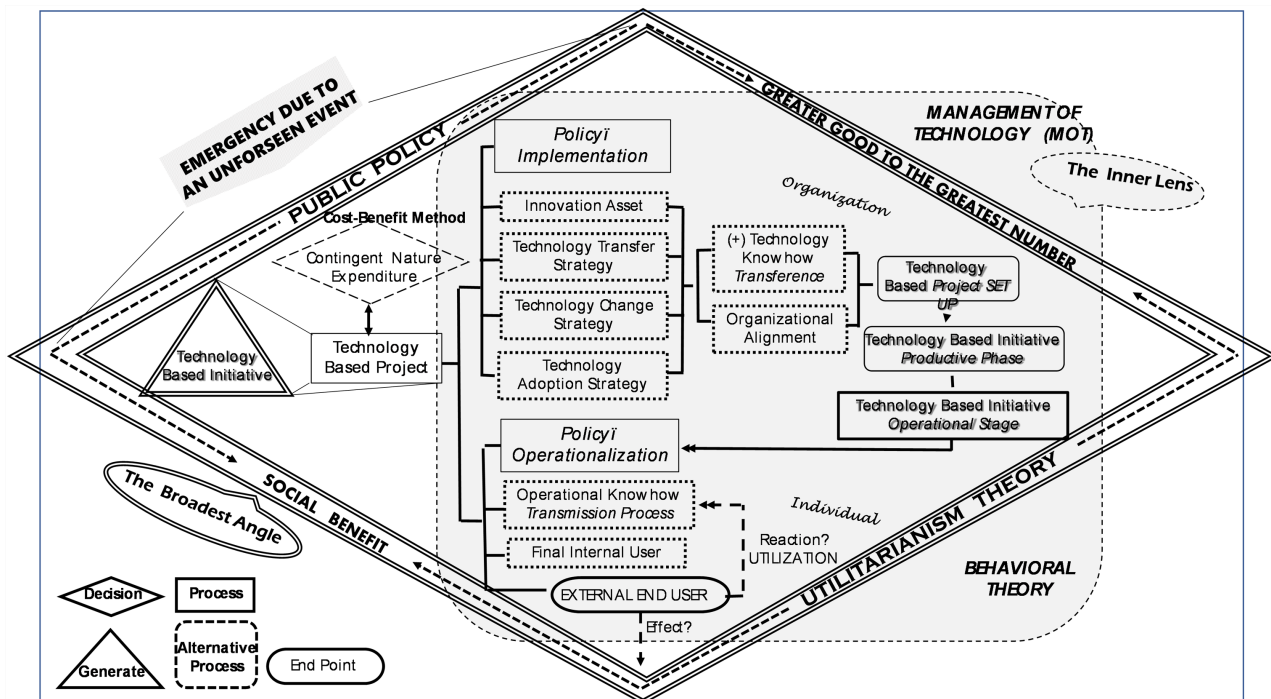


Figure 3. Research focus. A two dimensional theoretical referent network.

action (Shafritz et al., 2017). Even when refined differences may well be identified, the sources denote a common spirit in reference to government's authoritative decisions instrumental component in terms of guidance for actions focused on social benefit. Within this context, in view of a Technology based initiative deep-rooted at the heart of a Public Policy, it is expected to bring about the greatest good to the greatest number by means of the resulting economic choices as illustrated by Government's investments on water, energy, transportation provision and all sort of infrastructure facilities, as well as in expenditures applied to social contingency' attendance. Focused on goals, this rationale' basis came out from the prominent classic Ethical approach referred to as Utilitarianism Theory (Bentham, 2000) in force beyond the Nineteenth Century horizon for serving as center of assumptions on economic choices (Baumane-Vitolina et al., 2015).

Under this lens, it is assumed that the best action is the one that maximizes utility considered as the benefits to society derived from an action which stands also for the reduction or elimination of a given issue. Mills (1863) widened the notion out of the material benefits' boundaries in terms of considering the greatest good as individuals' pursue of greater happiness. These presupposition' elaboration and further introduction into Sociology and Economics is put on view by Veblen' utilitarian hedonism and controversial conception of expressed through the term Conspicuous Consumption (Veblen, 1899), in reference to the preferences for luxury goods and services purchases. In the last decades of the XX Century, Utilitarianism assumptions still were a matter of intense debate (Kilpinen, 1999; Miller & Williams, 1982; Simmons, 1982), gaining clarity early XXI Century as shown by Eggleston' (2012: p. 453) explanation of the concept as the conjunction of five

characteristics labelled as: *consequentialism* (Sinnott-Armstrong, 2003), related to the consequences or outcomes of a decision or an action; *welfarism*, associated to facts about well-being; *individualism*, presume that the sources of value to be found are individuals; *aggregation*, stands for the notion that the value of a state of affairs is determined by summing the values associated with the individuals in that state of affairs; and *maximization*, implying the notion of the value of a state of affairs to be as great as possible (Ethics Encyclopedia).

Utilitarianism principles lead to the conception of Social Benefit in reference to the contribution to society derived from a good or service provision either by Public or Private entities, defined as *...current transfers received by households intended to provide for the needs that arise from certain events or circumstances* (OECD, 2001). A mirror interpretation is found under the reference of *...Welfare defined as the total income or total expenditure of beneficiary households. Estimates include both direct and indirect beneficiaries* (The World Bank, 2022). Results of these concepts' perspective are measured by statistical indicators using physical infrastructural evidence and/or beneficiaries or number of persons allegedly served by the results of a Public Policy implementation. Bentham' Utility Principle (op. cit.) regarding persons' egalitarian value supports the view of all involved minorities' attention as means to well-founded inclusion actions. A case in point on the upper range' side of the differences are the in-depth observations of the dependence of wealth upon machine-technique and their consequences on social behavior later discussed by Veblen (1899: p. 15), the themes related to how social and economic Institutions influence people' behavior, the social creation of habits of thought and their aftermaths on society addressed by this author, set the grounds for further theoretical development extended by Hamilton (1919) under the umbrella of the Institutional Approach to Economic Theory. Aware of the sensitive topic, in depth revision of these Theories is beyond the scope of the present research.

2.2. Theoretical Referent. Broad Angle Configuration

Within this multi theoretical referent, the components' interconnection display a network of interactions acting together, usable for the identification of a different outcome, than the produced through the application of a number of single Theory ones, revealing so a Complex System nature (Allen et al., 2011; Collander & Ruppers, 2014: p. 13) of aggregate type as considers systems of linked components creating synergy from their interactions (Manson, 2001). Thus, the structure of the opening Theoretical frame required by the research focus statement referring to the context created as a result of a Technology Rippling Effect, is explained by a sequence of reasoning ignited by a Public Policy released to rule the objectives and substantive measures defined to face a given problem (Dimock, op cit) as illustrates the case of the education provision services' continuity while facing a World Wide Health emergency that lead to the population' lock out, being this solution empowered by technology selecting Technology based Education Model upon the notion of...*the best action is the one that maximizes utility considered as*

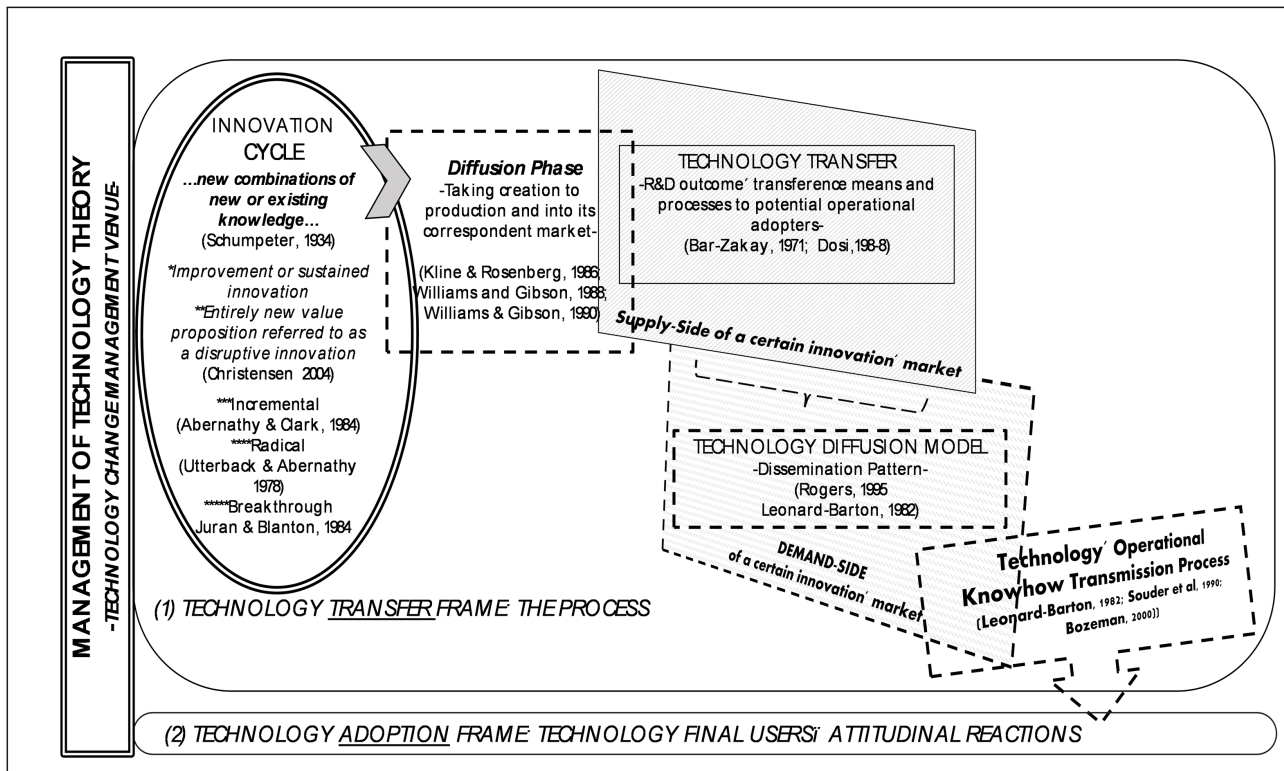
the benefits to society derived from an action (Bentham, op cit). The resulting Public Policy implementation follows Veblen (1899) idea that economic Institutions influence people' behavior positioning so the procedures' activation at individual dimension in consistency with Weber' (op cit) view in which... *a problem of social policy lies in the domain of general cultural values...* These theoretical interconnections form a close loop due to the education services provision' nature as a Social Benefit consistent with previous mentioned OECD (2001) definition.

Being acknowledged that the Education Services provision continuity in times of World Health emergency is so ruled through a Public Policy, implemented and operated by a Government Agency, the required expenditure amount is absorbed by specific contingency budget funds applied with the view of ... *Welfare defined as the total income or total expenditure of beneficiary households. Estimates include both direct and indirect beneficiaries...* (The World Bank 2022). The Broad Angle perspective identified, frames the research focus on the logic of the concept of Social Benefit aimed to gain greater good for the greater number. Still, in a Technology based initiative environment fostered by Public Policy decisions triggered by unforeseen events, recognizing individual differences and learning about individuals' attitude when facing the actions exerted towards them as means of implementation, emerges as a central building block to prevent failure due to unevenness of demographics profile on a given receivers' population to be served.

2.3. The Inner Lens: From Technology Transfer to Technology' Operational Knowhow Transmission

End Users involvement on implementing Technology Based Public Policies' actions call for readiness regarding technical knowledge, ability and skills to operate access to the certain Technology, moving forward the implementation actions into MOT' Technology Transfer venue by means of the Technology' Operational Knowhow Transmission *Process*. Thus, being the research focus set at this point, in search of a suitable analytical frame the theoretical foundation is revised from a two main MOT' block perspective being the first the *process'* basic components positioned at the Technology Transfer Theory field, followed by the individual' reactions in terms of *attitudinal responses*, topic to be found in the Change Management Theory area.

Applying an inductive perspective, **Figure 4** portrays the Theoretical components' interactions behind the Technology Transfer *process* acting as the external stimulus determined to promote the Technological Change that represents Technology Utilization. Building Grounded Theory on the specific matter calls—as necessary condition—the selection of a suitable Study Setting characterized as a massive Technology Change set in motion by a Public Policy Mandate, activated by a derived Technology Ripple Effect. A Scenario of the kind is found in events such as E-Government Services Process' operationalization or in industries reconversion such as the future' retail industry. The emergence of the World' Health emergency in the period 2019-2022 rise the monumental challenge to



Block (1). Technology Transfer Frame: The Process.

Figure 4. Theoretical Referent Structure. The Inner View. Management of Technology Components.

protect continuity to Education Services Provision, turning into a Technology based model as the nearest response, being for that reason selected as instrumental to the analysis of the phenomena of interest with limits determined by the two Research Questions presented.

2.4. Technology Transfer Frame: The Process

Grounded within the context of the innovation cycle, the term focuses on the diffusion stage—taking creation to production and into its correspondent market (Kline & Rosenberg, 1986; Williams & Gibson, 1990), regardless being an improvement or sustained innovation or an entirely new value proposition referred to as a disruptive innovation (Christensen et al., 2004)—the concept has been mostly defined, analyzed and discussed upon the basis of R&D outcome' transference means and processes to potential operational adopters (Bar-Zakay, 1971; Dosi, 1988). A frame of the kind sets the Technology Transfer topic at the Supply-Side of a certain innovation' market. Within these context, key works were developed to support the Technology Transfer process as represent the United Nations Industrial Development Organization—UNIDO' Manual on Negotiation Techniques (1996)—directed to develop team' competencies and skills on negotiation techniques to gain efficiencies in R&D outcome commercialization—and the United Nations Conference on Trade and Development (UNCTAD, 1985) International Code on the Transfer of Technology (draft TOT

Code) that aims to create conditions for a free market of Technology standing the view of private rights protection based on intellectual property laws, in reference to the ...*process by which commercial technology is disseminated* by means of a transaction *involving the communication, by the transferor, of the relevant knowledge to the recipient* (United Nations Conference on Trade and Development, International Code of Transfer of Technology, UNCTAD-TOT, 1985: pp. 5-7). A central feature of this document is the clear differentiation of the terms Technology *Generation*—in reference to R&D results-, Technology *Transfer* based on the ownership rights' transaction process, and the dissemination process later referred to as Technology *Diffusion* conceptualized as the flow of the protected assets to receivers through licensing agreements (UNCTAD-TOT, 1985: pp. 11-15).

Long term noteworthy attention to Technology Transfer' theme was documented by Bozeman (2000), being the topic' importance comprised in a body of knowledge emerging back in the 1940 decade (Tenkashi & Mohrman, 1995; Johnson et al., 1997) whose range goes from general or broad view where Technology Transfer is defined as ...*the development of a technology in one setting which is then transferred for use in another setting* (Markert, 1993: p. 231); the regulatory view stated by the World Intellectual Property Organization (WIPO, 2017) as...*a collaborative process that allows scientific research findings, knowledge and intellectual property to flow from creators, such as universities and research institutions to public and private users*, to the detailed attention oriented to the organization of the abstract conceptions in two general groups of representations labelled as *Models* according to their generic characteristics namely qualitative and quantitative models (Sung & Gibson 2000; Wahab et al., 2009) being considered of relevance here, among the number of them, works focused on 1) quality of research promotion and *market introduction* also known as the Appropriability Model view; 2) the Diffusion Model, set at the demand side as focuses on the *dissemination* pattern of a certain innovation from the source to the end users groups (Rogers, 1995); 3) the Gibson and Smilor (1991) Knowledge Utilization Model that outlines the internal utilization level by introducing the notion of the communication between developers and receivers and on the knowledge organization to the effective use of the transferred asset; and 4) Williams and Gibson (1990) Communication Model that considers Technology Transfer as an active, ongoing communication flow process of ideas' exchange among participating parties. A common characteristic of these models is the consistency on the R&D outcome scope of vision either for commercialization and/or dissemination of technological results generated in a certain context implemented or used in a different one, as for the view of receivers' *internal* utilization by means of communication flows between the source of origin and the receiver.

The described theoretical insight suggest that both literature from academy as well as results of International Agencies special groups' works, meet a common ground for the term Technology Transfer' general definition by implying the

R&D outcome' ownership view. This set of basic concepts covering a range from definitions, best practices and negotiation techniques to an international code of conduct draft, underlines that the primary interest is on the market scope of the Technology transaction asset followed by the internal users view, while—the crux on the matter—operational features as Technology Knowhow Transmission Process from internal to external end users remains unchartered even though is an operative topic that prove worth enough as to be included among the Technology Transfer notion components.

The R&D outcome' supply and internal Demand-Side view of these dominant explanations of Technology Transfer term' meaning, seems unsuitable for the requirements to analyze the phenomena situated on the External Demand-Side, the one where the ownership rights topic has been set on and the given innovation enters into the productive cycle moving from operationalization into the *utilization phase* that most often in XXI Century includes an *external end user*, as in the distinction between technology adopters and technology end users' concepts (Leonard-Barton, 1982: p. 14). At this point supply and demand sides' link is identified by means of a new rendering of the topic introduced as came to surface the importance of the semantic differences specified among the terms *Transfer* related to Technology asset' rights, *Transference* regarding the receiver' Technology set up process required for internal utilization, and *Transmission* as reference to the transmit process or *Technology' Operational Knowhow* conveyance from the internal operational source to the external end user for **utilization** purpose, as means of Technology Adoption stage' wrap up.

2.5. Innovation: The Core of Technology' Operational Knowhow Transmission Process

From Latin *novus/nova/novum* designating something new, fresh (Latin Dictionary), the innovation concept associated to the entrepreneur' role was introduced by Schumpeter into the Economic Science (op cit) in reference to five types or objects of innovation: new products, new production methods/processes and new sources of supply as well as new markets exploration and new ways to organize business identified to emerge from the business/organizational practices' arena. As identified, the inclusion of **knowledge** as a component in its definition, opens the space to the view that includes skills and methods required for implementation and further operationalization, referred to as knowhow or technical knowledge (Bozeman, op cit).

A key conceptual distinction is pointed here to identify the innovation' decision-maker as the technology adopter whilst the user is considered to be the ultimate person involved in operating and/or in direct interaction with the specific innovation (Leonard-Barton, 1982). The concept gains consistency upon the basis of Schumpeter' (1934) broadest definition of innovation in terms of **new combinations of new or existing knowledge**, resources, equipment and other factors that marks a difference from invention. Once that the innovation' exchange value is crystallized through a specific transfer mode enters into the re-

ceiver' control either through royalties' agreement, technical services provision and/or into the ownership sphere as an asset either tangible or intangible. Technical operational knowhow transmission—and in occasions active operation—soon was identified as a profitable single service unit usually provided by the transferors to the transferees under the term of technical assistance.

For the purpose of this analysis placed on grounds of Public Policy implementation, the innovation' theoretical referent also fits Souder et al (1990) and Leonard-Barton' idea of a transmission process of technological knowhow' skills and methods, as well as further direct operationalization by the receiving user of the new methods of operation resources, equipment and other factors such as the new ways to organize the service provision empowered by a given technology infrastructure. Under these conceptions Schumpeter' definition provides a fundamental component as it includes a key point when referring to an innovation as new or *existing knowledge* supporting so innovation' view as ...any practices that *are new to organizations*, including equipment, products, services, processes, policies and projects (Damanpour, 1991) further expanded to the fundamental admission of innovation to be consider also ...as an idea, practice or object that is *perceived as new* by an individual or other unit of adoption... (Rogers, 1995; Daugherty et al., 2011).

The innovation concept has gone as well through the lens of the source of origin where concepts as *technology push* applies to the process in which development results are taken into commercialization while the industry view privileges the *market pull* perspective looking for a technological solution to a given need or requirement. Dixon (2001) work provides a full explanation to these two concepts. Upon this understanding, Technology Transfer process is present in a diversity of environments regardless its most common reference within the context of the innovation cycle focused on the diffusion stage (1). Moving forward on this idea, Leonard Barton (1982) related the introduction of a technological innovation—into the owner' or into a user' organization—to the management of change.

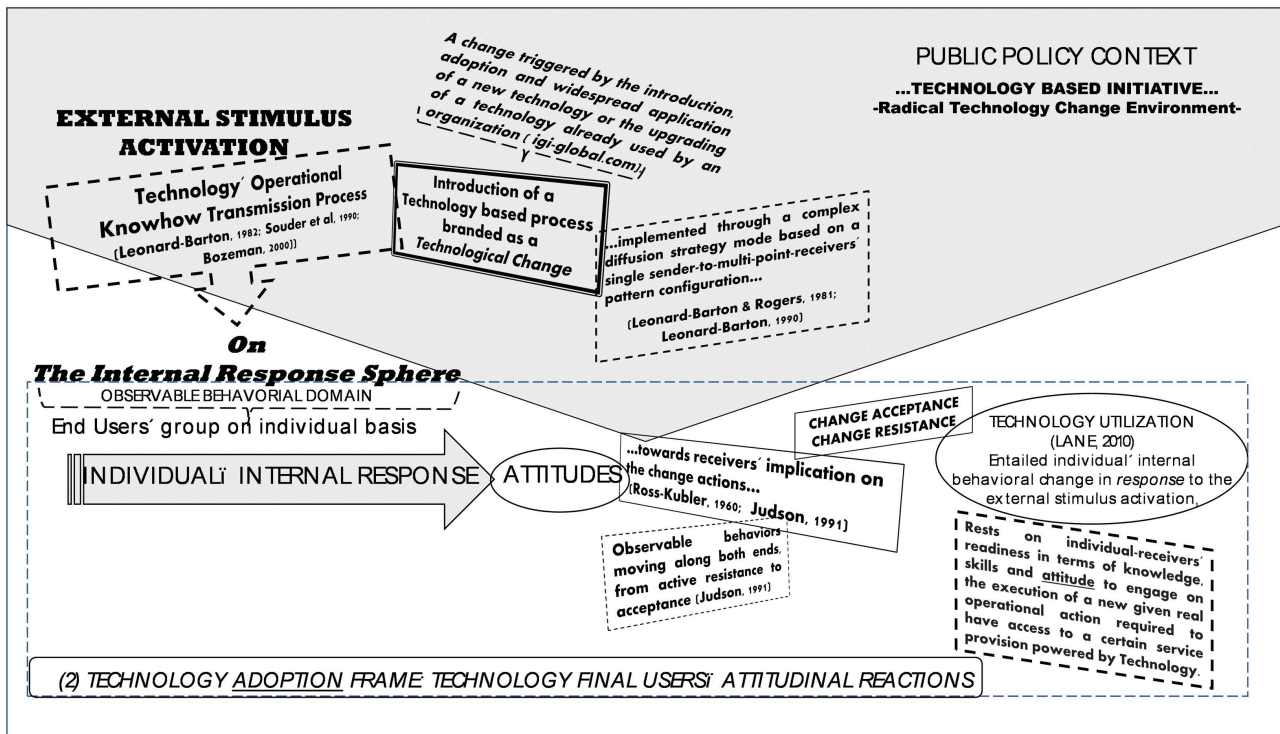
Exploring the research theme' net applying the innovation view, raise awareness that in line to its origin—a Public Policy Mandate—the research focus follows a continuum of theoretical components such as (a) the *demand pull* perspective of an existing Technology (b) *perceived as* innovation, whose implementation is expected to (c) activate a *major technological change* with great social and individual responses (d) of *end users* facing operational challenges necessary to develop the skills and abilities required to master a given technology' operative knowhow, (d) as a basic condition to *have access* to a service provision powered by a given technology infrastructure. This set of components suggest the presence of a Change Management environment, being this the point where theory suits well the research interest as identify a problem located amidst an uneven set of receivers where the range of the technology' operational knowhow readiness goes from highly skilled to technology-illiterate end users facing a challenging technological change that will trigger a variety of individual reactions expressed by observable behaviors. Here a cross point with the theoretical

frame' broad angle is identified in regard a major implementation decision as it has to be defined either the best-most effective transmission process of the proposed solution to fill the *greatest good to the greatest number* principle, when dealing with receptor' demographics unevenness ranges in full alignment to the ethical principle of person' egalitarian value.

2.6. The Convergence Point: Activating Technology Utilization

Being acknowledged that a necessary condition to attain Technology based initiative' benefits is by making an effective use of it, theories' convergence point is recognized where the Public Policy mandate reaches the operational practicalities by means of the fact of the entailed End User' engagement to develop and/or actively apply the knowledge and abilities required to execute a given operational process as an opening condition to take the specified Technology-based initiative into *utilization*, in reference to the act of using something in an effective way (Cambridge Dictionary 3). Conceptual differences around the matter are addressed and discussed in works set on internal-Demand-Side health industry' R&D environment, supporting the view of the need to integrate Technology Transference and Translation of Technological Knowledge processes in order to smooth the progress of *Technology Utilization* (Lane, 2010). In doing so, it is envisaged that an *operational technological knowhow transmission process* call on to be primary set in motion in order to involve End Users' group on individual basis, becoming then the convergence point of the perceived Technological innovation—an external stimulus—and the behavioral domain observable through attitudes—an individual' internal response—on what is identified by means of the introduction of a Technology based process branded as a Technological Change, implemented through a complex diffusion strategy mode based on a single sender-to-multi-point-receivers' pattern configuration (Leonard-Barton & Rogers, 1981; Leonard-Barton, 1990).

The complexity of the structural-conceptual net around End Users' Attitudinal Response activated as an external stimulus provide support to understand why the Operational Knowhow Transmission Process turns into an enabler driver for a Technology Change (TC) implemented by the End User by means of Technology Utilization (Figure 5). Denoted as a key component in a diversity of knowledge domains, Technological Change construct has obtained also multiple attention in terms of its meaning, having found in this research a single webpage displaying 582 legal interpretations applied to a number of contracts (Lawinsider). In this research the suitable Technological Change definition applies to *a change triggered by the introduction, adoption and widespread application of a new technology or the upgrading of a technology already used by an organization* (igi-global.com). The view itself is anchored in innovation outcomes whose impact is regarded in accordance of its nature as *incremental*—not fundamental—referring to slow, gradual or evolutionary transformations (Abernathy & Clark, 1985), *radical* considered as revolutionary being the one that *creates new markets, supports freshly articulated user needs in the new*



Block (2). Technology Adoption Frame: End User's Attitudinal Response.

Figure 5. Theoretical referent structure. The inner view. management of technology components.

functions it offers, and in practice demands new channels of distribution and aftermarket support (Abernathy & Utterback, 1978: p. 45), and a dynamic *break-through* change, term used to designate the view of continuous improvement derived from doing things better as pathways to take the organization to a next performance level (Juran & Blanton, 1988).

From previous described types derives the identification of Technology Change view as implying the phenomena on the individual environment “external stimulus” driver that motivates/produces a swift of a given kind on the receiver’ contextual domain, while at subject level such motive power activates a broad range of emotions and attitudes acknowledged within the Psychology sphere as the—controversial—Quantum Change phenomenon (Miller, 2004). Set on a single scenario, these views reveal (1) the presence of a contextual change *acting for* the switch over a certain context and (2) the entailed individual’ internal behavioral change in *response* to the external stimulus activation, being reasonable to be regarded a causal type of relation as the external change agent—stimulus—might spark off an individual’ internal change expressed through a certain attitude. Located at the very center of the behavioral domain, research’ action moves forward into the following analysis stage focused on the identification of reaction’ towards a Technological Change of radical nature, setting the research frame—in consistency with Leonard-Barton statement (1982: p. 1) on grounds of Change Management theoretical sphere of influence and in alignment to the assumption that entailed end users’ reactions is to be regarded

as a valuable-necessary input to add-in when deciding interventions oriented to take pressure off resistance to change' risk, as basic component of a given Technology based initiative implementation strategy.

Conceived as a structured guidance strategy to introduce and implement until completion a given Innovation, Change Management *process* characterization has been described through a set of models based on different perspectives as identified by those focused on the change process' sequential phases (Lewin, 1947); the ones introducing the organizational perspective with an emphasis on human resources—referred to as Soft S—as the 7-S Model developed by Peters & Waterman (1982) widely referred as the McKinsey Model; those proposing a set of steps for implementation (Kotter, 1995); those related to the ...five *basic building blocks for successful change*, as the ADKAR model an acronym on Awareness-Desire-Knowledge-Ability-Reinforcement (Hiatt, 2006: p. 43) and the ones focused on the *attitudes* towards receivers' implication on the change actions (Kübler-Ross, 1969; Judson, 1991), being the Kübler-Ross Change Curve Model the most accepted explanatory frame for the effect of the change process on individuals while Judson' range of Continuum to Resistance of Change fits the notion of the resulting reaction being so both identified as a suitable theoretical referent for the present analysis due to the introduction of 18 individual' observable behaviors to significant changes in a range of rejection-acceptance.

For the purpose of this research, the contextual characteristics are identified to be set in a *radical* type of change environment acknowledged as an *external stimulus activation* on the *internal response* sphere where two opposing constructs along a single dimension come into view: Change Acceptance and Change Resistance, being the latter found as the suitable theoretical reference in the present context due to the benefit on its instrumentality to move forward on the analysis, being operationalized in a range of eighteen observable behaviors moving along both ends, from active resistance to acceptance (Judson, 1991), as well as its consistency to the Kübler-Ross Change Curve (1969) stages focused on reactions to change expressed by basic emotions. From this understanding derives the notion of individual' attitudinal response regarding change *acceptance*—the action of consenting to receive or undertake something offered (Oxford Dictionary 3)—being aware that even when being a must-to-be option individual' reaction remains far to be consider as an automatic action nor a tacit knowledge fruit or a taken for granted contextual component. Here, Technology Utilization rests on individual-receivers' readiness in terms of knowledge, skills and attitude to engage on the execution of a new given real operational action required to have access to a certain service provision, as stated at the core of the research interest operationalized in RQ.1 focused on the identification of entailed End Users' behavior *when* facing a major Technological Change point toward ...*the implementation of a political action powered by Technology...* Answers to RQ.1 are a determinant component to be identified in order to move forward into RQ.2 continuum quest referred to the *effects* of entailed End Users' attitudes—to a Technology Operational

Knowhow Transmission Process—required for the referred Public Policy implementation, utilization, operation and further results' achievement.

3. The Study Setting

Once that the research interest' boundaries have been established in the context of an extended theoretical net and founding that match conditions of a new phenomenon being explored, as the purpose is to generate an abstract analytical schema of it that relates to a particular situation in which individuals interact and/or are engaged in a process in response to a phenomenon (Creswell, 1998: p. 56), the Grounded Theory Approach is identified as the major suitable theoretical frame to apply as the research' actionable procedure (Glaser & Strauss, 1967). A main principle of this method is to generate theory closely related to the context of the phenomenon, being for this reason **infield data generation** a basic component to work on, starting with the infield data source selection, thus, the Study Setting determination becomes a foundation stone for the research' validity and reliability as it constitutes the unit of analysis where the research generates its data, being here the unit of analysis the event triggering in a country the change from presential to massive technology based education services provision mode registered as response to the World Health Crisis of the 2020-2022 period. The Study Setting then turns a procedural component whose selection calls for consistency either to the theoretical net as to the data generation (abduction process) sourcing, being as well a fundamental input to set the operational direction for the analysis by means of the methodological platform structure and further implementation.

The turmoil scenario faced due to a Global health emergency in force during 2020-2021 rise new challenges at the Technological front being the Educational Services Provision continuity one of the most wide, complex and visible endeavors to deal with at country level due to the cascade-type impact over key institutional agents and large population groups. In response to the emergent pressure, long distance educational modes took relevance being among them those Technology-powered referred to as Technology Based Educational Services. Upon this topic there are innumerable other aspects, but found that using technology as an enabling educational platform is—for some countries—an innovative solution as massive education delivery means, it rise the question as to how they deal to utterly **change over from** a traditional education system operated through presential attendance in dedicated physical facilities into a technology based educational system, given a no-option context where the external conditions exercised a unique, unexpected, unknown, devastating pressure to face the immediate continuity of the education provision challenge at national level. The emergent circumstance bring in attention to a possible void resulting of the nonexistence of a link between the Management of Technology discipline—in the figure of Technology Transfer' Strategy embedded in the Operational Knowhow' *Transmission Process* followed by Technology Change Management Tech-

niques—and the operationalization of education’ policy decisions at national level. The purpose here is to explore the kind of tensions between technology and their end users that come to the surface as political action powered by technology involves a major social structural transformation.

Aware of the many readings of the same problem, critical distance to the sustained discourse of technology as efficiency and competitiveness’ means is present as it gets down to spill over into a mismatched dimension, referred to as multi-layered social context reality, full exposed at country level by a global sanitary emergency. The momentum ask for research actions oriented to capture the receivers’ responses to Technological Change initiatives well as to identify the effects of them on the correspondent Public Policy, being instrumental for the analysis the actions of an emergent country engaged in the task to protect the Right to Education of 33.6 million students from 3 to 29 years old (INEGI, 2021a) enrolled at the time (period 2019-2020) in an educational system infrastructure to be re-configured-aligned to a specific technology platform to cope with an education services provision response in the context of the emergence of a highly unusual phenomenon implying a Global health emergency. The challenge continued along the following education cycle (2020-2021) attending 32.9 million students, from whom 2.5 million were of first enrollment into the system. The use of official sources regarding the Public Policy venue and statistical indicators is a necessary research’ input aligned to the authorized data release timing, for this reason data generation and processing spanned nearly three years.

4. Methodological Platform

4.1. Mapping Operational Direction’ Course

The Theoretical Referent’ momentum is highlighted as the two main compass points have been charted on: 1) the research’ phenomena dimension and 2) the operational direction for the analysis. At this point, the stated research questions’ operationalization shape the configuration of an analytical enabler along two combined strategies in correspondence to individual’ *reactions* to a given technological change carried out at country level to deal with a crisis, as well as to those reaction’ *effects* back on the eliciting Public Policy domain, expressed through numerical indicators released by official sources in form of statistical data registers. Being the research focus identified as a new phenomenon to be explored and capturing individual’ attitudes a fundamental data creation source, the Qualitative Research type nature identified as Grounded Theory emerges as the suitable approach to work on (Strauss & Corbin, 1990), pointing out to a two-data source model design, fully displayed in **Figure 6**.

Recognizing the presence of an extensive conceptual continuum to identify-extract-analyze and further apply along the research development, to benefit data frame and contrast actionable operations, Theory’ concepts afford an initial base to build up a Methodological Platform organized as interconnected operational

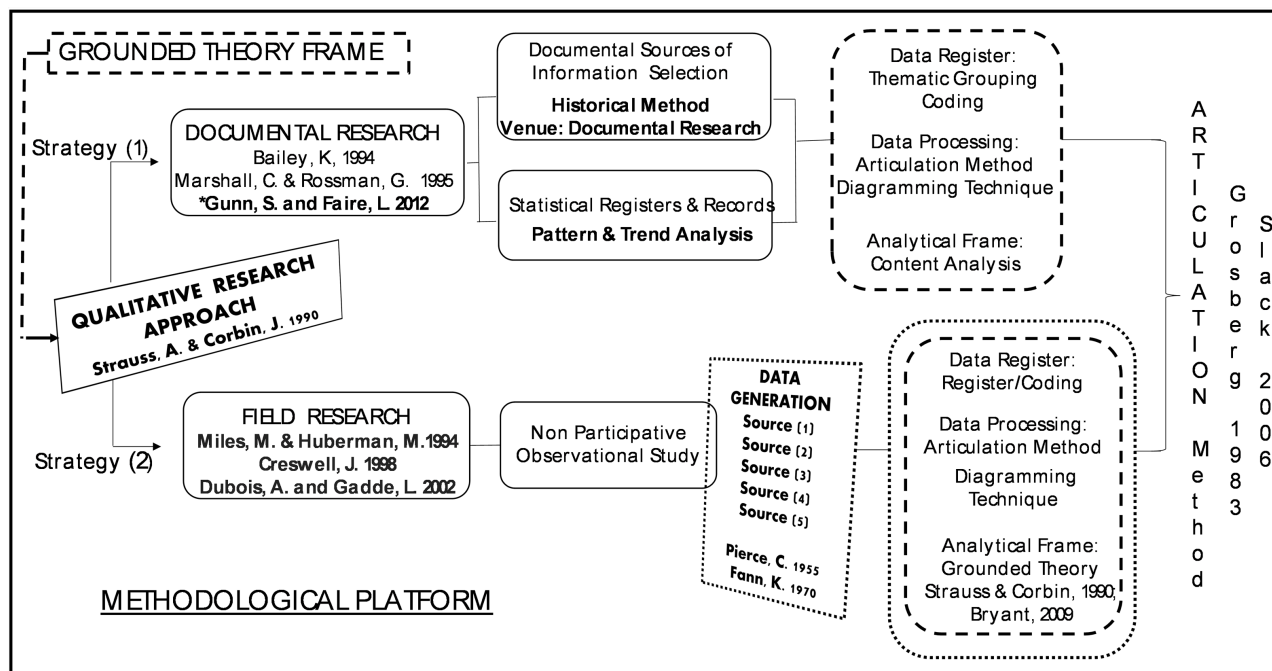


Figure 6. The operational direction for the analysis. Methodological Platform. Strategic Map.

strategies, integrating two main data sources: documents and infield observation, one assigned to the intense iterative documental investigation type of analysis of information on the topic of interest (Bailey, 1994), while the second involves a participative observational study oriented to explore the reactions—in terms of attitudes—at individual level (McKechnie, 2008). Here two actionable verbs come to the surface: 1) *explore*, understood as action to identify, generate data and interpret their meaning to formulate a set of propositions for further Theory formulation, applying Grounded Theory Approach procedures on the whole (Strauss & Corbin, 1990; Bryant, 2009) and methods such as abduction, understood as the process which starts with an observation to form explanatory hypothesis or propositions (Peirce, 1955; Fann, 1970). Systematic observations were operated through 2) the action-verb *capturing* as integrated in the infield work process of getting records to **create data** from a sampled data source ... Modelled by the Theoretical referent, this activity is named observational Data Generation, differing to data collection as ...*data are produced from their sources using qualitative research methods...*(Garnham, 2008). A core characteristic of the derived methodological platform' configuration is the loop shape, continuous back-and-forth dynamics, that comes to surface as the analysis moves from a deductive view required to identify RQ.1' core component—individual reactions—to an inductive perspective—for effects on the external stimulus detection—when engaging on RQ. 2 quest.

The workflow mechanism seems to be useful for the proper research' progress follow-up, so, in accordance to the data sources for each research' key component, the operational course was organized in four main methodological activity' units—termed stages—keeping awareness of its inter-stage interactive nature

characteristic. Following this criterion Stage 1 mainly takes place within the documental-archival-registers and statistical area. Due to its nature, Historical research method is applied as analytical tool as it fits the requirements to introduce supportive evidence for the focus definition, the RQs formulation and the correspondent Theoretical referent to work on (Gunn & Faire, 2012). Being the phenomena under analysis a consequence of an emergent event knowledge creation, the research suits Grounded Theory principles as a major frame resting upon observed fact, supporting the need for an in-depth exploration to generate primary data of value—to input a “thick description” (Denzin, 1989)—as the proper action to be conducted in Stage 2 following its correspondent methodological requirements (Dubois & Gadde, 2002).

4.2. Data Sources

4.2.1. Official Records' Strategy: Documents, Statistics and Registers

An insight to the research' Public Policy venue led to collect data in regard to the official mandate to put on hold the presential mode of education services provision at national level, by means of a Secretary of Public Education Agreement format announcing changes on the education 2019-2020 cycle' *calendar* (schedule). A data timeline registering all change announcements released on the Official Daily of the Federation (*Diario Oficial de la Federación* (1), (2), (3), (4) and (5) registered in **Figure 8**) along the two educational cycles running along the pandemic period was selected as the suitable mechanism to follow up the Public Policy data generated by this source. The health' emergency raise the awareness of the National Institute of Statistics, Geography and Informatics (INEGI) regarding the importance to generate Education data during such time period. By means of a survey conducted to assess the impact of covid-19 on education (INEGI, 2021a), by key indicators displayed through a Press Release format (INEGI Press Release 185/21, March 21, 2021a) updated through a second edition in April 23 (INEGI, 2021b) with complementary data issued the next year (INEGI Press Release 709/22, November 29, 2022) introducing information on the matter collected for 2021. In this way official statistics input the configuration of tables and graphics on which the effects-side of the research is mostly based. For this segment, Data is collected by means of archival analysis technique from registers and statistical data on the matter published in the WWW—Internet access/direct request—by the unit of analysis' Institutional specialized Sources.

4.2.2. Infield Strategy: The Observational Study

As stated, this research is oriented to generate Theory in reference to Technology Ripple Effect and Public Policy' interconnection down to the end user, being then visual and verbal evidence of the user' reactions, in terms of attitudes, the core input for the analysis. Thus, observational research is considered a well suited method to apply in order to generate data based on a direct observation-agenda and semi-structured interviewing set as collection tactics becoming the basic source to organize data into common themes and meaningful theoretical interactions apropos how individuals respond to the mandatory technologi-

cal change in progress. Such context identifies a cross-sectional nature for the study given that evaluates subjects at one point of time, the present time-at the time. In consistency to the sampling criteria of 6 - 8 data sources as sufficient when homogeneous samples—students/End Users enrolled in the nation' education system—are selected in qualitative research (Kuzel, 1992; Morse, 1994). Following the notion of a cell of social structure/tissue' analysis, a sample of ten students of five families was determined according to different demographics contexts, covering widely the range of education system' levels—from preschool to undergraduate—and a developing country' regional development spectrum: five geographic sites along the Nation' territory as reported in **Table 1** (Rural and Town context = representing the South and Southern Regions; Urban Outskirt and Capital City context = representing the Mega Central Region' area of influence; Provincial Capital City = representing Western and Northwestern Region). In this order of ideas, to gain balance regarding the Technology Readiness conditions, a very careful analysis of the users' demographics and psychographics characteristics was conducted due to the fact that, in diverse degrees of intensity part of the End User's population—compulsory required to adopt the mandatory change—configure a segment that perceives the given Technology initiative it as an innovation, revealing the presence of a Technological gap combined with Technology Literacy asymmetries whose effects require to be controlled by an specific Technology Operational Knowhow transmission strategy.

The observation agenda was in place at the first of each of participant subject' incoming education cycle active week (2020-2021 education cycle-first five days/10 observations-day schedule = 50 observations per subject from a continuum of 19 attitudes, full sample N = 504 total observations registered, based on Judson (1991) continuum of resistance to change' range—four attitudes disaggregated in 18 visible behaviors—as basic criterion to generate factual/nominal type of data, with respect to the students' reactions, that can possibly be ordered hierarchically as initial categories of information about the extremely positive or

Table 1. Observational study. Participant' general context. Technology based education provision mode' end users.

Context	Family	Activity/level	Income/equipment
(U1) Rural Context (Community) Father income/housewife	biparental M/No siblings	freelancer/migrant Pre-Elementary	3 - 5 minimum wage cell phone*
(U2) Urban Context (Small Size Town) Single Mother income + social benefits	single parental M/F	beneficiary/migrant Jr. High/Elementary	less to 1 m/wage cell phone**
(U3) Urban Outskirt Context (Village) Double Income	biparental 2M	freelancer/local Jr/ Sr/High	6 - 8 minimum wage cell Phone/Computer **
(U4) Provincial Capital Context Double Income	biparental M/F/F	employee/migrant College/Jr-Sr High	more than 20 m/wage cell phones/Computers*
(U5) Capital City Outskirt (Suburbs) Single Income	biparental M/F	employee/local Jr/Sr. High	more than 20 m/wage cell phones/Computers*

*Owned; **Shared.

negative attitudes when facing educational processes that implies a Technological Change. The purpose of the observations is to generate data about the individual' attitudes in consistency with the Social Psychology view (Aronson et al., 2016) where is considered that attitudes determine what persons do, being evaluations of people, objects or ideas (Banaji & Heiphetz, 2010; Bohner & Dickel, 2011; Eagly & Chaiken, 2007; Petty & Krosnick, 2014). Upon this view, each of Judson' visible behavior list is suitable for attitudes components' analysis following the ABC or tripartite Model by Ellis (1977) based on (A) an Affective component referred to individual' feeling about a given circumstance; (B) a Behavioral component related to the individual' behavior when facing the given object of the attitude, and (C) the Cognitive component related to the beliefs and thoughts formed by the individuals about the nature of the attitude' object. For each family a set of three semi structured interviews were conducted at three points, the first at the beginning of the observation period, oriented to address the sample' demographics characteristics as well as the household' Technology Readiness in two dimensions (Erosa, 2013; Tazzey, 1992): Technology infrastructure (tangible resources) and developed skills to operate such infrastructure (intangible resources), a second interview—at the midpoint—seek out to generate observation process' feedback, while the third of the interviews' set was programmed at the end of the observation period consisting mainly in final data validation.

Selected as operational means to carry out the delicate operation of qualitative data' processing, given that here they are captured in form of descriptive words (attitudes) that can be analyzed for patterns or significance—categorization—using coding strategies, Scalogram analysis was the selected instrumental technique to cover Grounded Theory' procedure first step—systematic data analysis process—labelled as **open coding** consisting on forming initial categories about the phenomenon under analysis by segmenting information. The purpose of this operation is to find subcategories—properties—searching data to put on view the extreme possibilities on a property' continuum. The use of the scalogram to quantify qualitative data provided a systematic guideline to organize the observation' list involving the measure of an individual' agreement or disagreement with a series of statements referred to attitudes based on Judson (op cit) change continuum. Scalogram analysis—a systematic process to measure qualitative data and determine whether a measure forms a Guttman scale where items form a continuum from least to most favorable (Kishor, 2014)—proves suitable to develop a cumulative scale of items (attitudes) as enabler of sample' ranking and grouping data generated into different categories of change acceptance and to depict relative levels of technology readiness of students within a geographical region, as well as to identify the centrality of the attitudes considered to be individual' least to most favorable behavior to engage in a Technological Change process of the kind. Once completed the open coding step—as the categories of information become saturated—applying data analysis' constant comparative

method, the attitudes' set resulting from the Scalogram become useful as input to follow Grounded Theory' **axial coding** step where a central category of the phenomenon is identified exploring its causal conditions, specifying the resulting interactions and the context that influence such interactions, delineating finally the consequences for the phenomenon under analysis. Categories resulted from axial coding model are integrated to be presented as **propositions** in the correspondent results' segment, and as an integrated Model in form of the Theory' Logic Diagram at the report research' Conclusion.

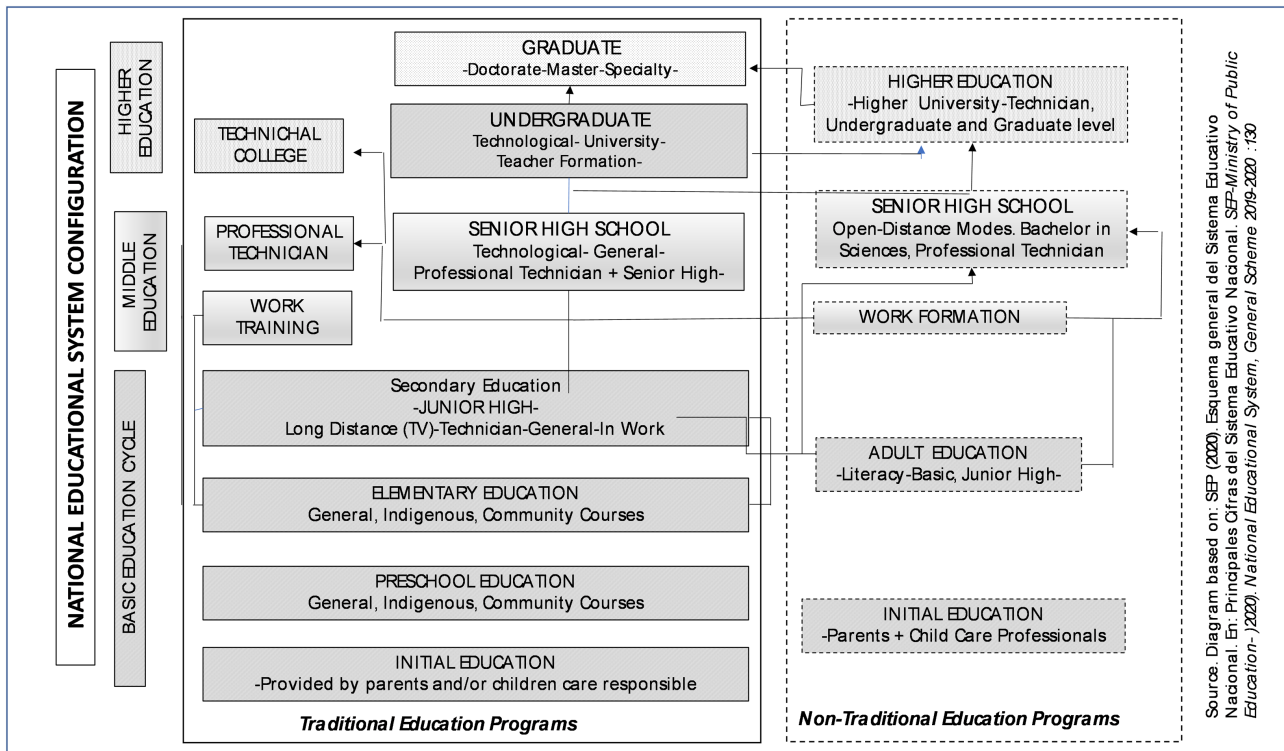
The next methodological challenge is to produce an identity on top of data-variety-differences, connecting the different notions by means of making a unit expressed through a text' content focused on the given context' meaning. The practice of establish a relation among elements such that their identity is modified into a new integrated discourse is referred to as *articulation* (Grossberg, 1993: p. 4; Slack, 1996). Based on this notion, articulation process is ignited creating thematic nodal points to partially fix the meaning being the act of linking them the essence of the rising text' own character emergence (DeLuca, 1999).

5. Results and Findings

5.1. The Technology Ripple Effect' Drive

In times of unusual-unexpected Worldwide health crisis the continuity of the public education services provision created a major social need to attend. Moving from presential to technology based education services provision seems to be the Public Policy solution on hand to attend the population' requirements on the matter. The implication is to set in motion a Technology Change that implies the Cultural Change embedded in an established paradigm' emergent substitution: education services provision moving from student-teacher-facility-physical attendance-presential mode, to massive student-parent-home-technology based education service access. The challenge' dimension and complexity is seized by the structural composition of the Education System at the time being operated dominantly on presential mode basis. **Figure 7** shows a full coverage of the education services provision from 3 year old children to adult students engaged in a culturally rooted presential attendance to all kind of education activities where the school facility is the place, the teacher is the authority figure and source of knowledge and the classroom the students' socialization environment.

In short, this education delivery model correspond to an Institutional view operating as a given culture formation means, finding for that reason a breakthrough kind of Technological Change the transformation of the whole education system into a Technology based operated model being the learning space the student' homes (during confinement by mandate), the authority figure the you tube channel/TV/Radio presenter and the socialization means programmed meetings attendance run through some available public platform. The implicit cultural change that the Public Policy mandate' implementation generate—a political action powered by Technology—becomes the invisible elephant present in



*In the 2019-2020 Education Cycle attended 37 589 611 (32.1 million in Public Services and 6.6.3 million in the private sector) students enrolled, in a physical facilities base of 33 130 schools distributed along the geographical area of the Nation' Territory. (SEP, 2021). Secretary of Public Education. Education. Main Figures of the National Education System 2019-2020:12.

Figure 7. The National Education System Configuration. Technological Change Implementation' Universe.

the room when sensitive Management of Technology' concepts of Change Management, Technology Adoption and Technological Culture creation are not identified among the change strategy' components given that the cells tissue of the Educational System—represented in **Figure 6**—is assembled by each one of the 33.6 million entailed persons—plus their extended influence sphere—that at the end of the Technology' ripple-chain reaction become a vast universe of Technology' End Users.

5.2. The Public Policy Mandate

Public Policy' decisions oriented to address a particular social requirement turns mandatory when so is expressed in an official publication means. In front of a health problem of unknown dimensions at the time, among the population' protection actions the Head of the Education Ministry issued in the Official Daily of the Federation (*Diario Oficial de la Federación*, (1) 2020) using the format-figure of an *Agreement* (DOF March 16, 2020. Agreement Number 02/03/20) an official mandate suspending the classes at the all level country' schools ruled by the Ministry of Public Education for the time period March 23-April 17, 2020 as a preventive measure to reduce the impact of Covid-19 propagation in the national territory (Art. 1). As found, the first-initial mandate covered a short time period (three weeks before Holy Week holiday extending so to a five weeks closure

period), giving notice of classes' suspension for a given period which in practice means an operational education annual cycle calendar' change. The mandate is directed to Public (89%) and Private (11%) educational facilities.

Looking through the evolution of the decisions taken upon the Covid-19 risk coverage at country level, provides clear understanding of the education provision measures' dimension as well as the complexity of the task required to implement the adopted solution (Figure 8). The context created by the lockdown mandate raises the need to attend education requirements of a base of 24,597,234 students enrolled in the Elementary Level at the time, (representing 73.2% of the total register). Turning the sight to Technology based Education mode... *supported by Information Technology, Communication, Knowledge and Digital Learning—Tecnologías de la Información, Comunicación, Conocimiento y Aprendizaje Digital. TICCAD (sic)—using TV and Radio as transmission means* (DOF. General Education Law, Official Daily of the Federation, July 13, 1993, under the oversight of the Secretary of Public Education. Last reform April 17, 2009). A mandate of the kind set in motion a major cultural change as political action powered by Technology implies a foremost social structural transformation when the physical presential attendance education mode evolves into an entirely student-centered mode while sustaining the system' structural configuration.

The sequence of documental evidences on the matter registered in Figure 8, reveal how a Public Policy Mandate activates a Technology Ripple Effect, through a Technology based initiative designed as Learn At Home Strategy (I, II and III), operated by the Secretary of Public Education' Undersecretary of Basic

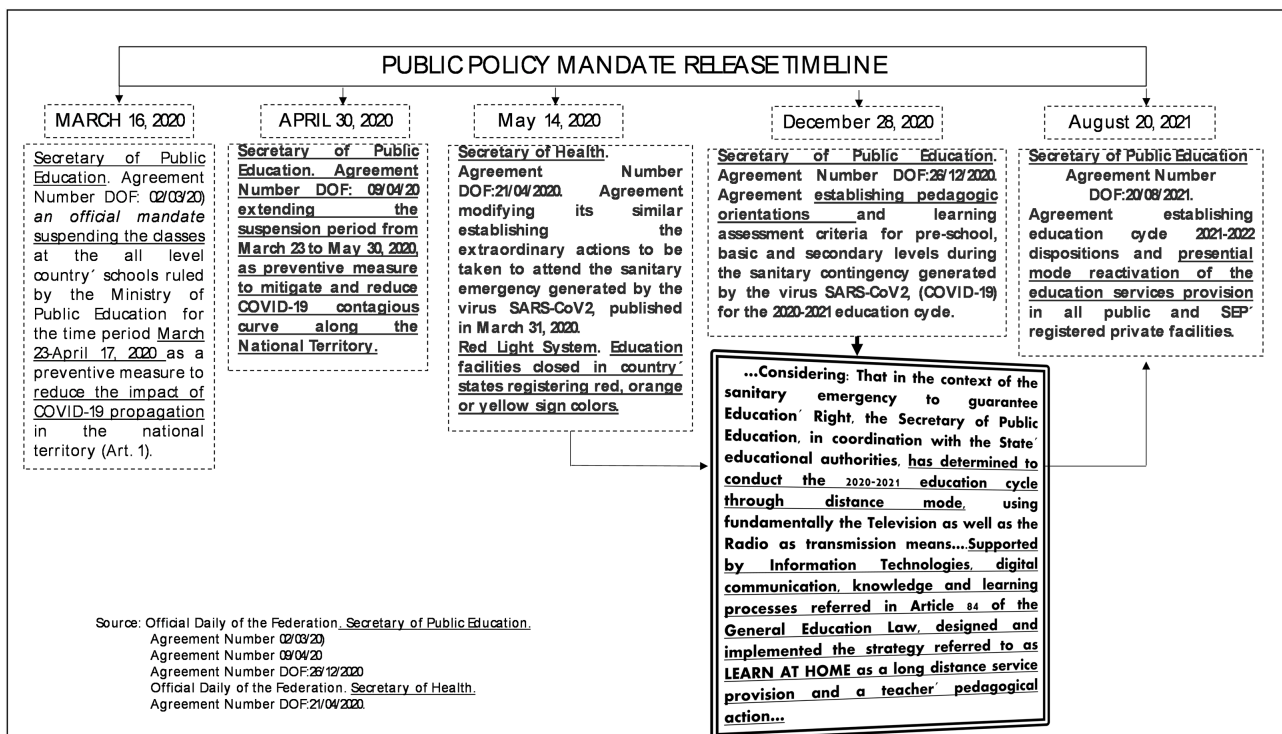


Figure 8. Technology Ripple Effect Driver. The Public Policy Mandate. Information Pattern' Evolution.

Education within a context of additional resources constraint registered in the Informative Note issued by the *Chamber of Deputies (2022)* in reference to the Basic Education Budget Evolution 2019-2022 (page 2) being neither observed reports of any visible dedicated operational sub budget program. However, analyzing figures of the education expenditure approved and further contrasted to the exercised registered in the Public Accounts of the time period, an over expenditure difference between the approved and the exercised expenditure is found in each year (**Table 2**). Even when specific available official data on the matter keeps out of reach, being instead found notice in a national reliable source about an agreement signed in August 3, 2020 between the country' Government and the Private TV Broadcast networks for 450 million MX the first year program' broadcasting fee (Expansion <https://www.youtube.com/watch?v=ldYLYpkewIA>).

The Learn at Home strategy started operations in March 23, 2020 enabled through a transmission platform of three simultaneous broadcast modes: Television (8.5 million—per week—audience along 15 months), Radio (594 Programs produced, 60 physical activation capsules and 130 musical backgrounds. Broadcast through 18 Radio Stations in 15 Country' States and in 31 Native Languages) and Internet registering in this mode—in broad figures-Learn at Home II, a number of 332.5 million visits at the website <https://aprendeencasa.sep.gob.mx> (videos, class resources and handouts, teachers' materials, text book access, 31 week classes programming extending coverage from Basic to Senior High level in Cycle 2022-2023, reporting more than 9 million users, while along the Learn at Home III version the webpage registered more than 191 million of visits with about 4.5 million users and 44.9 million sessions about 7 minutes each on average (*Secretary of Public Education. SEP Report, 2021: p. 9*). In full, three digital platforms supports the Learn at Home Strategy 1) Portal Learn at Home SEP (<https://aprendeencasa.sep.gob.mx/site/index>), 2) the Portal Youtube Learn at Home SEP <https://www.youtube.com/channel/UCk-pjGg2A6IN6aGC2jdxQrw> and 3) the Digital Platform <https://nuevaescuelamexicana.sep.gob.mx/>.

The official source reports that according to Google Classroom more than 937

Table 2. Education expenditure. approved and exercised 2019-2022.

Year	Approved	Exercised	Difference
2019	754,299.3	768,767.5	+14,468.2
2020	784,271.1	795,716.0	+11,444.9
2021	813,170.2	836,648.3*	+23,478.1
2022	859,549.	NA	NA

*Observed preliminary in the period 4th Quarter-2021. **Source:** Cámara de Diputados. LXV Legislatura (*Chamber of Deputies*). Centro de Estudios de las Finanzas Públicas (CEFP). Evolución del Presupuesto de Educación Básica 2019-2022. (*Basic Education Budget Evolution 2019-2022*) Nota Informativa. 29 de Marzo, 2022:5. Based on information of the Secretaría de Hacienda y Crédito Público. Public Account 2019-2020, PEF 2019-2022 and 4th Quarter-2021. <https://www.cefp.gob.mx/publicaciones/nota/2022/notacefp0222022.pdf>

thousand accounts were activated for educational figures and 11.5 million accounts activated for students' connection during the first program' operating period being so an online coverage of 46.7% of Final End Users' base. Official National Institute for Statistics and Informatics reported in other survey (INEGI, 2022) figures regarding the Technology available to the 3 - 29 years old population registered at the National Education system. According to the mentioned source 95.8% of homes possessed cell phones, 77.5% has digital TV set, 50.9% possess a Computer and 22.7% owns a Tablet. The Technology based initiative operation works using mainly the intelligent phone (65.7%), lap top (18.9%), desktop (7.2%, Digital TV (5.3%) and Tablet (3.6%) (INEGI, 2021b: p. 3). An interesting figure refers to 36.6% of the Preschool level' population equipped with computer and 62.9% reporting to have Internet connection available at home. These figures point to an acceptable level of Technical readiness to be engaged in the particular Technology Operational Knowhow Transmission Process. Even when these findings shapes the size of the Technology' solution receivers the *Technology Utilization* concept emerges as the next focus to be explored to gain understanding on the Technology based initiative effectiveness as a key initial set of causal relations are identified and expressed by:

Proposition 1. A Public Policy Mandate operationalized by a political action powered by Technology is *Sufficient Condition* to activate a Ripple Effect that extends to the End Users.

Proposition 2. Entailed End User' *engagement* to develop and actively apply the knowledge and abilities required to execute a given operational process is a *Necessary Opening Condition* to take the specified Technology-based initiative into *Utilization*.

5.3. The Technology Based Initiative. The Model

Referred in official sources as *...education distance mode, using fundamentally Television and Radio as transmission means, supported by Information Technology, communication, knowledge and digital learning (sic)...* the emergent education services provision' implementation configures a Technology Transfer Model—whose attributes are briefly described in **Table 3**—operated by a Government Agency as dominant partner is identified with a Technology' Vertical Diffusion Model enabled by an online platform where the transmission set' (TV-Radio-Internet) information' access, incorporation, register, use and administrative processes are displayed through a dedicated Internet space: <https://aprendeencasa.sep.gob.mx/> being the Technology Based Initiative identified with an online education model—generally perceived at country' level as a Technological Innovation of Technology Pull nature—applied to a given program of education services transmission, identified with a mature technology—as it is market available and in some cases with free internet access implemented and operated by public founding expecting to create benefits by attending education needs (basic level) of a certain population group (3 to 16 years

Table 3. Technology based initiative. General technology transfer' model attributes. *Condensed.*

Model Attribute	Operationalization Features
<i>Technology Transfer Contextual Characteristics</i>	Public Policy Mandate: Highest National Level Create an alternative Distant Mode System to provide Educational Services for the Cycle 2020-2021, in response to the World' Health Organization' (UN-WHO) rules and policies to be attended due to the implementation of a long-term sanitary emergency, in substitution of the presential education services provided regularly to 33.6 million students along the 2020-2021 education' cycle (INEGI, 2021b).
<i>Technology' Vertical Diffusion Model</i>	* Single Point (Secretary of Public Education. Under Secretary of Basic Education)- to-Massive Multipoint of 24.6 million Basic Education level' Students (direct receivers) enrolled at the time in a presential education mode organized in (a) a National System (5 main structured-levels), (b) operating in all country' Geographical States (32) and (c) supported through two Founding modes: public/private.
<i>Technology Transfer Mode:</i>	'Defined as <u>the transfer of systematic knowledge (Equipment and Platform operation required to access Content' Program by Education Grade level) necessary to receive Technology based Education Services Provision</u>
<i>Technology Transfer Distinctive Condition:</i>	Technology Based Education Mode compulsory by Government mandate. Education format operating in the country for the Basic Education Level through the Learn at Home Strategy-Program. Transmission through tripartite education services provision means: Television (Open/Cable/Institutional), Radio and Internet (46.7% of End Users' base).
<i>Technology Architecture:</i>	*Technological System Architecture: Webpage format https://aprendenecasa.gob.mx *Education Level (Initial, Pre-school, Elementary, Junior High School (Secondary) and Bachillerato (Senior High). *Content: Educational Program (Curricula). Individual-Curricula/individual Courses. Programs to be delivered in Spanish and Bilingual Courses with 19 selected native languages from a register of 68 in use within the country (Diagram 10). *Technological knowhow Transmission Implications: Regional Development Asymmetry, Differences in connectivity platform, Wide range of general technology illiteracy, uneven equipment access (Internet connection, Computer, TV, sometimes radio), language barriers, among others.
<i>Technology Transfer Subject:</i>	* Technology Platform End Users: students/teachers/hosts-conductors/administrative officers. <i>Operational Requirements for the user/receivers:</i> Internet access, Platform access, Equipment (TV open/cable access, Radio, laptop, tablet, computer, cell phone etc). Educational materials (technical contents) access processes protocols, guidelines. *Equipment: intelligent phone (65.7%), lap top (18.9%), desktop (7.2%), Digital TV (5.3%) and Tablet (3.6%) (INEGI, 2021b).
<u>Student-Teacher interaction</u>	GOOGLE Classroom https://edu.google.com/products/classroom/?modalactive0none
<i>Real-time Meetings-Videocon</i>	Meeting Platforms Zoom http://www.zoom.com/ Meet http://www.meet.google.com/ Teams (Microsoft) https://www.microsoft.com/en-us/microsoft-teams/group-chat-software WhatsApp-Chat Group https://www.whatsapp.com/
<i>Materials Development</i>	Informational Type: Text Books, Content Scripts, Videos, Animations 181 million Official Textbooks in 2020 (Free Coverage for students on Basic + Jr. High School)
<i>Management</i>	Government Agency *SEP' Under Secretary of Basic Education Production design, programming structure, transmission, students register, attendance control, general back up operations and housekeeping activities.

Source: adapted from Erosa, V. (2020b). Turning To Online Education: A Massive Technology Transfer Challenge. 4th International Conference on Computing and Network Communications (CoCoNet '20) October 14, 2020. Vellore Institute of Technology (VIT), Chennai, India.

old). Further findings from the Field Study reveal the use in the Private Sector of a variety of commercial Digital solutions that incorporate interaction functions as the virtual classroom exchange encourages socialization and transactional processes such as fee coverage and certificate emissions—as managerial procedures' simplification solutions.

5.4. The Model' Operationalization

The System' Architecture characteristics profiles a basic multi type information deposit (text, video, photo, diverse materials) to attend educational' processes-front desk operations regarding System-Course level access, Course Sessions and their correspondent aids, resources and materials, as well as a message transmission means (classes schedule, retransmission programming, register and assessment periods and all back desk processes). Information Technology uses for individual and/or group interaction or transaction process are out of the general direct technical schema, being complemented through external free solutions available on Internet. The Model' operation is in Spanish Language recalling that the Radio Transmission network is operated as well in 19 native languages at the time. End Users rely on an equipment composite to access and operate the Technology based initiative, the data varies slightly according to the education level for instance cell phone use was dominant for elementary level (72%), while in Higher education level decrease to 52.4% in benefit of lap top use (33.4%), incorporating Digital TV (1.2%). Education' annual cycle 2020-2021, changing to the Technology based Distance Mode, started August 24, 2020 being the web platform the main technical component that links education provision services to a Target Audience integrated by: 4,780,787 students in preschool level (3 years), 13,972,269 students in elementary school level (6 Year/grades), 6,473,608 students enrolled in secondary school (3 year/Junior High) and 5,239,675 registered in the 3 year Senior High level (www.infobae.com).

A structural architecture of the kind suggest the stimuli of a passive attitude on the students, as their role basically is circumscribed to an information recipient, operating under the assumption that given the solution' availability, the End User' engagement in the Technology Utilization procedures will naturally occur. However, being Technology Transfer a process involved in a composite of managerial actions, traditional sequence of planning-strategy-project-resource allocation-implementation frames the key instrumental process to set in motion *Technology Utilization* by End User' given purpose, as a necessary—essential—condition if the expected outcome or social needs attendance goal is to be achieved.

Proposition 3. In the context of Technology Change and Technology Adoption Management strategies, knowledge and ability to handle the Technology' operational know-how transmission process is a *Necessary Condition* to enable End User' engagement in Technology Utilization.

5.5. End User' Reactions

For the Management of Technology view an implementation action is an early component of the Change Management process designed and operationalized as means to reach Technology Utilization on a given purpose by its End User. This is the place and time where readiness' importance in terms of knowledge and abilities required to set in motion the technology turns visible as the *Technology Operational Knowhow Transmission Process'* activation which means to move the center of operation to an external third party, being aware that an individual' response to the embedded change will result. Such response is identified by an attitude expressed towards the changing stimuli. Exploring the tension between Technology and the entailed End User at individual level, in this research using Judson' (1991) continuum to change response, a set of 190 observations collected from 10 students (research units) along a 5 day period ($190 \times 5 =$ total 950 observations, taking the registered 504 "Yes" answers as criteria to configure the universe-base) during the Technology based initiative' first week of implementation (August 2020/Education cycle 2020-2021) was instrumental to generate data regarding Technology End Users' attitude towards the implementation of a political action powered by Technology implying a major social structural transformation. Here a word of recap is introduced to remind that the Observational Study is the selected mechanism to generate data suitable to cover up Grounded Theory' notion of abduction as the process which starts with an observation to form explanatory hypothesis or propositions (Peirce, 1955; Fann, 1970) within RQ. 1 scope.

To grade and rank mutually exclusive response patterns of Technology End Users' attitudes towards the use of a given technology based initiative, Scalogram Analysis is considered as the proper exploratory method. Due to the study setting, Judson (1991) composite of 18 items that reflect the *attitude regarding change* were instrumental as the statements to be identified (yes/no) during the observation fieldwork. To benefit content validity, one statement was added as a variation of Judson' **Cooperation under pressure* considering two options: (statement 4) cooperation under pressure from the *course' system* and (statement 3) cooperation under the pressure from *parent*, thus a universe set of 19 attitudes in terms of visible behaviors was configured. Classifying those attitudes according to the rule of highest engagement into Technology utilization, each statement was weighted according to a Yes = 1/No = 0 criteria, being the results registered into a score matrix to be used as the basis of the scalogram matrix arrangement. To start with this process (Richards, 1957), the first operation is to generate data to input the score' results following Judson' attitudinal ranking order organization, results obtained through the attitude score' order criteria shows plain responses for each of the 19 units observed, revealing the presence of dominant contradictory attitudes as to the highest score of Cooperation and Enthusiastic follows adverse engagement behaviors such as indifference and doing as little as possible. This result suggest the

presence of End Users’ polarized attitudes towards the access to the operational knowhow of a Technology based education provision service as substitution of the presential-in site model, providing basis to formulate Proposition 4 as follows:

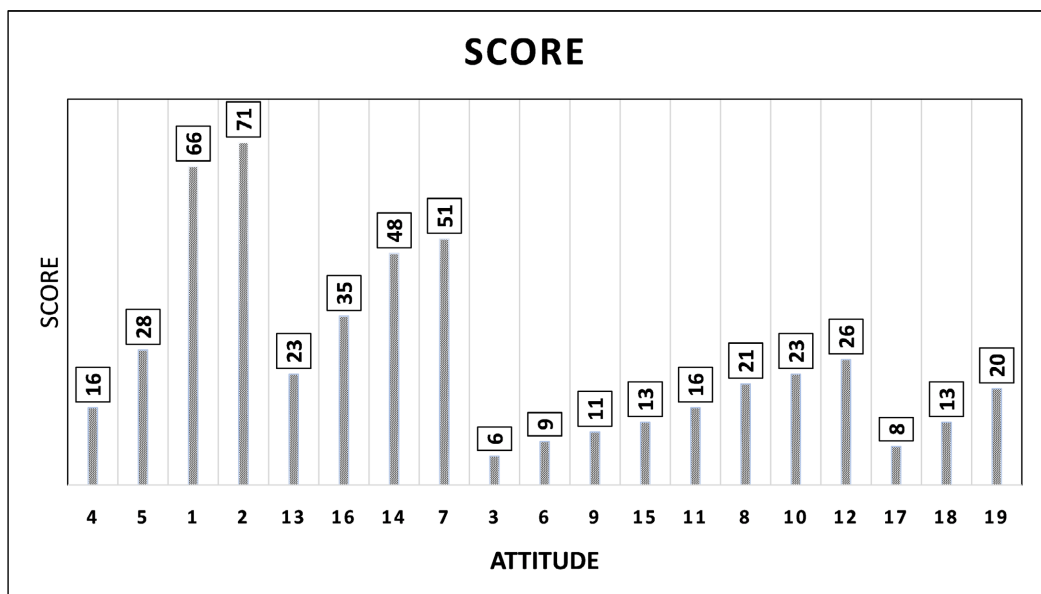
Proposition 4. Introducing a major change through a Technology based initiative implementation, *Technology Operational Knowhow Transmission Process’ activation* is *Sufficient Condition* to produce an individual’ response identified by expressing an attitude towards the change’ stimuli.

In search of a attitudes’ patterns the next analytical action is to order by ranking the score’ results following a highest to lower criteria to generate data useful to source the scalogram formation. This operation allows identifying the presence of dominant responses intertwined along an acceptance-adverse-rejection non pattern group sequence. Moving forward on the Scalogram Analysis process, the next step is to organize the scores according to ranks identified on base of base of resulting scores similarities by means of developing a scalogram matrix applying the technique’ specific column/row ordering (Annex I. Scalogram Matrix).

This mechanism allows identifying four ranked pattern-groups according to its internal configuration as shown in **Graphic 1**. Pattern’ configuration shows asymmetry due to a different number of attitudes—Pattern (4) put together 3 attitudinal responses while Pattern (3) gathers 8 types of responses. Thus, following the ranking criteria by ordering highest to lowest score from right to left, each ranked pattern is configured:

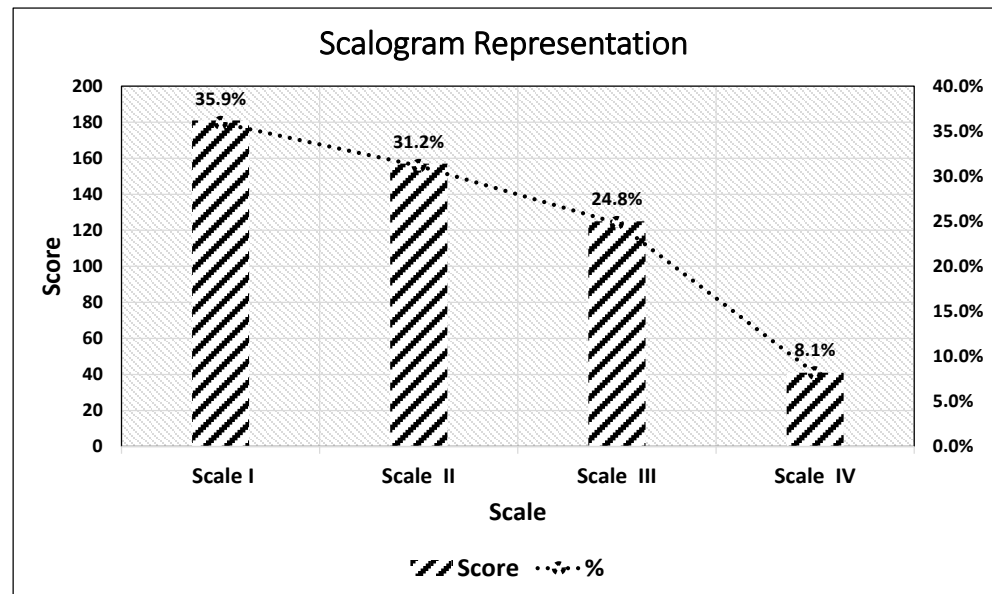
- Pattern (1) = Attitude 2, 1, 5, 4
- Pattern (2) = Attitude 7, 14, 16, 13
- Pattern (3) = Attitude 12, 10, 8, 11, 15, 9, 5, 3
- Pattern (4) = Attitude 19, 18, 17

The scalogram turns visible in **Graphic 2**. representing the grouping of four



Source: Data from Scalogram Matrix. Annex 1.

Graphic 1. Attitudes observed. Frequency. Results organized ranking each group’ internal configuration.



Source: Data from The Scalogram Matrix. Annex 1. The scale has been accepted as its content validity results in $C_R = 1 - (6/504) = 0.119 = 0.9881$.

Graphic 2. Attitudes Rank' Grouping. Scalogram Representation.

scales running in decreasing tendency, the first rank—configured by forward-moving attitudes such as Cooperation, Enthusiasm, Acceptance and Cooperation under pressure of a parent—labelled as the (I) High Engagement Group in the use of the Technology platform (Scale I = 35.9%) shows a moderate result of favorable attitude of entailed End Users—sampled—implying a general context of low level of readiness in the matter for utilization, while within it results of High Engagement reflects high readiness level for the Technology Utilization given that the access to the *Technology' Operational Knowhow Transmission Process* is a considered to be a necessary condition to develop the required knowledge and ability to utilize the particular Technology.

Graphic 2 reveals as well that Scale II bring together (31.2%) attitudes observed as Indifference, Doing as little as possible, Working to rule and Personal withdrawal (increase time off job and away from job) referred as Low Engagement implying low readiness level. Scale III shows the kind of negative attitudes that prevents readiness for utilization as they move from hostility (Protests) to depression (Apathy loss of interest in job and Passive resignation) creating an atmosphere of discomfort (doing only what is ordered/slowing down) whose consequences are the risks of non-learning and/or develop a regressive behavior doing things as learned even when the conditions have changed. Within this result' context, numbers as ...11.5 million Google accounts were opened for students (Report SEP, 2021:7)... seem to have a different meaning when considering that may exist the possibility that opening an account does not necessary means that its End User masters its operational procedure, is in the proper readiness level to deal with its utilization or has a non-desired attitude towards the change to be faced.

The Example (1): The fieldwork found that observed individual U.1 living in a rural community is enrolled in Preschool level where is expected to learn how to read and write. However, the information regarding classes' schedule is posted *written* on the Transmitter' Webpage or broadcasted by Cable TV. The established situation as implemented looks like a loop contradiction as to learn how to write and read, you should first read a written message using any of the available communication means. The context pictures an End User without knowledge nor hands-on access to a computer-equipment or cable TV, the need to understand the class schedule' written message without the knowledge or ability to access to the Technology Operational Knowhow Process cause frustration expressed through a protest attitude, further justification of non-attendance and in consequence non-learning. This example illustrates that dealing with Technology transmission for further Utilization children *are in need of guidance/tutoring* either by a parent or an assigned teacher to develop the required knowledge and ability to access to the technological solution, becoming a specific Technology' receiver segment.

The Highly Engaged group of respondents in present research has a peculiar configuration as three of the observed subjects attending three education levels (Junior High, Senior High and Undergraduate) at different private schools are members of one middle class family with a highly developed Technology Culture fostered by both working parents, while the fourth respondent is a six year old boy from a rural community member of a traditional agricultural family, supported by the father' work as former USA migrant doing handyman jobs, whose first educational experience in life is the technology based process' class attendance, being reluctant to enter into the presential system three years later when the emergency was considered over. The attitude' effects over the individuals of the High Engagement segment are identified as positive given that the three students from the State' Capital City location were successfully admitted—on the first exam—to the next level each cycle, benefitting with education continuity, while the young boy so far attends by own choice—decision supported by parents and teachers—first Elementary Grade in continuity through the Technology based education service provision. Group one reveals easiness along the know how transmission process in conditions where a Technology Culture has been rooted among new End Users, as well as in blank pages-persons where Technology based support is accepted as a natural process to face a certain activity requirements.

For the Public Policy, effect of the Cooperative set of attitude is identified in the consecutive cycle' education continuity enrollment indicator, the adverse attitudes weight is equally important in the consequence being reasonable to introduce the variable among the array of influences whose outcome is observed in (1) the drop out number of persons (738,400 persons) that did not ended their education cycle year during the period 2019-2020, being acknowledged that 59.8% of them declared that the drop out reason was basically associated to the

pandemic effects. The impact intensified moving down the indicator from 33.6 students million registered during 2019-2020 cycle to 32.9 million registered for cycle 2020-2021, data includes the 2.5 million *new* registered students (INEGI, 2021b).

Often mentioned in official reports and documents, the desertion phenomenon is considered as education's efficiency indicator due to its influence in education continuity. Regarding the matter, the same source reports that from the country's population *in range from 3 to 29 years old that was registered during cycle 2019-2020*, the number of students that did NOT continue or deserted from the educational system the following cycle—due to Covid-19 or lack of resources reasons—was about 1.8 million persons, mostly enrolled in the public system (1.5 million). Results of this research suggests that Attitudes' grouped in Scale II integrated by the Low Engagement type of attitudes (31.2%): Indifference, Doing as little as possible, Working to rule and Personal withdrawal (increase time off job and away from job) are signs of alert regarding drop out, which once being detected deserve attention programs and actions in order to increase continuity' likelihood.

The Example (2): Living in a small urban town observation unit U3.2 used to look how to work the easy way keeping old performance habits when attending passively to school, occasionally watching classes on the family shared cell phone or in an open TV set. Soon discovered that such activity could be undertaken without leaving the bed during the classes' sessions and that dressing and cleaning up were not a necessary requisite to attend them. In consequence failure in the final exams happened and the full year cursed during the education cycle of 2019-2020 has to be repeated. Hardly succeeded as the family established rules at home in terms of place and time to study, the use of the shared phone, the open TV set and the assurance of true commitment. At the end of the term applied for higher level continuity failing two entry exams in two different institutions. Lesson learned, look for a basic job, attend classes in a small community college and combine activities to support the basic educational expenses, as still lives at parent' home.

Attitudes configuring Scale III and Scale IV are non-favorable—and sometimes harmful—to the Technology Operational Knowhow Transmission process as they are at the delicate line between passiveness and declared hostility. Deceiving attitudes such as the ones registered in the Third Group (Scale III = 24.8%) could be individual' coverage of personal emotions identifying red signals when are identified behaviors as, just Doing what is ordered, passive resignation and slowing down as it may be interpreted as the existence of an engagement response which happens to hide apathy loss of interest in job whose end result is non-learning and a regressive behavior. The receiver's segment is in need of assistance to generate higher self confidence levels when facing perceived difficulties and complexity in the access to the Technology Operational Knowhow Process in order to encourage them to the change barrier and be part of the change.

The Example (3): Registered in the second grade of the Junior High—

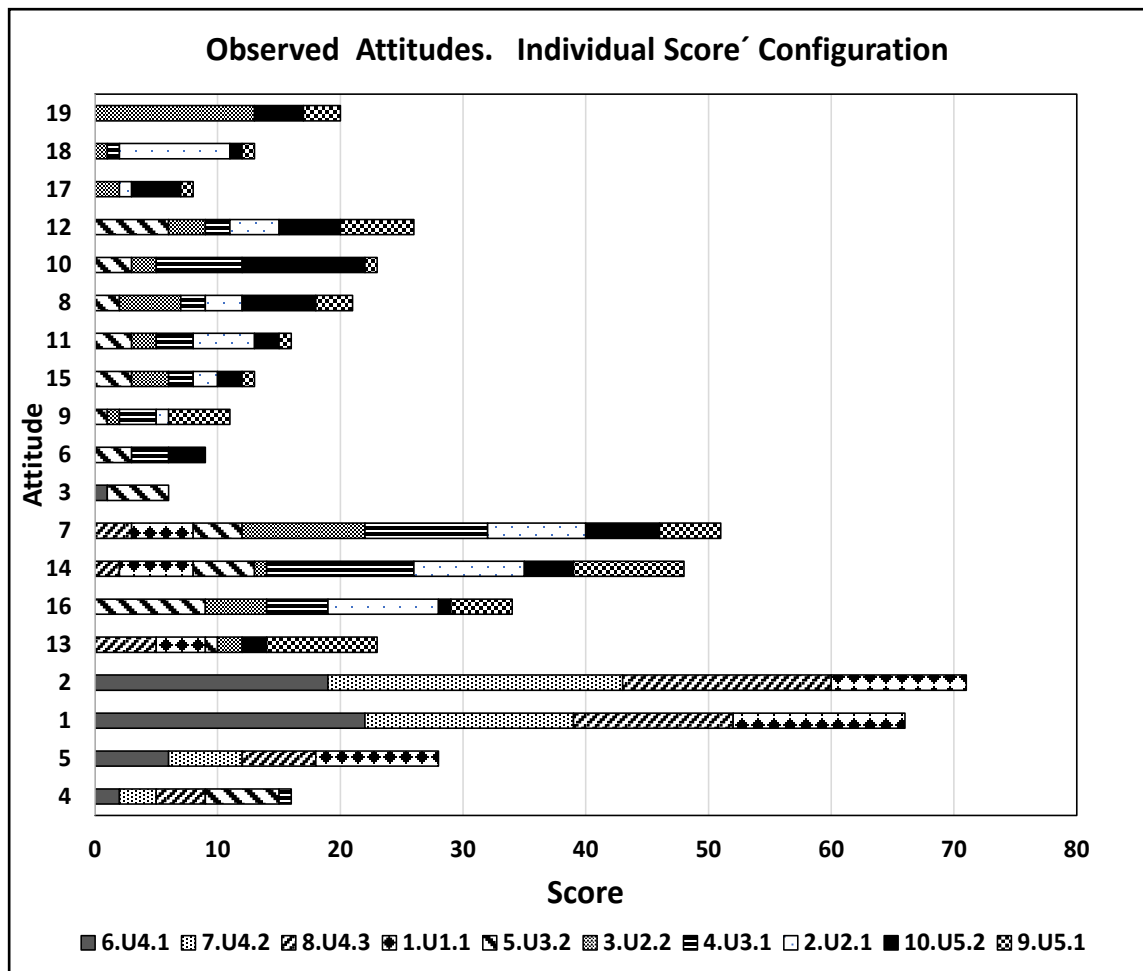
Secondary—level a 14 year old boy has been performed as a non-problematic average student attending formally to presential classes at a public institution and highly engage with the assignments and learning experiences' compliance. The youngest member of a family of four living in a small urban town at the Mega City outskirts, U3.1 had since early childhood frequent asthma health problems. The change to technology based education provision system bring into the family of low income the Technology platform readiness pressure as a used cell phone-prepaid-time should be shared with the eldest brother registered in Senior High level. The response began with a passive resignation attitude, waiting for the telephone use, which raise the inconvenient to mis-fulfill classes' duties on time resulting in loss of interest in the educational attendance as the student perceived to be invisible in the system' context in which is enrolled. This non-response-single direction type of communication was interpreted as a lack of interest and value in the effort made by the family to keep the education continuity. The student gets into regressive behavior and decided to wait until the presential mode restoration. The pressure leads to the emergence of an out-of-control eating disorder, with presence over the three lock-out years. Eating compulsively, at the beginning was interpreted by the family as an adolescent growing reaction until almost doubled his initial weight and received attention being identified the presence of high levels of anguish due to the impotence to cross the Technology readiness barrier as the family has limited resources for it and to the low self-confidence caused by the poor results obtained through the new system utilization. At the end of the lock out period—August 27, 2022—the presential mode was restored in mix conditions in the country and the student eagerly return to the mode in which feels comfortable and socially seen, disappearing the eating disorder and the isolation behavior. However, a change of school was necessary as could not reach sufficient note to keep a place in a highly demanded public school of the town.

Scale IV configuration includes Deliberate sabotage, Spoilage and Committing “errors”, considered as adverse readiness level' attitudes due to the blockage that they produce over the technological acceptance. Referred as the High Rejection group, such attitudes are present randomly at both extremes of the sample' income level.

The Example (4): In the U2, Southern Urban context' small town, the observed attitude correspond to spoilage as both—an elementary level student and a junior high student—basically supported by an international children' program aid, sharing an old cell phone uses it mainly to hear music or to access entertainment or sport transmissions, being that the single mother works as freelancer domestic help to cover the phone rent or to paid credit installments for a basic TV set supposedly used to attend classes. At the high income extreme U5, students registered as well in elementary school and in Junior High, living at a high middle class suburban area of the country' Capital City, seem to exercise deliberate sabotage over the own-dedicated technology equipment as pressure to get a new one. In consequence either an update 4 K TV 65 “set to install at each

students’ bedroom or the latest Tablet model to ...attend class meetings properly... are providing all kind of support—private remedial online tutor included—to participate in the educational model. For the small town students involved in a shock context, even though when both of them moved forward in their respective levels and internal family conditions—perceived as ...all day watching TV/listening music..., a non-learning/poorest performance consequence was recognized.

Results of the Observational Study allow attaining a supported answer to RQ1. In terms of polarized sets of attitudes expressed by the End Users of a certain Technology bases initiative implemented as a Public Mandate. Findings suggest that different attitudes may occur at individual level along an observational time period, with an open possibility to interact and/or overlap in a given context, though one of them stays as the dominant one. As illustrated in **Graphic 3**, the configuration of each attitudinal response **differs** in accordance to each individual reaction as for instance the results for “Attitude 4-Cooperation under the course’ system” even when registering high frequency is observed only in four of



Source: Data from The Scalogram Matrix. Annex 1.

Graphic 3. Attitudes’ score configuration by observed unit.

the participants, while “Attitude 7-Indifference” is expressed by eight of the sampled persons. Applying the results analysis under the person’s type of attitudinal responses criteria, **Graphic 3** allows to identify response pattern of U4.1—light gray—as a High Engagement one (attitudes: 1, 2, 5, 4) while participant coded as U5.2—dark black—dispersed, contradictory and sometimes overlapped attitudinal responses are positioned in a fluctuating range moving with different intensity from Low Engagement (6 = Passive resignation; 7 = Indifference; 13 = Personal withdrawal; 14 = Doing as little as possible; 16 = Working to rule) to Low Rejection (8 = Apathy loss of interest in job; 10 = regressive behavior; 11 = Doing only what is ordered; 12 = Protest; 15 = Non learning) and the High Rejection group (attitudes: 17 = committing “errors”; 18 = spoilage and 19 = deliberate sabotage), revealing dominating Low Rejection attitudes—with the highest frequency in attitude 10—even when a significant intensity is registered in the High Rejection group. This attitudinal response profile raises a sign of immediate attention requirement at individual level.

Analysis of these results and findings moved a bit forward the research’ interest leading to make a first contrast of results based on Judson’s continuum of change adapted to the **Kübler-Ross Change Curve (1969)** emotions’ gradient show in **Table 4**. Establishing an association between attitudes and emotions is a

Table 4. Comparative Analysis. Scalogram Results. Attitudes’ patterns configuring Scales I, II, III, IV compared to Kübler-Ross Change Curve emotional stages when confronting a major change.

Scale/Item	SCALE I HIGH ENGAGEMENT High readiness	SCALE II LOW ENGAGEMENT Low readiness	SCALE III LOW REJECTION Non readiness	SCALE IV HIGH REJECTION Adverse readiness
<i>Judson Continuum* (1991)</i>	2. Cooperation 1. Enthusiasm 5. Acceptance 4. Cooperation under pressure of a parent	7. Indifference 14. Doing as little as possible 16. Working to rule 13. Personal withdrawal (increase time off job and away from job)	12. Protests 10. Regressive behavior 8. Apathy loss of interest in job 11. Doing only what is ordered 15. Non learning 9. Slowing down 6. Passive resignation	19. Deliberate sabotage 18. Spoilage 17. Committing “errors”
<i>Kübler-Ross** Change Curve (1969)</i>	Acceptance. Exciting new Opportunities. Relief that the change has been survived. Impatience for the change to be complete. Integration Acceptance Hope Trust	Depression Apathy Isolation Remoteness Isolation	Individuals perform tasks in the same way as before, even when is not the appropriate behavior. Anger	Lack of information Fear for the unknown Fear for doing something wrong Shock-Denial

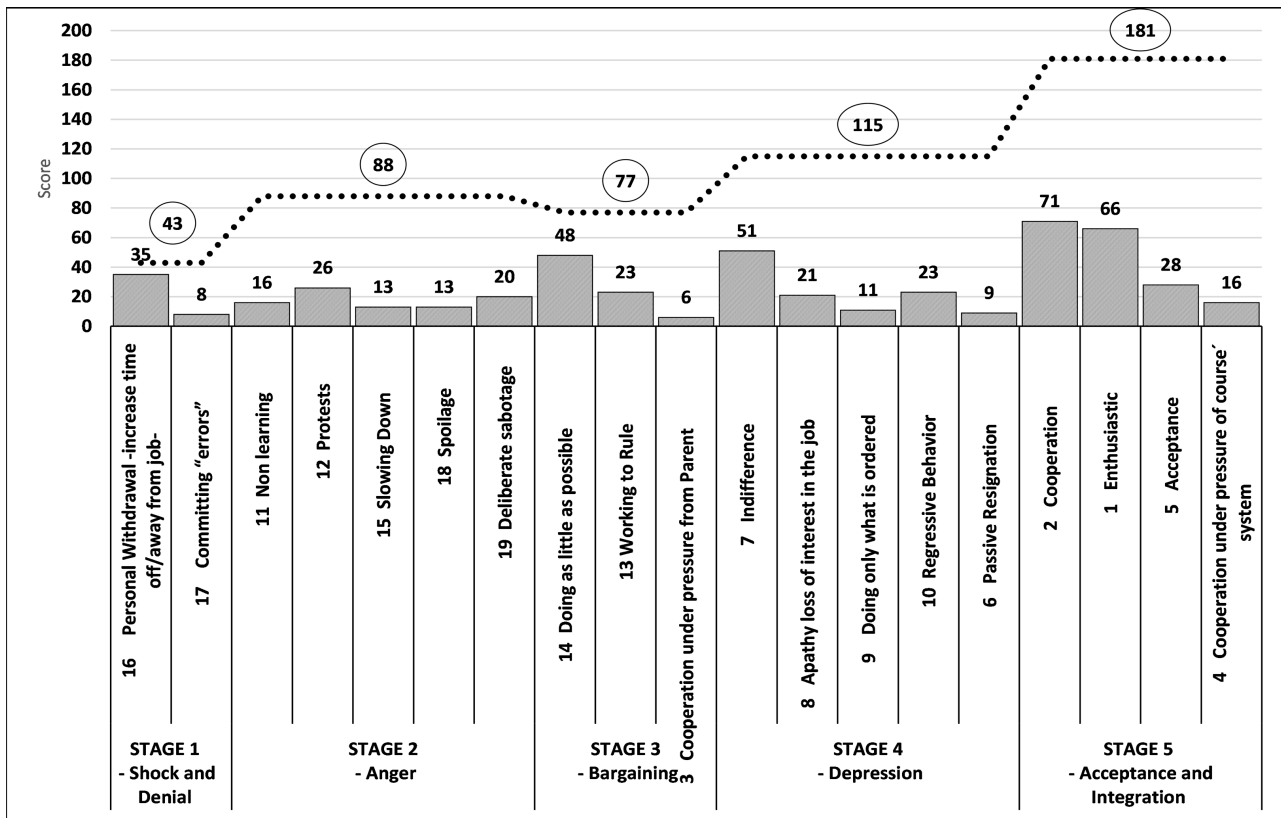
Source. ***Graphic 2**. Attitudes Rank’ Grouping. Scales Representation. **Kübler-Ross Change Curve. EKR Foundation.
<https://www.ekrfoundation.org/5-stages-of-grief/change-curve/>.

relevant aspect derived from this biopsy type of analysis, valuable enough as to be included in the Technology Operational Knowhow Transmission process agenda to enable a closer approach to the End User' needs given that knowledge and understanding of individual' response to the Technology based initiative is crucial for further Public Mandate' implementation as its can be extrapolated when dealing with E-Government Processes implementation, Public Institution' Management routine' operation and E-Taxation procedure' compliance, all considered as massive Public Policy mandates powered by Technology, to be utilized by differentiated universes of an external third party composed by individuals, each of them—acting as a cell of a social tissue—with a correspondent attitudinal response that could produce either economic effects—such as the negative expenses caused by the non-use/non benefiting/rejection of the Technology based initiative—as the social impact represented by the effects produced in terms of individual' pressures.

Reordering results based on the Change Curve' criteria allows to detect a certain correspondence between the sets of attitudes and the emotions produced on individuals, keeping the ranking order for both methods in the Acceptance level, showing consistency when contrasting the emotions criteria to the observed four examples' responses. Configuring categories according to the attitudinal set in terms of emotions profiles results in a smooth S shaped curve, here, marking two lowest points for the shock/denial and the bargaining stages, being the later considered as the one calling for special attention as it contains possible non visible-deceiving behaviors that can be harmful to the access to Technology' utilization process as identified in **Graphic 4**. Following the emotions based criteria, the effect of the Technological Change on U5.2 profile described previously fits in both the Stage 1 = Shock and denial as in Stage 2 = Anger. The correspondence between attitudes and emotions come to surface as a topic of interest to be followed in further MOT research activity.

5.6. The Effects over the Expected Technology Benefits

Results and findings previously identified have disclosed a series of effects that may be categorized as the ones belonging to the individual' immediate sphere, in a range defined from monetary resources pressures to education continuity or personal future' risks to consequences around non-desired emotional impacts. Becoming massive behaviors, these attitudes turns one of the variables of the multicausal economic effect, visible in macro terms—as Gross National Product %, National Account—budget-expense figure reported by the country' Chamber of Deputies—and even as a political achievement if the number of beneficiaries is taken as a whole to the forum. Within this effects over the expected Technology benefits' context, the macro variable calls for official sources' data to be introduced into the analysis to find out a plausible answer for RQ2. Coming from the country' official responsible of statistical information, the selected source is the “Results for Covid-19 impact on education survey” (phone survey



Source: Scalogram Matrix. Annex 1 and Table 4. Comparative Analysis. Scalogram Results. Attitudes' patterns configuring Scales I, II, III, IV compared to Kübler-Ross Change Curve emotional stages when confronting a major change.

Graphic 4. Comparative Analysis. Results in terms of Judson' Attitudes ordered according to adapted Kübler-Ross Change Curve Stages.

to a stratified sample base of 10,559 respondents) released in March 23, 2021 by the country' National Institute of Statistics, Geography and Informatics (INEGI, 2021a). Enrollment Data from this source has been integrated already to the analysis as well as some references to the Technology platform use. Now the focus moves into the continuity and desertion data as major influences over the expenses' figures. Upon this basis a first effect is identified among the 2% of the 3 to 29 years old population that being registered in the education cycle 2019-2020 *did not finished* the term (738.4 K students), being Senior High' the most affected segment (3.6%) followed by Junior High (3.2%). The reasons for non-continuity, technically referred as an intra-curricula desertion, are mentioned to be ...missing contact with professors (28.8%), a jobless condition (22.4%) lack of Technological equipment (17.7%) and those students considering that distance education is little functional for learning (15.4%). An approximate economic impact over the education expense could be pondered by applying numbers provided by OECD (2021) referring to Mexico' expenditure of 2 878 USD per student in all levels secondary, figure far low beyond countries as Canada, the Netherlands and New Zealand registering from 11,000 to 14,000 USD expense per student cursing the same level.

A second effect of economic nature is identified is the next cycle' enrollment reduction from 33.6 million to 32.9 million including 2.5 million newly-registered students. According to the source (INEGI, 2021b) a number of 5.2 million persons between 3 and 29 years old (9.6% of the total age-segment population) was *not registered* for education services due either to Covid 19 impact or to income constraints. In addition to this number, 3.6 million persons *did not register* to receive education services due to urgent need to make a living or because do not have access to the technology platform required to attend the implemented system (21.9%). Official data about desertion and non-continuity' magnitude make sense with research results regarding the dominance (69.1%) of non-desired attitudes towards the access to the given operational process, observing an inclination mostly towards indifference and low rejection attitudes than to a hostile reaction. Under the macro view, when massive effects of these two attitudinal responses have a negative impact over the nation' education expenses additional to the lowest figure of the last decade, reported for the cycle 2020-2021 (Deputy's Chamber, 2021), being so reasonable to considered it as major economic effect over the particular Public Policy mandate whilst on the other side of the coin represents costs associated to prevent the effects of the Worldwide health crisis over the country' 33.2 million students population.

From the Diffusion Theory (Rogers, op cit) view considering that the particular Technology based initiative is perceived as an innovation, whose implementation is found at its early diffusion stage where is commonly accepted that the number of first adopters is a relative small proportion (2.5%) of all potential adopters—the innovators—followed by a second segment represented by the S Shaped Curve (13.5%) segment of Early Adopters, results of the first analysis are encouraging if the change promoted is visualized for the long term far from the view of the consequence of giving a short term solution to an urgent problem. This position is perceived as unclear as there are two displayed public discourses, the first is a written declaration included in the Learn at Home Strategy 2020-2021 Report as follows:...*the advances that the Technology based mode represents are not to be seen as a temporary action, but as a tool that will foster for millions of students the best absorption of their learning capabilities* (Secretary of Public Education, 2021: p. 2). Nevertheless, at the highest level the same education authority released contradictory information publishing (Official Daily of the Federation. DOF: 20/08/21) the Agreement number 23/08/21...*establishing diverse dispositions for education cycle 2021-2022 development and to go back to pre-sential classes in public services facilities*. The mandate was postponed due to the nation' health crisis intensity, being ratified in June 03, 2022 (Bulletin Number 129, Secretary of Public Education, SEP) informing about presential activities' calendar to be implemented at the school facilities starting from August 29 2022 to July 26, 2023 in the Basic Education level along the annual cycle of 2022-2023, which is in progress. So, the advances achieved through the three year period of major' cultural change operations enter into a hold up zone, also by Public Poli-

cy mandate.

6. Conclusions

In depth analysis, yet not exhaustive, has been developed upon the relevance and complexity of the implementation process of a given Technology-based initiative derived from a Public Policy set at an unforeseen event environment—a political action powered by Technology—on social needs’ attendance. Being a topic of key interest for its time, immersed in a Technology Rippling Effect atmosphere, Technology End Users’ (TEU) attitudes toward Technology Operational Know-how Transmission Process and the derived effects on the correspondent Public Policy mandate are identified providing a reasonable basis to formulate a correspondent answer to RQ1. And RQ2 presented using a Grounded Theory narrative being that *...in strict terms, the findings are the theory itself* (May, 1986: p. 148). Extensive references from literature supports the theoretical net in which the phenomena under study is involved, while the specific research focus’ data are generated applying an instrumental mechanism of infield observation. In benefit of internal consistency, the findings as well as examples’ quotes are presented providing useful explanatory material to formulate Propositions whose relations describe the phenomena under study at an abstract level. Given the research’ results and findings that provide satisfactory answers to RQ1 and RQ2, it seems reasonable to formulate the conclusion presenting the culminating theory by means of its Logic Diagram featured in **Figure 9**, where a Public Policy Mandate operationalized by a political action powered by Technology activates a

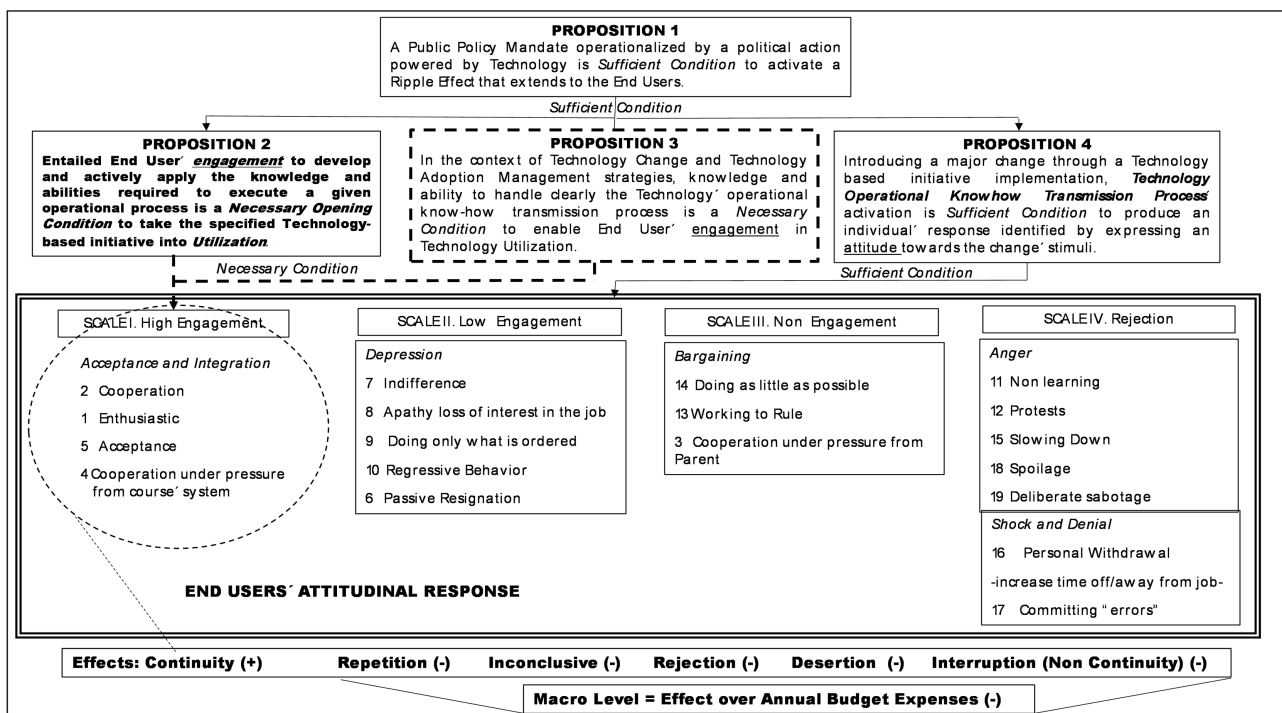


Figure 9. LOGIC DIAGRAM. Theoretical model explaining the relationship between Technology and entailed End Users’ attitudes that come to the surface as political action powered by Technology implies a major social structural transformation.

Ripple Effect that extends to the End Users whose attitudinal responses are of key importance for the Public Policy operationalization, well intended set to avoid damage to society as a whole or to benefit services provision through efficiencies powered by Technology.

Within this context *the central phenomenon* being analyzed is set as the entailed individual Technology End Users' reactions in terms of attitudes towards the first contact with the Technology based initiative that happens to be its massive Operational Knowhow Transmission process. Inserted in the Management of Technology perspective, being instrumented in a context of a selected country' Technology based initiative in the sphere of Education Services Provision change, the analysis reveal the presence of causal relationships among the implementation process and the resulting set of polarized attitudinal responses to Technological stimuli, produced in divergent and paradoxical contexts, rising a red sign identified as Public Policy effects on social benefit goals and public expenditure being, both of them, first order challenges to attend when enabling massive Technology Change and Technology Utilization strategies are defined. Findings in the attitudinal venue of the research input Grounded Theory' procedure as axial coding categories of causal conditions for a given central phenomenon, identified within a specific context that set boundaries for the relational work developed to bring up the consequences or effects of such relationship net, both positive and negative, in two overlapped dimensions, the social one configured by the effects of attitudes over individuals, which being likely to become massive, moves forward to a second dimension rising at macro level a red sign in the direction of social benefits and country' budget expenses. From the analysis carried out in quest of these relations, is found that a long distance emerge in-between the policy makers' decisions, the policy implementation parties' actions and the outcome' effect on the compact social entity, or beneficiary whole, as the effect of the social policy on individual-end-beneficiaries rests on how the later respond back to the former. Differences in regard this theoretical standpoint are positioned on the tacit recognition of the presence of an uneven/differentiated type of beneficiaries as within the *greatest number* individual' demographics, economic inequalities and behavioral differences take place, rising awareness of the existence of an important segment of Low Engagement End Users that applies to individuals as receivers. Thus, the principle of utility' maximization is tempered due to the implicit recognition of the Low and High Rejection' attitudes segments out of the reach of the benefits' span, suggesting that up to down the range, the outcomes do not build mutually beneficial relationship among receivers.

Technology' Ripple Effect activated by Public Policy mandate is a phenomenon in expansion due to the dynamics of digital processes' diffusion either at Government and Corporate spheres, thus the introduction of the concept as a scientific component of Technology Planning actions calls for attention. Learning and understanding about the End User' reactions in terms of attitudes is introduced to the list of valuable input in benefit of Technology based initiatives'

implementation still defined under the assumption that Technology End User are *supposed* to partake in the Technology Change process while passively engaging in the correspondent operation. A situation of the kind is recognized then, as a suitable condition to gain benefits from Management of Technology techniques and procedures—further ahead than the Technology Planning Stage—as it connects Technology-Knowhow Transmission phase of Technology Transfer Strategy and Technology Change Strategy—set at Organizational grounds—into the core procedure of *individual*’ Technology Adoption visible as Technology Utilization. The innovative view featured in this research could be extended to process’ variations of the kind of massive mandatory vertical diffusion characteristics such as the implementation of E-Government processes, Taxation duties procedures as massive E-Invoice’ emission, whilst at Corporate level seems to be a valuable input for Global Supply Chain integration processes and/or to incentivize commercial paradigms’ change as in the case of E-Commerce and B2B’ expansion models.

Being acknowledged that a persistent Technological transformation is ongoing, major changes in culture are about to be faced, thus, the challenge to decide between perform as a change generator or become a change-reactive adopter is a matter not of time as for when should be faced. Once that a Technological change has set its course, continuity and improvement are factors of core importance, while the regressive actions introduce unwanted risks such as paralysis of the expected benefits and produce a deep harm to all re-intention prospects, actions such as incremental adoption strategies and dominant’ partner involvement could be helpful to ease resistance. If this is a delicate consideration to attend when a Public Policy mandate introduces a major Technology Change that implies the substitution of a social implanted paradigm, in the Individual Formation venue a clear understanding of the powerful influence of Technology Ripple Effect, on this research’ instrumental case is found in [McMahon \(2010\)](#) view ...*Education’s external benefits are social benefits that spillover to benefit others in the society and in future generations.*

7. Research Limitations

Focusing on individual’ attitudes from the Technology perspective even when innovative, provides a partial view of a multi variable and multicausal topic. The dimension and complexity of the research focus deserve the creation of an investigation’ new line to facilitate intensity in a number of topics highlighted along the present text. Using a cell-biopsy type of data generation source is useful for exploration purposes as means to grasp the phenomenon momentum in conditions of unforeseen events, whilst for further hypothesis testing, empirical research with a larger participant’ sample is proposed.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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**ANNEX 1.
THE SCALOGRAM MATRIX**

SUBJECT/ Attitude	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		Freq.
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
6.U4.1	2	6	22	19	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	
7.U4.2	3	6	17	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50		
8.U4.3	4	6	13	17	5	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50		
1.U1.1	0	10	14	11	4	1*	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51		
5.U3.2	6	0	0	0	1	9	5	4	5	3	1	3	3	3	2	3	2	3	2	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	
3.U2.2	0	0	0	0	2	5	1	10	0	0	1	3	2	2	5	2	3	2	5	2	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	
4.U3.1	1	0	0	0	0	5	12	10	0	3	3	2	3	2	3	2	7	2	7	2	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	
2.U2.1	0	0	0	0	0	9	9	8	0	0	1	2	5	3	0	4	1	2	5	3	0	4	1	9	0	0	0	0	0	0	0	0	0	0	0	0	0	51	
10.U5.2	0	0	0	0	2	1	4	6	0	3	0	2	2	6	10	5	4	1	6	10	5	4	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	50	
9.U5.1	0	0	0	0	9	5	9	5	0	0	5	1	1	3	1	6	1	5	1	6	1	6	1	1	3	1	1	1	1	1	1	1	1	1	1	1	3	50	
Score	16	28	66	71	23	35	48	51	6	9	11	13	16	21	23	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	504	
Scale	Scale I				Scale II				Scale III				Scale IV				Total score																						
	Score =181				Score =157				Score =125				Score =41				504																						
	Scale I				Scale II				Scale III				Scale IV																										
	35.90%				31.20%				24.80%				8.10%				100%																						

The scale has been accepted as its content validity results in $C_r = 1 - (6/504) = 0.119 = 0.9881$
Source: Research ' Infield Study. Set of 190 observations collected from 10 students (research units) along a 5 day period (190 x 5 = total 950 observations) taking the registered 504 "Yes" observed attitudes as criteria to configure the universe-base.