

Which factors influence the adoption of online self-service technologies by B2B customers of a Telecom?

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Abstract — Telecoms are companies that provide communication services. In 2020 a drop in Telecom's revenues is expected due to COVID and this impact will remain for future years, with higher drops in coming years. The adoption of Self-Service Technologies allows to solve the problem of selling and serve the customers on-line, increasing customer loyalty, reducing cost, fostering innovation and thus increasing revenues. The major research question for this work is: "Which factors influence the adoption of online self-service technologies by Business-to-Business customers of a Telecom?". In order to derive a conceptual framework to answer this question several theories were used: The Technology Acceptance Model (TAM), The Innovation Diffusion Theory (IDT) and the SST attitude/intention model. A conceptual framework that drives the adoption of Self-service technologies in Telecom B2B segments was proposed and tested.

Keywords - *Technology Acceptance Model; Telecom, Business To Business; Self-Service Technologies; Innovation Diffusion Theory; SST attitude/intention model.*

I. INTRODUCTION

Telecoms are companies that provide communication services. In 2020 a drop in Telecom's revenues is expected due to COVID and 5% is expected by 2024 [1]. The adoption of Self-Service Technologies (SST's) allows to solve the problem of selling and serve the customers on-line, increasing customer loyalty, reducing cost, fostering innovation and thus increasing revenues.

Research done within the scope of SST's for this work always pointed to studies related to ecommerce [2], mobile money [3], mobile payments [4], self-checkout in hotels [5], amongst others but not Telecom nor usually B2B related. This means that there is not much research done regarding the adoption of an SST's for subscribing mobile services for the B2B segment of a Telecom service provider. Also, when one explore some of the most well-known Telecom websites like Telefonica or British Telecom (BT), for example, if we visit the business website and try to subscribe a service as Business to Business (B2B) customer, what is presented is typically a contact form to engage with a contact center or a field sales representative. However, this is not the case for Business to Consumer (B2C) segments where self-service is already deployed for more simpler product subscription

In fact, research [6] shows that usually new ideas are tested faster in B2C and then replicated in B2B.

It is also important to understand that an SST is an Information System (IS). According to [7] the success of an IS depends on the continue use intention (use continuance) of the system. Another important aspect and one of the major reasons for result inconsistency towards the factors that influence customers to utilize SSTs is the fact that different type of SSTs has different factors influencing the user that is going to use it [8]. Based on this, the main research question (RQ) to address in this research is: "Which factors influence the adoption of online self-service technologies by B2B customers of a Telecom?"

In the search for an answer to the research question, we additionally intend to achieve the answers to the following research sub-questions (RSQ): (1) RSQa: "Is it viable to implement on-line self-service / self-provisioning for B2B?"; (2) RSQb: "Will all segments adhere to self-service?" and (3) RSQc: "Is it only applicable to simple products or can be used in more complex ones (like Software as a Service (SaaS)/ Platform as a Service (PaaS)/Big Data)?"

II. RESEARCH METHODOLOGY

The research methodology must select a path in order to achieve the desired objectives. The "research onion" is a useful tool for a methodological approach in the research [9]. The philosophy that is more adequate for this study is the positivist approach because this research is linked to an observable reality [9].

The research was conducted in a deductive theory leading to the deduction of hypothesis to be tested according to [10]. Also, deductive theory also is adequate to this research because allows the deduction of hypothesis given of what is known regarding a given field of study, in this case Self Service Technology, and theoretical considerations [11].

Extensive literature search and review was done selecting the most approximate conceptual models and theories that could better proxy to help on answering the current research question. This extensive literature research allowed the selection of the constructs that theoretically would influence either positively or negatively the SST's adoption in this research context. This allowed the creation of a conceptual framework with proposed constructs that would influence the adoption of SST's in the research context and deduct the hypothesis.

In order to test the hypothesis a quantitative research was followed. Quantitative research is also common in SSTs research and there are examples like the following studies. In fact, there is a dominance of the quantitative methods on SST research [12] so it is reasonable and feasible to utilize this research method in this study.

For this research primary data was used collected via a survey, which questions were done proxying already tested questions in other researches, using and trying to target a population that has online SSTs usage experience for service / product purchasing. Following a similar approach to [13].

III. RELATED WORK

A. Self-Service Technologies

SST's allow users to be an integrative part of the service or product delivery and generate them on their own without a company employee participation [13]. This is also in line with the trend that one can observe that consumers are not willing to wait for any service, driven by smartphones and Internet of Things (IOT) technology. Also, self-service technologies allow businesses to deliver and offer services to its customers on-demand, on any location and without sales representatives [14].

Even though self-service technology is generally adopted and "taken for granted", it changed business models and enterprise processes. [15]

Self-service technology market is split between telephone/ interactive voice response (IVR), Internet/Online, Interactive Kiosks and Video/CD [13]. Examples of these technologies are: ATMs, Photo Kiosks, ticketing kiosks, information kiosks, candy vending machines, snack vending machines, on-line banking, mobile banking, amongst others. This market is intended to grow at 13% Compound Annual Growth Rate (CAGR) until 2023 according to MRFR analysis.

B. Technology Acceptance Model

Introduced by Davis in 1989, The Technology Acceptance Model (TAM), which is an extension or expansion of the Theory of Reason Action (TRA), that was developed by [16] and has been widely used to assess the adoption of SSTs [17], namely, e-commerce [18]. [17] expanded the TRA theory because at the time there were no reliable frameworks to predict and the intention to use an information system. Due to this absence of research, it was common to see in practice unvalidated measures throughout design, selection, implementation and evaluation of systems. So besides of its academic value, TAM also has a practical value.

C. Innovation Diffusion Theory

This model was first introduced in 1962 by Rogers and tries to explain how an innovation is adopted over time. Innovation can be a product, a service or a behavior [19]. An innovation is diffused through time: "Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system" [20] This means that an innovation does not have the

adherence or diffusion of everyone at the same time. In fact, there are 5 types of adopters that will embrace an innovation over time. [21].

D. SST attitude/intention model

Reference [8] presented a new model that complements TAM by introducing two additional determinants: Need for interaction and risk. SSTs are very good for service providers because it can "standardize service delivery, reduce labor costs and expand the options for delivery" but at the same time is challenging if not accepted by the users [8], that's why these two new determinants were introduced.

Need for interaction is the need to maintain contact and a personal relationship level with a person from the firm that is delivering the service [8]. This means that personal interaction will have a negative attitude towards SSTs if a person prefers it. Also, if there is a perceived risk, explained in later paragraph, that will also have a negative influence in the attitude towards SSTs.

Definition of Risk in the SSTs context is defined as "an uncertain consequence of an event or an activity with respect to something that human's value" [22]. This definition of risk refers to the uncertainty regarding factors that can be learning requirements, price and social relevance [8]. Price can be of particular importance in buying a service online if the perception of the buyer is that is going to pay more.

IV. CONCEPTUAL FRAMEWORK

In Related work sections several theories were described in order to try to derive a conceptual model that could be designed and tested in order to understand the factors influencing B2B intention to subscribe on-line telecom services.

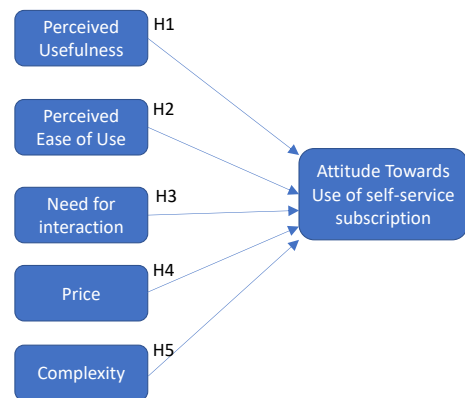


Figure 1. Conceptual Framework

So, based on: Technology Acceptance Model [17] - That demonstrated the importance of Perceived Usefulness and Perceived Ease Of Use; Innovation Diffusion Theory (IDT) [21] - That considered that Complexity is an obstacle towards adoption; SST attitude/intention model [8] - Where Need for Interaction and Risk, are used in this research as uncertainty towards price. These assumptions, allowed to design a new conceptual framework that drives the adoption of Self-service technologies in Telecom B2B segments.

This model is presented in Figure 1. Conceptual Framework. The conceptual framework that is going to be evaluated also allowed the formulation of five hypothesis to be tested under the current research.

A. Hypothesis Deduction

1) *H1. Perceived Usefulness impacts positively the attitude towards the use of self-service telecom services subscription*

Perceived Usefulness (PU) is “an individual’s subjective awareness of monetary and performance value of a technology” [17] showed that Perceived Usefulness is an important determinant towards the adoption of self-service technologies. Also [23] demonstrated that PU is also a good determinant for the SST adoption. However, they also concluded that is not only a single theory that is sufficient to predict SST adoption. Research driven by [24] also confirmed that PU has a positive impact on the adoption of SSTs. In studies about mobile banking PU has shown that is one of the strongest determinants for the intention to adopt that SST [25].

2) *H2. Perceived Ease Of Use impacts positively the attitude towards the use of self-service telecom services subscription*

In online shopping studies, and one can think of mobile subscription of services as online shopping, was demonstrated that Perceived Ease of Use (PEU) has a positive influence in the intention for shopping online and contribute for customer satisfaction [26]. Another SST like selling online airline tickets showed that Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and trust influence positively the attitude towards ticketing usability, in line with previous researches [27].

3) *H3. The need for interaction impacts negatively the attitude towards the use of self-service telecom services subscription*

If someone prefers an employee to deliver a product or service during a service encounter that is defined as a need for interaction [28]. One of the advantages of SSTs is the absence of human interaction creating a replicable and more efficient process. However, when you are creating value in B2B sales, professional customers value service time, personal relationship and professional sellers [6]. So, it is important to understand that the need for interaction will impact negatively the attitude towards SSTs. This was already researched and confirmed by [8]. Specially because consumers will avoid self-service technology if they have a great need for interaction [29].

4) *H4. Price impacts negatively the attitude towards the use of self-service telecom services subscription*

Reference [8] definition of risk refers to the uncertainty regarding factors that can be learning requirements, price and social relevance. However, for business buyers’ price can be

of particular importance in buying a service online. If a company is also able to help a customer on saving money or have additional perks this also contributes to satisfy customers [13]. That’s why it was included as a determinant. Another interesting fact is that B2B sellers try to optimize prices, meet customer specification criteria, comply with regulatory conditions and also be ethical and at the same time procurement from the buyer side try to maximize their cost-of-ownership models, “to ensure that rational, quantifiable criteria around price and performance shape their analyses” [30]. So, with this we can conclude that price is a predictor of resistance to innovation [31].

5) *H5. Complexity impacts negatively the attitude towards the use of self-service telecom services subscription*

Complexity means the degree on which an innovation is perceived as simple to use. If an innovation is complex it creates a barrier towards adoption [21]. If complexity increases, it increases risk perception. This risk can be time risk or financial risk [32] in this conceptual model the risk perception of paying a higher cost. Researches in other fields of study regarding the complexity of innovations has shown that it is highly negatively related to the rate of adoption [33]. But when evaluating more recent research one can find that less innovative products are more easily adopted because if a product is perceived as complex will be difficult to use. So, this means that complexity has a positive effect towards resistance to an innovation and a negative one towards diffusion. Complexity, also has a significant impact on technology adoption and is one of the best and most consistent predictors of resistance to innovation [31].

6) Hypothesis Deduction Resumed

In Table 1 - Hypothesis deduction the hypothesis deducted and the respective contribute authors are presented.

TABLE I. HYPOTHESIS DEDUCTION

Hypothesis	Authors
H1. Perceived Usefulness impacts positively the attitude towards the use of self-service telecom services subscription	[23] [24] [25]
H2. Perceived Ease Of Use impacts positively the attitude towards the use of self-service telecom services subscription	[26] [27]
H3. The need for interaction impacts negatively the attitude towards the use of self-service telecom services subscription	[28] [6] [8] [29]
H4. Price impacts negatively the attitude towards the use of self-service telecom services subscription	[30] [31] [8] [13]
H5. Complexity impacts negatively the attitude towards the use of self-service telecom services subscription	[21] [32] [34]

V. RESULTS

This research followed a quantitative approach and the adopted method to collect primary data was through a survey. The survey was split into the following sections: (1) Socio demographic of the respondent, (2) Intention to Adopt Self-service with a binary and a likert scale question (IAS); (3) Perceived Usefulness and Perceived Ease of Use question were based on [35]; (4) price this followed the questions of [2] on financial risk; (5) Need for interaction was based on [5] and (7) the complexity constructs were based in [36].

The survey was answered by 125 respondents. Most of the people was aged between 36 to 50 years and the majority of the respondents (80%) has a Bachelor's degree or higher in terms of education. There is still a significant percentage of respondents with high school or some high school. In terms of subscription of services online, 91.2% of the respondents answered that they currently do this, thus showing propensity to the utilization of on-line self-service. When asked if they would subscribe for the company, they are working for telecom services on-line, the percentage of positive answers is 86.4%. This is a binary question with no intent measurement. So in empirical terms one can infer that there is a propension to use on-line self-service to subscribe mobile services from a Telecom.

A. Adequacy of Data

One of the most common used tests for internal reliability is the Cronbach's alpha. The value of alpha is between zero and one. A one value means that there is a perfect internal reliability and a zero value means there is no internal reliability. As a good rule an alpha above 0.70 is considered as efficient [11]. For this research a value above 0.70 was considered as adequate. All the constructs presented a Cronbach's alpha above 0.70 as presented in Table II.

TABLE II. CHRONPACH'S ALPHA

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
Perceived Usefulness	.814	.817	3
Perceived Ease of Use	.886	.888	3
Need for Interaction	.746	.746	3
Price	.865	.865	3
Complexity	.874	.876	2

1) Factor Analysis

Factor Analysis is a very commonly used technique in order to analyze data and as a good exploratory tool and allow to cluster variables that are correlated thus simplifying the analysis process. However, there is a condition that is mandatory to apply this technique which is that the number of respondents must be bigger than the number of variables.

In the case of this research that criteria are met because there are 135 respondents for 23 variables [10].

To verify if the sample is adequate to do a principal components analysis it is common to use the Kaiser-Meyer-Olkin Measure of Sampling adequacy and Bartlett's Sphericity Test. An adequate value for KMO is greater than 0.7 (Middling) and with a value circa 0.8 the sample is meritorious [37]. For this study the value of KMO is 0.794 which is meritorious and also the Bartlett's test has $p < .001$. So, the sample is considered adequate. The next step was to extract communalities. Given the used criteria of choosing factors with eigenvalues above 0.7 in this research we will have 5 components as a result of this choice. With the rotated component matrix, the factors will be clustered into the variables that show a strong relation (above 0.5) with it.

After analyzing the component rotated matrix, it was possible to cluster factors according to this relation: (1) Factor 1 is Price (PR); (2) Factor 2 is Perceived Ease Of Use (PEOU); (3) Factor 3 is Perceived Usefulness (PU); (4) Factor 4 is Complexity (CPX) and (5) Factor 5 is Need For Interaction (NFI).

2) Validity

In order to validate if the factors have any kind of significant relationship with the intention for using online self-service to subscribe telecom services, the Pearson's r method was selected. A value between 0 and 1 is expected to demonstrate the strength of the relationship. It can be either positive or negative reflecting the direction of the relationship [11].

According to Table III - Pearson's r towards IAS, PEOU and CPX have a positive relationship with IAS while PR has a negative one. All the previously mentioned variables have a significant relationship.

TABLE III. PEARSON'S R TOWARDS IAS

	PR	PEOU	PU	CPX	NFI	IAS
Pearson Correlation	-.229**	.357**	.578**	.226**	-.153	1
Sig. (2-tailed)	.008	.000	.000	.008	.076	
N	135	135	135	135	135	135

3) Hypothesis Result

In order to test the predictors of intention for using online to subscribe telecom services a multiple regression analysis using the (enter) method was done. The dependent variables used were the factors that were determined in the previous section. The computed model has an adjusted R square above 0.5, which means that the model is well adjusted to the data because it can predict more than half of the variation. [19]. Only the coefficient NFI had no statistical significance and does not comply with ($p < 0.05$) but that was also expected from the Pearson's r analysis.

TABLE IV. COMPUTED MODEL

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
(Constant)	4.163	.050		83.002	.000
PR	-.204	.050	-.229	-4.055	.000
PEOU	.318	.050	.357	6.319	.000
PU	.515	.050	.578	10.228	.000
CPX	.202	.050	.226	4.004	.000
NFI	-.136	.050	-.153	-2.709	.008

PEOU, PU and CPX are statistically significant and are positive towards IAS, NFI is not significant statistically and PR is significant statistically however the coefficient is negative. This means that H1, H2 and H4 are accepted and H3 and H5 are rejected.

VI. CONCLUSION

This section concludes the work that has been done regarding adoption of on-line self-service for B2B customers of a Telecom company.

The first part will start by answering the research questions and in the following sections it will be presented the contribution of this work and future work to be done.

A. RQ1: "What factors influence the adoption of online self-service technologies by B2B customers of a CSP?"

The hypothesis tests have shown that there is an influence on the adoption of self-services technologies by B2B customers by: (1) Perceived Usefulness; (2) Perceived Ease of Use and (3) Price.

Also using a binary variable on the survey showed that 86.4% of the B2B respondents would subscribe services online for the company they are working for.

The other two factors Need for Interaction and Complexity seem to have no impact or require further study in the intention of usage.

B. RSQa: "Is it viable to implement on-line self-service / self-provisioning for B2B?"

In the evaluation chapter, need for human interaction was not much valued nor it was considered a factor influencing adoption and 86.4% of the respondents would subscribe services online for the company they are working for. So, it can be concluded that is viable to implement on-line self-service for B2B. However, price has a negative impact on the interaction, for this reason it is important to explain very well the pricing components and have a very clear subscription process in order to have transparency and clarity so that the user will not feel that is losing by subscribing online.

C. RSQb: "Will all segments adhere to self-service?"

The survey results shown that there is no difference of behaviors between respondents of different type of companies, namely small, medium or large. So, all segments will adhere but with more adherence on the corporate side which is surprising because SME is considered sometimes a "volume" market.

D. RSQc: "Is it only applicable to simple products or can be used in more complex ones (like SaaS/PaaS/Big Data)?"

It was not possible to determine if complexity is a major issue on adopting and subscribing more complex services online. The research showed that the perceived usefulness, perceived ease of use and price are more important factors to take into consideration and that complexity had no influence in the adoption of SSTs.

VII. CONTRIBUTIONS

At the time of the research there is not much work on adoption of SST's by Telecom B2B customers so the major contribution of this work is bringing some insight on self-service adoption on the subscription of telecom services for business to business.

The major contributions of this work were: (1) increase the research on Telecom B2B SST's; (2) demonstrate that PE, PEOU and PR are factors that influence the subscription of SST's by B2B customers of a Telecom.

Since the sample was collected online one can assume that the application of this research is universal but some refinement can be done in future works.

VIII. FUTURE WORK

After finishing this research, areas that could be explored and have deeper research could be:

(1) MOBILE APPS – The present research considered only web (online) usage it would be interesting to understand if there is behavior change when using a mobile application app;

(2) SAMPLE and population REFINEMENT – Refine the respondents to the survey. The used population is a general one. Refining the target population to deciders and purchasers for telecom services in companies could improve a lot the insight on this field of study. It would be important also to focus on country specific data and Focus on SME – SME is considered a volume market, so it needs more volume and automated solutions. Surprisingly it came out that the adoption rate for SME is lower than for corporate. Probably the refinement of the survey in terms of Need for Interaction and Complexity could led to different conclusions.

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