Consumers' choice preferences for a Data-Driven-Business-Model (DDBM) for last-mile logistics services

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Abstract

The business environment of e-shopping and parcel delivery services is a dynamic market sector due to emerging technologies and the ever-increasing role of data as a critical resource. E-commerce deliveries in the last-mile of the supply chain involve individuals and not plain postal addresses. The choice process of e-shopping and parcel delivery services, will be quantified using the technique of Stated Preference (SP) Experiments through which respondents will choose the most preferred delivery service, by trading off the different service attributes. To this end, the demand for e-shopping and parcel delivery services will be estimated applying a Nested- Multinomial Logit Model (N-ML) and the results of the econometric analysis will feed the business elements of an innovative Data-Driven Business Model (DDBM) for last-mile logistics services. Following the taxonomy development method of Nickerson et al. (2013) and applying the VISOR framework we analyze business models for Delivery Service Providers (DSPs) who operate in a digital ecosystem. The final taxonomy of DDBM consists of five meta-dimensions, seventeen building blocks, and their associated characteristics depicted as a morphological box. As a last step, the taxonomy developed evaluated by a case study to postal services.

***Keywords**: Data-Driven-Business Model, last-mile logistics, Nested-Multinomial Logit Model, taxonomy, VISOR framework, postal services*

1 Introduction

The growing e-commerce industry, resulted to the increases on the demand of lightweight packets and parcels delivery services, demonstrating a prosperous ground for Delivery Service Providers (DSPs) leading to important supply chain reconfigurations and technological developments to respond to consumer demand. Technology disruptions for traditional delivery services, such as the use of drones, the use of a central last-mile micro depot (CMD), the adoption of a smart lock system, present an opportunity for DSPs to serve customers and to adhere ecological performance measures due to externalities in the cities where they operate in. At the same time digital platforms operate as a key enabler between stakeholders, business partners and individuals, providing integrated and connected last-mile logistics operations towards data-driven services. This continuously growing availability and volume of data, coupled with the competitive last-mile delivery service industry, pressure DSPs to leverage them economically, and to proceed with changes in the organizational structure and business processes. DSPs need to innovate their business models, not only because they operate in an ecosystem in which all stakeholders affect one another, but to also adapt to competitive market and growing consumers' needs and expectations. In this paper, we aim to design an innovative Data-Driven Business Model (DDBM), to create alignment between consumers' preferences and business value for last-mile logistics services. To this end, DSPs can use the innovative DDBM as a tool to guide them through the digital transformation for decision-making having sound data-based insights. The structure of this paper is as follows. After the introduction, we provide the theoretical background on the concepts of e-shopping and parcel delivery services and the essence of business models. In Section 3, we present the Design Science Research (DSR) Framework chosen to approach the aim of this paper as well as the econometric analysis processed to estimate consumers' preferences. In Section 4 we present a comprehensive taxonomy explaining the building blocks and its characteristics for last-mile logistics services. The paper closes with the evaluation of the taxonomy developed to a case study for postal services and

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we conclude with the summary of this work proposing future research and presenting the limitations.

2 The relationship between Consumers' Preferences and Data -Driven Business Model (DDBM)

In order to develop an innovative DDBM for last-mile logistics services, we need first to determine the service attributes of the parcel delivery service that will be chosen by consumers while they proceed with e-shopping and parcel delivery service activity. The most common delivery service factors reported in academic papers, are 'delivery time' and 'delivery fee'[5][16], 'delivery location' for automated parcel stations [6], 'time-slots' and 'delivery information'[9]. We have also consulted, the price catalogues of three distinct Delivery Service Providers who operate in the market sector of Courier, Express and Postal (CEP) services, where the services offered and the cost of them are presented in details. Following these two sources of information, we concluded to five delivery service attributes, such as: (1) delivery place, (2) time and speed, (3) track and trace, (4) value-added services, and (5) delivery cost. In order to construct hypothetical scenarios, to ask e-shoppers to choose the service that offers them the maximum utility we analysed each service attribute into levels [2].Consumers will evaluate the effects of different delivery attributes by trading off of these service attributes' levels and choose the delivery service that is the most appropriate for them. For this purpose, we developed four (4) different service alternatives which are: (1) Free Delivery, (2) Economy Service, (3) Standard Delivery Service, and (4) Special Delivery Service, that will be used to measure consumers' preferences for e-shopping and parcel delivery services. We have also included to the choice set, the option, not to choose any of the alternatives offered that is the 'No-choice' option. The description of the five service attributes with their different levels and the construction of the four different delivery services, are listed in Table 1.

The connection between data and consumers' preferences as a key resource in a Business Model, constitute the new value proposition that an Organisation needs to follow to restructure its business processes and design an artifact to visualize how data drive business elements' processes and how an enterprise generates value. The business model concept, is a useful tool for managers, to better understand the business logic of the company by describing how value is created, delivered and captured. Data-driven business models (DDBM) comparing with the traditional business models differ in that DDBMs are using data as a *key resource* while data are collected from consumers who use electronic devices or applications, and provide information about e-shopping characteristics or delivery service preferences. In the context of e-shopping and parcel delivery services, this type of information is about shipments (i.e. name, surname, postcode, date, phone, street name, house number, city of origin, cash-on-delivery, type of currency, etc.), type of products purchased and e-shop's origin. Likewise, in the logistics service industry, the data derived from or through the logistics processes such as order pick-up, sorting, transportation, last-mile delivery, etc., can be analyzed and collaborating with other business stakeholders, can be used to design business processes and improve decision-support and customer experience (CX). In other words, a business model, is aligned with the business strategy of an Organisation and with the Information Technology Strategy, as each business process is supported by its respective information system. In both research and practice, the most influential business model framework is the Business Model Canvas (BMC) by which divides the business operations into four key areas (infrastructure, offering, customers and finances) consisting of nine building blocks (key partners, key activities, key resources, value proposition, customer relationships, customer segments, channels, cost structure and revenue. There are also other frameworks and representation of business namely the VISOR framework [7], and the Business Model Navigator [11]. In this research we will use the VISOR-framework, as is the most suitable for operators that utilize technology to facilitate business processes, and enable them to make transactions for products and services through a digital platform (DP). The VISOR model, emphasizes the importance of customer contact points (i.e. interface), the central role of digital platforms (i.e. service platforms) and the need to orchestrate a complex ecosystem of multiple actors (i.e. organizing model) [7]. It assembles digital business models into five components:

Table 1. Delivery Service Attributes and Levels of the SP Experiment

Delivery Service Attributes	Attributes' levels	Free Delivery Service	Economy Service	Standard Delivery Service	Special Delivery Service	
Delivery Point	-at home -pick-up point [reference level]	-pick-up point	-at home -pick-up point	-at home -pick-up point	-at home	
Time and Speed of delivery service	-standard delivery (3-7 days) [reference level] -express delivery (1-2 days) -next day delivery -Delivery at a specific -time-window -Saturday morning delivery	-standard delivery (3-7 days)	-standard delivery (3-7 days) -Delivery at a specific time-window	-standard delivery (3-7 days) -express delivery (1-2 days) -Delivery at a specific time-window	-express delivery (1-2 days) -next day delivery -Delivery at a specific time-window -Saturday morning delivery	
Track and Trace	-full track and trace service [reference level] -notification messages for order status email/ sms/ app -notification messages for the expected day and time of delivery	-full track and trace service	-full track and trace service	-full track and trace service -notification messages for order status email/ sms/ app	-full track and trace service -notification messages for order status email/ sms/ app -notification messages for the expected day and time of delivery	**No Choice**
Values-Added Services	-Indemnity in case of unreliable delivery service (time, cost, etc.) -Cash on delivery -re-route shipment in case of consumer's absence from home -free return [reference level]		-Cash on delivery -re-route shipment in case of consumer's absence from home -free return	-Cash on delivery -free return	-Indemnity in case of unreliable delivery service (time, cost, etc.) -Cash on delivery -re-route shipment in case of consumer's absence from home -free return	
Delivery Cost	-0€ [Reference level] -2€ -3€ -4€ -6€	-0€	-2€ -3€	-3€ -4€	-4€ -6€	

1. *Value proposition:* Reason why a particular customer is willing to pay for a product or service.
2. *Interface:* Interaction between the customer and the service platform.
3. *Service platforms:* Engines to enable delivery of products or services.
4. *Organizing model:* Structure and processes of the ecosystem to create the products and services.
5. *Revenue model:* Distribution of revenues and cost among the ecosystem participants.

Within the VISOR framework, we will develop the taxonomy of the innovative DDBM.

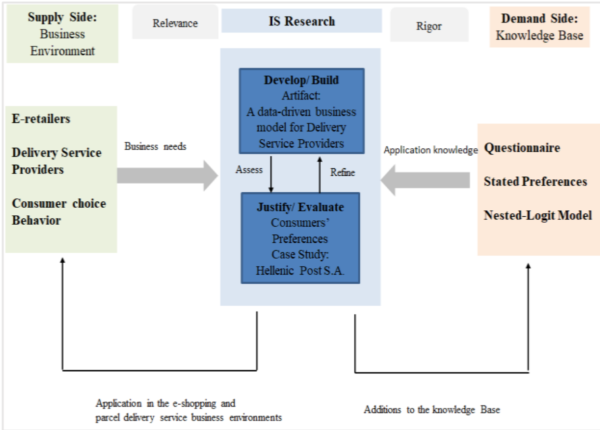

Fig. 1. Design Science Research (Hevner's three-cycle view)

3 Design Science Research (DSR)

To design an innovative DDBM, we applied the framework of the Design Science Research (DSR), which is used as an essential and legitimate research framework in Information Systems (IS) research [12][14] and helps managers and IS specialists to express the business logic of a firm, focusing on 'producing and applying knowledge of tasks or situations in order to create effective artifacts' providing the foundations for rigorous design science research. Figure 1 presents the DSR applied in this research. The IS research framework, overlays a focus on three inherent research cycles, namely the rigor, relevance, and design phase. We start with the Relevance Cycle where we aim to investigate e-shopping and parcel delivery services. More specific, it introduces the supply side where data-driven services are to be provided by Service Operators (e.g. e-retails, DSPs, etc.) to e-shoppers. The Relevance cycle provides the theoretical concept of this research while the third cycle, that is the Rigor Cycle provides the methods and the expertise of the scientific field of last-mile delivery services. The internal design cycle is the heart of any design science research project, and integrates supply and demand sides which will lead us to the construction and evaluation of the artifact and the new business processes. This cycle of research activities iterates more rapidly between the construction of an artifact, its evaluation, and subsequent feedback to refine the design further. In accordance with this research framework, we proceeded with building and evaluating the DDBM for last-mile logistics services.

3.1 Econometric Analysis

The data required to create the new business value (value proposition) for the innovative DDBM, will be collected using a structured questionnaire consisting of two main sections. The first one refers to the Revealed Reference questions and the second one to the Stated Preference Experiments (SPs). The first part refers to questions to measure consumers' most recent e-shopping and delivery service experience, as well as their perceptions and attitudes for the service received. The second part includes the SPs Experiments, in which hypothetical scenarios, developed to quantify the choice process through which respondents will choose the most preferred option to receive their online order. The questionnaire disseminated to people using social networks and it took place from May-September 2018. A total of 228 valid questionnaires were collected. The research population were all adults, who shop online and live mainly in Athens, and in other urban centers of Greece (i.e., Thessaloniki).

The decision of the e-shopper is the choice of a parcel delivery service from a complete set of service alternatives which will contain the service attributes and their levels. Therefore, consumer has a choice among five options which this can be expressed as: A={1,2,3,4,5}. We notice that, the choice of five different alternative services, including the 'No-choice' option, violates the property of Independence of Irrelevant Alternatives (IIA), since if the e-shopper decides not to choose any of the alternative delivery services, then cancels e-shopping activity and this impact on market shares of service demand.

For this reason, we applied the Nested Multinomial Logit Model (N-ML), to estimate the coefficients of the service attributes to see whether consumer's choice is influenced between e-shopping activity and choice of delivery service or e-shopping activity cancellation because of the 'No-choice' option. This can be interpreted as a choice set of an e-shopper partitioned into two nests B_1 *and* B_2: (i) e-shopping and parcel delivery service and (ii) e-shopping activity cancellation. The first nest, includes the e-shopping and parcel delivery service with all service alternatives, whereas the second nest includes the 'no choice option' indicating e-shopping cancellation. The utility that person *n* obtains from alternative *j* in nest B_1 is denoted, as usual, as $U_{nj} = V_{nj} + \varepsilon_{nj}$, where V_{nj} is observed by the researcher and ε_{nj} is a random variable whole value which is not observed by the researcher. The nested logit model is obtained by assuming that the vector of unobserved utility $\varepsilon_n = \langle \varepsilon_{n1}, \dots, \varepsilon_{nj} \rangle$ has cumulative distribution expressed as:

$$exp\left(-\sum_{k=1}^{K} \left(\sum_{j \in B_k} e^{-\frac{e_{nj}}{\lambda_\kappa}} \right)^{\lambda_\kappa} \right) \qquad (1)$$

This distribution is a type of generalized value (GEV) distribution, that gives rise to the logit model. The parameter coefficients for the nested logit model along with S.E., were performed in R software and are presented in Table 2. To estimate the N-ML model, we have set as a reference level the 'no-choice' option and the service levels of the 'Free Delivery' service, while delivery cost is a continuous variable (see Table 1). The variables included to estimate the N-ML model were, the alternative-specific constants (ASC) and the attributes of each service alternative (levels-of-service attributes). The coefficients that were estimated indicate the impact of each observed variable relative to the variance of the unobserved factors. They capture the average effect on utility of all factors that are not included in the model. They all have a negative sign and are statistically significant different from zero at the 0.001 level except of the 'Free Delivery Service' which was statistically significant at the 0.005 level. The negative coefficients of ASCs show that although delivery service completes the e-shopping activity, however it creates negative effect on consumers, such as waiting time or an extra delivery fee to be paid, or both, thus the utility of a parcel delivery service that a consumer will have exclusively from it, is a negative value. Among the three ASCs which are statistically significant the 'Special Delivery Service', has the highest negative coefficient (ASC_{SpD}=-7.54) comparing with the other three service alternatives. This is due to the fact that this alternative service has the most service levels comparing with the other three service alternatives, thus the difference is greater and adds to the utility estimation. Regarding the delivery service attributes, we see that 'Home delivery' ($\beta_1 = 0.96$), is positive and statistically significant, which indicates that consumers prefer to receive their online order at home. For the attribute 'Time and Speed', all the coefficients of the dummy variables are all positive and statistically significant showing that respondents prefer all different levels of 'Time and Speed' relative to the reference level 'standard delivery (3-7 days)'. The coefficients of all the dummy variables for 'Track and Trace', are both positive and statistically significant which indicate that consumers prefer having these two attributes relative to the reference level. For the service attribute 'Value-Added-Services' the coefficient of the dummy variable, 'Cash on delivery' ($\beta_{42} = -0.12$) is negative and statistically insignificant indicating that consumers are not preferring in paying 'cash-on delivery' thus, they are not interested in having this service. The coefficient of the dummy variable 're-route shipment in case of consumers' absence from home' ($\beta_{43} = 0.02$) is positive but statistically insignificant. Finally, the coefficient of the continuous variable 'Delivery cost' ($\beta_5 = 1.07$) is positive and statistically significant which shows that consumers are willing to incur extra cost in order to receive their online order faster and with other positive service factors. We can refer to the marginal probability (choice of nest) as the upper model' and the conditional probability (choice of alternative within the nest) as the 'lower model'. The term I_{nk} links the upper and lower models by bringing information from the lower model into the upper model and is often called the 'inclusive value'(IV) or 'inclusive utility' of nest B_k. Here we found that the IV of the upper model (0.19) is lower than the IV of the lower model (1.50) meaning that the expected utility that the e-shopper can receive is higher from the nest where he/she can choose the service parameters. From the econometric analysis, we understood that consumers who proceed with e-shopping aim to fulfill their needs, as an effect they aim to complete e-shopping activity and not to abandon e-shop basket, while they are ready to incur an extra cost if they receive an advanced delivery service for their online order.

4 From consumers' preferences to DDBM for last mile logistics services

Now we can apply the VISOR framework to develop an innovative business model for last-mile logistics services. In essence, the value proposition for the data-driven business model is to fulfill consumers' preferences for e-shopping and parcel delivery services, that is DSPs need to transform their supply chains, including *at-home, fast deliveries, with enriched tracking information,* while consumers are ready to incur *an extra delivery fee* as long as the service provided offers them higher convenience.

Table 2. Estimation results for the N-ML model

Explanatory Variable		Coefficient	t	p-value
	No-choice	**Reference level**		
ASC_1	Free Delivery Service (ASC_{FD})	-0.68	-2.80	0.005
ASC_2	Economy Service (ASC_{ES})	-3.19	-5.59	<0.001
ASC_3	Standard Delivery Service (ASC_{StD})	-4.63	-6.05	<0.001
ASC_4	Special Delivery Service (ASC_{SpD})	-7.54	-7.16	<0.001
Delivery point	at home (β_{11})	0.96	5.40	<0.001
	pick-up-point (β_{12})	**Reference Level**		
Time and speed of delivery	**Standard delivery (3-7 days) (β_{21})**	**Reference Level**		
	Express delivery (1-2 days) (β_{22})	1.35	5.92	<0.001
	Next day delivery (β_{23})	1.41	5.89	<0.001
	Delivery at specific time-window (β_{24})	1.25	6.40	<0.001
	Saturday morning delivery (β_{25})	1.49	5.44	<0.001
Track and trace	**Full track and trace (β_{31})**	**Reference Level**		
	Notification messages for order status email/sms/app (β_{32})	0.36	2.23	0.03
	Notification messages for the expected day and time of delivery (β_{33})	0.52	2.61	0.009
Value added services	Indemnity in case of unreliable delivery service (time, cost, etc.) (β_{41})	0.45	2.07	0.04
	Cash on delivery (β_{42})	-0.12	-0.95	0.34
	re-route shipment in case of consumer's absence from home (β_{43})	0.02	0.11	0.92
	free return (β_{44})	**Reference Level**		
Cost (β_5)		1.07	7.19	<0.001
IV No Choice		0.19	2.75	0.006
IV Choice		1.50	6.22	<0.001
Likelihood Ratio test	1674.5 (p.value=<0.0001)			
Log likelihood at convergence	-1640			
McFadden R-squared	33.79%			

Concerning 'value-added services', they need first to be examined and measured to estimate how much consumer is willing to pay for each of them or not. Based on this value proposition, we first determine the meta-dimension of the innovative DDBM, that is to define the purpose of business model development. In our case the meta-dimension is to focus on digital business models that employ digital platforms and digitized value offerings, such as digital services [4] [7][3]. Therefore, the meta-dimension in our case, reads as follows: *"key dimensions for data-driven business models for last-mile logistics services"*. Subsequently, all dimensions resulting from either conceptual-to-empirical or empirical-to-conceptual design need to address this meta-dimension. The first iteration (conceptual-to-empirical) provides conceptual meta-dimensions stemming from the VISOR framework [7], (i.e. the five ontological elements) given the digital business strategy that the service providers are following. Now we proceed with the second iteration in which we use an empirical-to-conceptual approach to validate the conceptual VISOR framework and add last-mile logistics specific dimensions and characteristics to the taxonomy. In specific, for each element of the VISOR-framework we have developed a guiding question so as to define the elements that will constitute the DDBM for last-mile logistics services. To this end, we have developed and selected seventeen building blocks defining the business processes to produce last-mile logistics services. Now we proceed with the third iteration, for the final taxonomy which follows the approach analysed in the Design Science Research framework fulfilling the purpose of the DDBM to operate as a tool by means of a morphological box. It follows the description of each building block of the morphological box while Table 3 presents the final Taxonomy of the DDBM consisting of five meta-dimensions, seventeen building blocks, and their associated characteristics.

Value Proposition

The value proposition includes four building blocks. Key offering (1) determines the overall outcome of the business model and is strongly influenced by the aspect of data. This building block consists of the following characteristics: last-mile delivery services, customs clearance, cross-docking, technology. These elements are about the provision of the core-product/service of the DSP, that is last-mile delivery service, including all the main processes and activities to prepare and deliver online orders to the end-user. A series of technological tasks support all the business processes to provide information to the consumers, flexibility of the delivery, personalized delivery, optimization of the delivery routes and time planning. Customer Value (2) includes these service attributes as, place of delivery, time and speed, track and trace services, value-added services and cost of delivery, that were measured through the SPs experiments in our survey. Customer segments (3) determine to whom the offering value is provided to, such as if the DDBM is business-to-business (B2B), business-to- customer (B2C), business-to-administration (B2A) or industry specific [8][13][17] Customer Relationships (4) refer to the interaction between customers and the company. The type of relations that can be developed are personal, self-service, automated-community or other types of interaction (i.e., mixed or indefinite).

Interface

The Interface includes the contact points that the customer has with the service platform and with other customers. This dimension includes two building blocks as it follows. Technological Innovations (5) such as AR/ VR and blockchain, AI, digital twins, 3D graphics and NFT, which play an essential role in creating and improving immersive realism on user experience in the metaverse environment [1]. Customer Interface (6) highlights how the customer can access and interact with firms through the digital platform, and have an identity in the metaverse. Interface devices' degree of technological embodiment can range from stationary (more distal) to bodily integrated (more proximal).

Service Platform

The Service Platform, is an intermediary five building block. The Platform owner (7) describes who is responsible for the platform while sometimes referred to as the ecosystem's keystone organization. Regarding logistics platforms, we found out that it can be represented by a single firm (e.g., start-up, small or medium-sized enterprise, or large enterprise) or by the shared entity, for example, as a consortium. Data Resource (8) refers to the data collected and are necessary for the main business of the firm. The service provider can collect data from the main activities processed and the respective IT systems used to operate these activities. Therefore, the main resource data can be collected from Consumers' Data, Geodata/Locations, Shipping/Order Data, Environmental Data, Condition Data. Data analysis (9) describes what advanced analytics methods can be applied to the data in order to extract information or knowledge from it [10][15][17]. It determines what has to be done to actually generate the value from data (and gaining a competitive advantage). Additionally, we added 'none' as a characteristic in case the business model relies on the raw data only as the offering. DaaS (10) refers to the process of "Delivery as a Service' that is a service-oriented delivery and business process in line with customer expectations and needs. Last-mile deliveries can be more responsive by making delivery to final customer more efficient. This can be succeeded by the optimization processes or routing and scheduling, such as vehicle fleet, on-demand delivery service, last-mile delivery service matching. IT infrastructure (11) is guided by IT strategy and governance and includes the following three characteristics: technical platforms, database systems and applications. These three characteristics determine the base to operate business.

Organising Model

Organisational characteristics (12) refer to the factors that are related to the resource constructs that create value, meaning that this dimension describes the core processes and resources needed to implement the business model. More specific the characteristics which constitute this building block are company size, market strategy, geographical area and digital processes. Delivery Network Infrastructure (13), is one of the most important building blocks especially for DSPs. It expresses how the parcel provider has organized its physical infrastructure to serve its customers. It consists of the following characteristics which denote the points of delivery such as, delivery agents, franchisees, last-mile micro depot, distribution centers. Key partnerships (14), refer to the network of suppliers and other partners such as Cargo Operators and handling agents, Postal Operators, Non-Governmental Operators, Transport Companies that the company can cooperate to run the business model.

Table 3. Consolidated Taxonomy for DDBM

Meta-Dimension		Building Blocks	Characteristics				
Value Proposition	1	Key offering	Last-mile delivery services	Customs clearance	Cross-docking		Technology
	2	Customer Values	Place of delivery	Time and speed	Track and trace	Value added services	Cost of delivery
	3	Customer segments	Business	Consumers	Government	Industry specific	
	4	Customer Relationship	Personal	Self-service		Automated-community	
Interface	5	Technological Innovations	AR/VR and blockchain	AI	Digital twins	3D Graphics	NFT
	6	Customer Interface	Web-based	Portable	Wearable devices (e.g. HDMs)	AR smart glasses	
Service Platform	7	Platform owner	Start-up	SME	Large Enterprise	Shared Entity	Established organization
	8	Data Resource	Consumers' Data	Geodata/Locations	Shipping/Order Data	Environmental Data	Condition Data
	9	Data analysis	Descriptive	Diagnostic	Predictive	Prescriptive	None
	10	Daas	Vehicle fleet	On-demand delivery service		Last-mile delivery service matching	
	11	IT infrastructure	Technical platforms	Database systems		Applications	
Organising Model	12	Organisational Characteristics	Company size	Market strategy	Geographical area	Digital processes	
	13	Delivery Network Infrastructure	Delivery Agents	Franchisees	Last-mile micro depot	Distribution Centers	
	14	Key partnerships	IT companies	Cargo operation and handling agents	Postal Operators	Non-governmental operations	Transport Companies
Revenue Model	15	Value Capture	Service Sales	Customers' Contracts	Project Contracts	Special Projects	
	16	Cost Structure	Value-driven		Cost-driven		Other
	17	Revenue structure	Delivery fees	Customers	Subscription	Pay-per-use	Freemium

Revenue Model

The Revenue Model highlights how to gain revenues from the DDBM and it includes three building blocks. Value Capture (15) describes how the firm generates revenue from the service/product provided to its customers. The characteristics for DSPs are, the price catalogue, customer contracts, project contracts and special projects. Cost Structure (16) represents the flipside of the revenue model, and thus decides on the success of the entire business model. Here, we distinguish the cost structure between value-driven and cost-driven based on. While value-driven determines the price of a product or service which provides value to the customer, cost-driven determines the price that the customer has to pay to acquire it. Additionally, we added the characteristic 'other' if the DDBM relies on mixed or other cost structures. Revenue Structure (17) explains how the business makes money and we have included such characteristics as delivery fees, customized, subscription, pay-per-use and freemium.

Further to technological advances to last-mile delivery services, DSPs can develop a pricing strategy, using the demand-supply interaction model, and taking into account consumers' preferences for e- shopping and parcel delivery services, they can determine the optimal service fee using digital platforms. That is to say, besides the number of orders, the price for each order also affects the platform revenue and profit. Hence, consumer choice behavior and commission charged for different orders should be taken into consideration when making operation plans.

4.1 Data-Driven Business Model: Implementation on postal services

We will apply now the final taxonomy, to a case study onto the National Postal Operator of Greece, that is the Hellenic Post S.A. (ELTA), to validate the identified building blocks. ELTA's strategy is in the process of digital transformation, that is the upgrade of human and capital with the technology. The morphological box developed after three iterations, will be implemented to the business operations of ELTA as it follows:

Value Proposition: The value proposition of ELTA is the provision of the universal postal services, that is to ensure that reliable, efficient, and high-quality postal services are available at affordable prices to all citizens within the Greek territory. The core product provided by postal services is last-mile logistics services and is addressed to every type of customers' segments such as individuals, small and medium enterprises, international companies and public organizations. The postal network is extended in an end-to-end service network within the Greek territory and abroad, by developing cooperations with other international Postal Operators.

Interface: ELTA started to develop and implement digital service applications (e.g., automated sorting system, post boxes, digital postman, smart queuing, etc.) to keep on with the market changes in e-commerce and parcel delivery services. Consumers can receive digital postal services such as electronic payment, track and trace services, e-shopping, etc. when interact through Organisations' web applications. For example, ELTA's clients can issue a shipping label for their online orders, using a web application named 'Web Labeling' for domestic and international shipments from their own computer device. In addition, the Digital Postman, using the Personal Digital Assistant (PDA) device, provides to customers delivery service as well as other electronic payment transactions.

Service Platform*:* ELTA, in order to produce digital postal services and match senders' and receivers' requirements, communicates with external IT companies who offer their supporting services to the Organisation based on the service level agreement signed between the two parties. These different databases can be integrated in a central information system and provide information about vehicles, such as speed or geographical position of a vehicle, dynamic maps with optimized routes, optimization and matching of freight availability and truck capacity and management of logistical processes.

Organising Model: The organizational model of ELTA, is structured in two main divisions: a) the production of postal services and b) the administration of postal services which include all the main business directions, which administer and support the production. Moreover, ELTA develops synergies with its subsidiary company 'ELTA-Tachymetafores', by providing delivery services to rural areas where ELTA's network is extended.

Revenue Model: ELTA is receiving funding from the government to maintain the cost of the Universal Service as is designated by the Law 4053/2012 (article 44). In addition, ELTA earns revenues from an extended service portfolio such as, domestic or international mail shipments, customs clearance services, provision of banking and financial products, and last but not least the retail services, such as philatelic. However, ELTA has also to maintain a significant size of physical assets that it operates as well as the payroll of its workforce.

All these tendencies that we have discussed so far, require a different postal infrastructure as well as different skills and patterns of employment for postal operators. While the digital transformation has become a strategic priority for postal operators the challenge of ELTA is to respond to market changes, clarify its business mission between universal postal service and commercial business, develop last mile delivery services based on consumers' needs and build on strategic relations with other business partners for transport and logistics services.

5 Conclusion

The customer experience of e-shopping and parcel delivery services has been conceptualized by measuring consumers' preferences towards five alternative delivery services (including the 'no-choice' option). Applying the N-ML model, the results showed that consumers get higher utility from the nest with the service parameters rather than with the nest with the no-choice option, therefore consumers who proceed with e-shopping, aim to complete it instead of abandoning the e-shop basket. The value proposition measured by SPs provided the feedback to design the innovative DDBM following the taxonomy development method of Nickerson et al. (2013).

After three iterations we designed the innovative data-driven business model (DDBM) for last-mile logistics services, consisting of five meta-dimensions, seventeen building blocks, and its associated characteristics presented as a morphological box. The DDBM implemented on postal services through a business case study for Hellenic Post S.A. as a validation process.

For practitioners, the consolidated taxonomy can be used as a guidance tool to innovate their business processes in accordance with consumers' preferences (value proposition). However, the taxonomy developed of DDBM for last-mile logistics services followed a qualitative research approach, which means that biases in terms of the findings cannot be excluded. Future research, can use our approach to study other business processes in other Organisations located in different countries, so as to increase the validity of our developed consolidated taxonomy.

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