

A SEMI-AUTOMATED NEGOTIATION MODEL APPLIED TO THE HOSPITALITY INDUSTRY IN THE AMAZON

UM MODELO DE NEGOCIAÇÃO SEMI-AUTOMATIZADA PARA A INDÚSTRIA DA HOSPITALIDADE NA AMAZÔNIA

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ABSTRACT

This paper proposes a semi-automated negotiation model applied to the hospitality industry in the Amazon, specifically in regions lacking a telecommunications infrastructure. In order to benefit the maximum number of partners and promote solid growth, a symbiotic eco-tourism management model, based on coproduction, is proposed. This model is supported by an e-commerce system that involves predicting data and is delimited by previously agreed compromise thresholds. The transfer of vouchers occurs through a collaborative data mule network.

Keywords: *Eco-tourism. Hospitality Industry. Data Mule. Amazon. Automated Negotiation.*

RESUMO

Este artigo propõe um modelo de negociação semi-automatizado aplicado à indústria de hospitalidade na Amazônia, especificamente em regiões sem infraestrutura de telecomunicações. Para beneficiar o número máximo de parceiros e promover um crescimento sólido, propõe-se um modelo simbiótico de gestão do ecoturismo, baseado na coprodução. Esse modelo é suportado por um sistema de comércio eletrônico que envolve a predição de dados e é delimitado por limiares de comprometimento previamente acordados entre as partes. A transferência de comprovantes para as operações (vouchers) ocorre por meio de uma rede colaborativa de Mula de Dados.

Palavras-chave: Ecoturismo. Indústria hoteleira. Mula de dados. Amazônia. Negociação Automatizada.

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1 INTRODUCTION

According to Tsaur, Lin and Lin (2006), ecotourism is a form of sustainable tourism that is expected to contribute to both conservation and development. This can be translated into concern for future generations, preservation of biomes, and social justice. In Brazil, the Ecotourism Inter-Ministerial Working Group (comprising the Ministry of Industry, Commerce and Tourism; The Ministry of Environment; The Legal Amazon; The Brazilian Tourism Company, The Brazilian Institute of the Environment and Renewable Resources; as well as individual entrepreneurs), proposed the following definition:

Eco-tourism is a tourism segment that uses the natural and cultural heritage in a sustainable manner, encourages conservation, and seeks the formation of an environmental consciousness, through the interpretation of the environment, promoting the well-being of populations involved (MMA, 1995).

So understood, eco-tourism, especially in the Amazon, represents an alternative to rural exodus, which is an issue in Brazil. Between 2000 and 2010, for example, 2 million people migrated from rural areas, driven by economic crises and lack of opportunities (BRAZILIAN INSTITUTE OF GEOGRAPHY AND STATISTICS, 2010). Ecotourism, as a sustainable activity, also generates vast job opportunities and promotes care for the environment. However, making this type of tourism viable requires a minimal infrastructure that is (1) efficient, because it requires well-defined methods and strategies applied to regional specifications; (2) ubiquitous, because it relies on technologies capable of improving business opportunities, even in remote areas, without traditional telecommunication systems; and (3) scalable, because it must accommodate growing demand, even when seasonal, without needing profound adjustments that imply excessive costs.

This study considers all Amazonian enterprises and services that operate, directly or indirectly, in the hospitality industry, and have been established in remote areas. These include farm hotels, hostels, inns, etc. In general, these entities remain on the fringes of a modern negotiation process with the world at large. Opportunities related to innovative techniques of e-commerce and digital marketing are overlooked. Typically these enterprises are located in isolated areas, with limited communications infrastructure and Internet access. Deprived of these resources, conventional growth and competitive strategies are inhibited and sometimes regionalized, or even controlled by intermediate operators who raise related fees to exorbitant levels.

As a solution to the problem of digital divide (DIJK; HACKER, 2003), this study proposes a model suited to the hospitality industry in remote regions. The uniqueness of the proposal lies in its enabling e-commerce businesses to become feasible in the Amazon through utilizing delay/disruption-tolerant networking (DTN), supported by an automated negotiation system (ANS) and based on a symbiotic coproduction model. The involving partnerships between entrepreneurs, local service providers, government, and nongovernmental organizations. The objective is to facilitate remote resources negotiation between entrepreneurs connected to eco-tourism, and potential clients, via the World Wide Web (WWW).

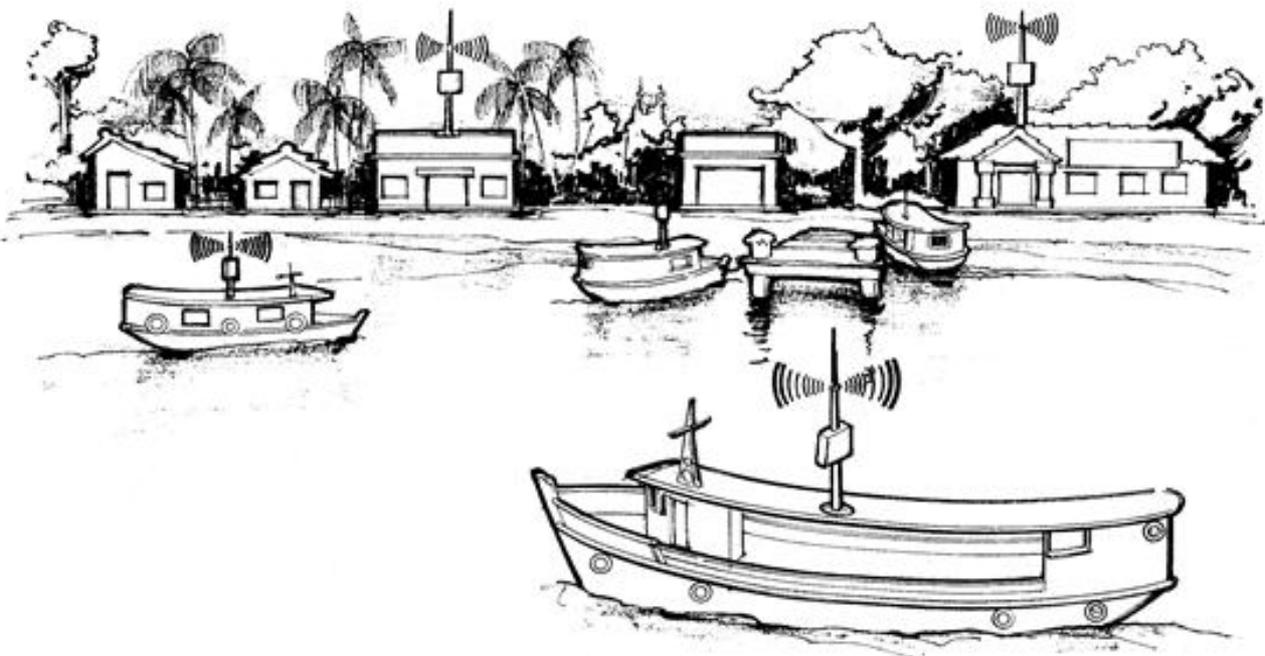
2 TECHNOLOGICAL INFRASTRUCTURE

Modern technologies—e.g., satellite links and other emerging resources provided by mobile technologies—represent one means by which to facilitate interaction between the digital universe and remote Amazonian contexts. However, most of these services remain relatively expensive in northern Brazil, and are rarely available in remote regions. Thus, the alternative is to adopt proposals more suited to the region’s socioeconomic context, such as those involving DTN technology, also known as data mules.

2.1 Data Mule

The term “data mule” is derived from “mobile ubiquitous LAN extension” (“MULE”). The concept relates to vehicles—in the Amazon, boats—that carry a small computer with a storage device and a limited embedded telecommunications module (radio frequency equipment) (SUNDARARAJ; VELLAIYAN, 2010). These devices are managed by DTN software such as IBR-DTN from Institut für Betriebssysteme und Rechnerverbund (SCHILDT *et al.*, 2011). The transfer usually occurs between remote areas, aiming to create an efficient and cheap data communications link through collaborative effort (see Figure 1). The data mule therefore represents a special case of DTN technology. Ongoing research led by NASA is investigating the use of DTN to make the interplanetary Internet feasible (BURLEIGH *et al.*, 2003), and this is directly relevant to the Amazonian case. That is, if the technology can enable communications in space, one of the most inhospitable places known to man, it could certainly be applied to remote regions of the Amazon (SANTOS *et al.*, 2006).

Figure 1- Depiction of a data mule network in the Amazon.



Source: Author.

The earliest ground-based applications using a data mule were proposed for sensor networks in India (ANASTASI; CONTI; DI FRANCESCO, 2008). Soon, other applications emerged to integrate remote communities around the world. In northern Brazil, for example, projects have been developed for the inclusion of indigenous people or of riverine populations (EXTREMECOM, 2011).

Data mules presuppose a partnership between nodes (in the Amazon, boats), where it is assumed that some nodes may be temporarily unavailable between the source and the destination. In the Amazon, where thousands of boats ply daily, such unavailability occurs frequently; however, this does not impair the data-transfer process continuity. Provided the data can be forwarded to other nodes, temporarily stored in the previous node until normal progress resumes, or transferred to another available node, nothing is lost. It should be noted, however, that in this model communication does not occur in real time. There may be delays of hours, or even days, before data delivery is completed. The greater the granularity of the system—i.e., the more boats participating in the network—the sooner the data will reach its destination.

2.2 E-Commerce

E-commerce can be divided into four distinct categories: enterprise—business; enterprise—government; enterprise—consumer; and consumer—government. This study considers the enterprise—consumer category, which is constantly expanding thanks to the nonlinear Internet navigation service known as the WWW. Among the advantages of e-commerce, compared to traditional face-to-face commerce, Ueyama and Madeira (2001) emphasized two aspects: (1) reduction in time and searching costs for consumers; and (2) expansion from local and regional to national and international markets, with minimal capital. Concerning the viability of e-commerce in remote regions, new revenue methods, as well as soft products including publications, catalogs, videos, etc., can be employed. That is, if suppliers/managers cannot be present, due to technological isolation, to provide immediate feedback, it is necessary to have an ANS available.

2.3 Automated Negotiation

One of the most efficient negotiation techniques in e-commerce, especially regarding scalability, is automated negotiation. Several e-commerce sites already use this technique, which may be based on learning. According to Beam and Seveg (1999), negotiation in e-commerce entails two or more parties multilaterally bargaining for mutual gain, using e-commerce techniques and tools that allow proposals and counterproposals to be advanced. Automated negotiation tools based on learning are largely consolidated in computational software structures known as intelligent agents (RAHWAN, 2002). Over time, the ability of the negotiating agent to learn creates enormous prospects for future negotiations. In automated negotiations offers can fluctuate in real time, depending on both actual deals and the prospects of completing them. Machine learning systems—e.g., those that use techniques including selection and regression—could be extremely useful in predictive negotiation models (OLIVER, 2015).

It should be noted that a simple e-mail between two or more people to negotiate regarding a particular product or service cannot be characterized as an automatic negotiation process in e-commerce. If, conversely, an autonomous agent conducts this negotiation with a human being, then this qualifies as automatic negotiation.

Ueyama and Madeira (2001) highlighted two types of automated negotiation: cooperative and competitive. In cooperative negotiation there are no competing interests. Here, the model resembles a form of bartering. Consider, for example, the case of two families negotiating a student exchange program for their children. Both families will be satisfied provided similar conditions are agreed upon for both sides. Competitive negotiation, on the other hand, only arises if the parties have conflicting interests. The method, adopted in conflict resolution, determines the strategies to be applied by intelligent agents under different circumstances. Competitive negotiation, therefore, presents similarities with a zero-sum game, where one player's gain constitutes another's loss. For example, for a buyer and a seller the objectives are contrary, since the buyer wants the lowest price while the seller seeks the highest.

The model described herein utilizes intelligent agents capable of incorporating business rules defined by stakeholders from the coproduction system. These intelligent agents define thresholds and offer aggregate services that refer to successful negotiation, as well as correlating it with concurrent events related to the business. Depending on the degree of flexibility allowed in the system, several additional products and services, referred to in this study as aggregates, may be incorporated into the negotiation rules. These can be subject to bargaining to boost the hospitality industry's business.

3 COPRODUCTION

According to Andrade and Vasconcellos (2017), coproduction is a kind of cooperation in which the multiple actors/sectors (stakeholders) involved should be open to participation based on reciprocal relations, similarly to comanagement (BERKES, 2009). In this study, coproduction represents the symbiotic collaboration of the hospitality industry in remote areas of the Amazon. The effective gains are for all stakeholders and are reflected in an increase in thriving businesses. In addition to creating jobs, this could enhance biome preservation. Moreover, these strategies contribute to increased awareness, care, and protection of the environment through integrated actions related to ecotourism. Jesus and Franco (2016) outlined a case study in which relationships allowed partner firms to combine resources creatively to establish various competitive advantages.

4 METHODOLOGY

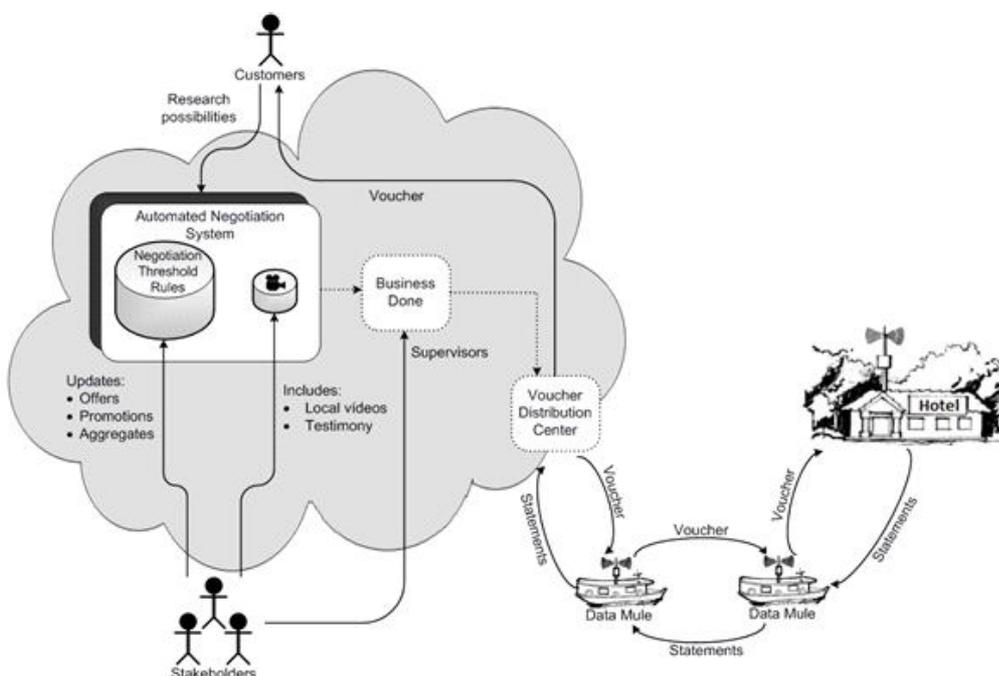
This theoretical essay presents an automated negotiation model for use in remote regions. According to Meneghetti (2011), the theoretical essay methodology is reflective and interpretive, and thus differs from the classificatory scientific format. It is one of the more appropriate ways in which to propagate new knowledge, even scientific or pre-scientific knowledge. Understanding theoretical testing is related to the concept of innovation. In this paper, innovation lies in the combination of diverse theorems aimed at devising a nonpredatory model that allows those involved to grow together. It presumes that in remote regions that lack communications infrastructure, this is the only means of promoting growth and sustainable development for all.

5 PROPOSED MODEL

Figure 2 summarizes the proposed model. We assume that the customer is no longer physically restricted to the region in which the product or service is offered. The business soon significantly expands. A key difference, in this model, is that the potential customer now has access to additional information compared to the traditional descriptive texts used on static Web pages, mainly because it is available on the Internet. Now, information comes, in real time, from catalogs, photos, promotional videos, presentation videos, customer testimonials, maps, etc., which are continuously updated. Additionally, the process is managed by an ANS, whose bargaining parameters are defined by the coproduction network. This integrates all actors in the region's hospitality industry, including hotel managers, local authorities, service providers, transport agencies, etc. Here, marketing strategies are not limited to items researched by the customer, but instead cover a whole range of services and network products that can be found locally. It should be noted that this is not a marriage proposal sale. Rather, this model adopts policies offering additional aggregates that become involved in the transaction only when the customer chooses to use the negotiating system.

For this to happen, all items within the bargaining process must have been previously agreed with the other actors in the coproduction system. For example, the items we consider include access to cultural events promoted by public authorities, and discounts on transportation, camping services, tours, meals in local restaurants, etc. (collectively referred to as aggregates). For greater efficiency, the negotiation process should be based on a model that incorporates machine learning, which enables negotiation decisions based on customer analysis. These practices enable, among other actions, predictive analysis. Additionally, the system must guarantee that transactions are based on offers consolidating the symbiotic regime, where there is mutual growth based on pre-established rules. This bargaining approach, wherein complementary aggregates are offered, should override the pure cash discount offer.

Figure 2- An overview of the model



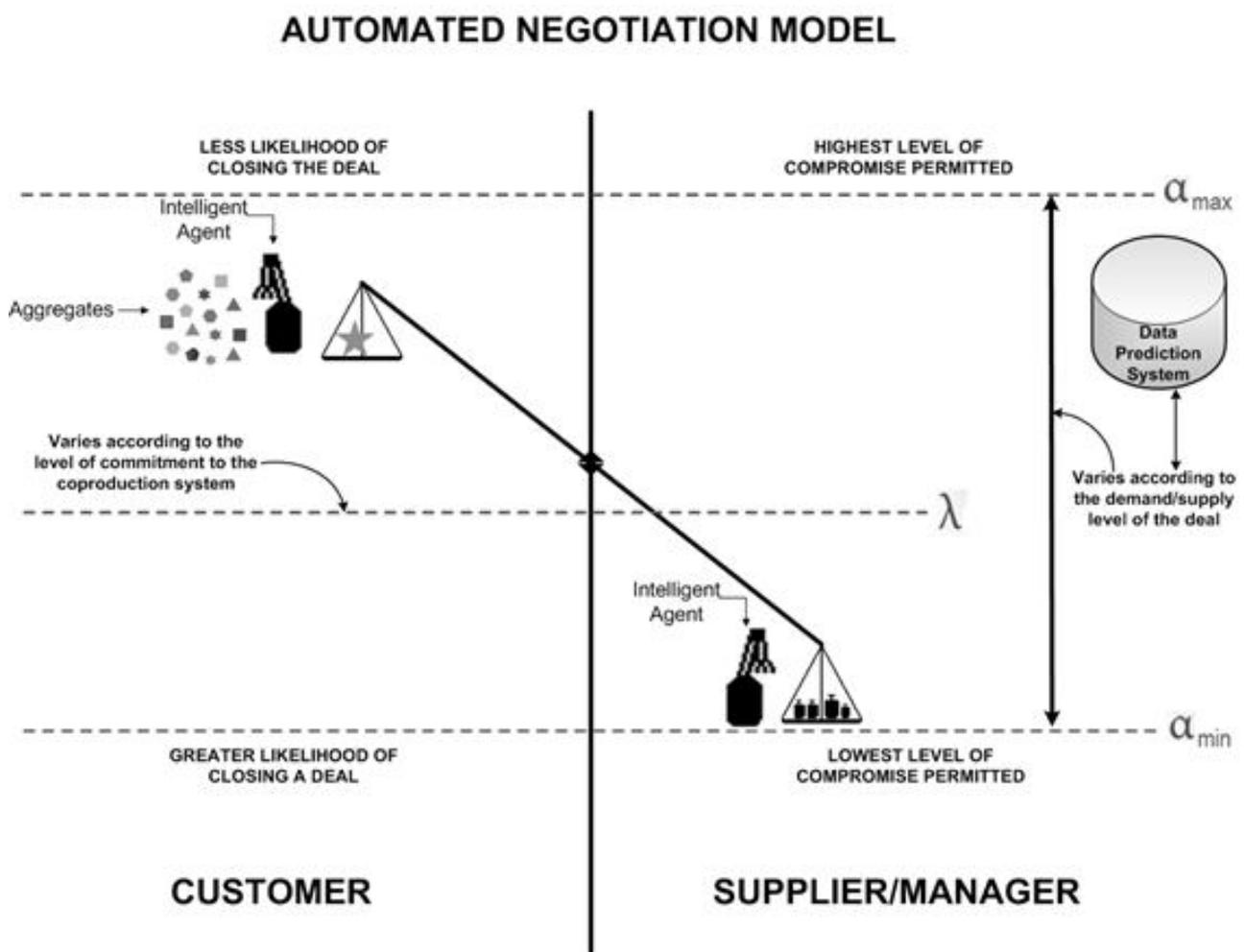
Source: Author.

Concerning the this process's viability in areas lacking communications infrastructure, the model predicts the use of a data mule network to automatically deliver vouchers related to transactions executed. Such automated delivery is important to register the deal between associates, thereby avoiding conflicts arising from unconsolidated information.

The model's efficiency requires that stakeholders are linked to unions, cooperatives, and public authorities in order to provide customer support from urban centers to remote areas, where the services will effectively be provided.

To depict the components of the automated negotiation model, Figure 3 utilizes the metaphorical representation of a scale. In this model, the measurement trays correspond to customer and service provider, respectively. As more aggregates are added to the customer's measurement tray, the likelihood of the negotiation being well executed by the ANS increases. Similarly, the more the service provider compromises by removing weights from its measurement tray, the lower its gains will be.

Figure 3- Automated negotiation model



Source: Author.

The system initially confronts the customer with three thresholds: maximum and minimum thresholds (α_{min} and α_{max}), from the concession level permitted in the negotiation; and the commitment threshold with the coproduction system (λ). This latter threshold is extremely important to maintain the system's symbiosis, because it represents the extent to which each service provider is

willing to concede, not only for its own sake but for the benefit of some partner affiliated with the coproduction system. That is, when aggregates are added to the customer's "tray," the negotiation system tries to convince that customer to replace a cash discount with a set of other items (aggregated) from different providers.

In this case, the deal is closed by the partner who benefits. This characterizes and strengthens the coproduction system. After exceeding the compromise threshold, the system can initiate the offer for effective discounts or present this offer incrementally, as defined by the provider.

All thresholds are defined jointly in periodic meetings involving stakeholders and coproduction staff. Balancing of the system occurs through punctuation compensation, where each participant manages his/her points to help another partner. Therein, each participant associated with the system provides a set of aggregates, accounted for by points. Via cooperative management, the coproduction system ensures equitable division of responsibilities. This allows the negotiation system to act wholly autonomously to complete the negotiation successfully.

6 FINAL CONSIDERATIONS

In a highly competitive system, eco-tourist entrepreneurs, especially those in areas lacking telecommunications infrastructure, must show solidarity in order to grow together. The coproduction system represents a promising path for this segment. Of equal importance is inserting these services into the digital universe, through e-commerce and automated negotiation, as a strategy to leverage business self-subsistence. As objectives, established through partnerships, converge, consolidation of business ventures becomes increasingly feasible. The hospitality industry is the most representative case in the quest for full customer satisfaction, both in the eco-tourism segment and in other segments associated with entertainment, because it addresses the client universe from a macro view, observing the necessary connections required for satisfaction. Thus, investing in this model will result in a high probability of success.

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