ORIGINAL

Business models in the space sector: the case of Rocket Lab

Modelos de negocio en el sector espacial: el caso de Rocket Lab

Modelos de negócios no setor espacial: o caso da Rocket Lab

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ABSTRACT

This article analyzes the evolution of the business model of a private rocket company, Rocket Lab. Given the rapid transformations of the space sector, where the private sector is increasingly relevant, little is known about the business models most appropriate to new challenges. Through a longitudinal search of Internet archives, we collected the main events in Rocket Lab history and use the CANVAS theoretical model to analyze the evolution of the company's business logic. The results indicate that the value proposition remained the core of the company's business model, with small adjustments being adopted. At the same time, the other components of the business model have undergone more significant adaptations over time to meet the needs of important partners, especially the military.

Keywords: Business model. Space sector. Rocket Lab. Ecosystem.

RESUMEN

Este artículo analiza la evolución del modelo de negocio de una empresa privada de cohetes, Rocket Lab. En vista de los rápidos cambios en el sector espacial, en el que el sector privado es cada vez más relevante, se sabe poco acerca de los modelos de negocios más apropiados para los nuevos desafíos. A través de una encuesta longitudinal en los archivos de Internet, hemos estudiado los principales acontecimientos de la historia de Rocket Lab y hemos utilizado el modelo teórico CANVAS para analizar la evolución de la lógica de negocios de la empresa. Los resultados indican que la propuesta de valor siguió siendo el núcleo del modelo de negocios de la empresa, con la adopción de pequeños ajustes. Al mismo tiempo, los demás componentes del modelo de negocios sufrieron adaptaciones más significativas a lo largo del tiempo para satisfacer las necesidades de los socios clave, especialmente los militares.

Palabras clave: *Modelo de negocios. Sector espacial. Rocket Lab. Ecosistema.*

RESUMO

Neste artigo, analisa-se a evolução do modelo de negócios de uma empresa privada de foguetes, a Rocket Lab. Diante das rápidas transformações do setor espacial, onde o setor privado tem cada vez mais relevância, pouco se sabe sobre os modelos de negócios mais apropriados aos novos desafios. Por meio de uma pesquisa longitudinal em arquivos da Internet, levantamos os principais eventos da história da Rocket Lab e utilizamos o modelo teórico CANVAS para analisar a evolução da lógica de negócios da empresa. Os resultados indicam que a proposta de valor permaneceu como o núcleo do modelo de negócios da empresa, adotados pequenos ajustes. Ao mesmo tempo, os outros componentes do modelo de negócios sofreram adaptações mais significativas ao longo do tempo para atender às necessidades de parceiros importantes, especialmente os militares.

Palavras-chave: *Modelo de negócios. Setor espacial. Rocket Lab. Ecossistema.*

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The acronyms and abbreviations contained in this article correspond to the ones used in the original article in Portuguese.

1 INTRODUCTION

The rocket launching sector originated from government projects, such as V2 rockets and the Apollo Project. However, in the 1980s, to meet the growing demand for satellite launching and space stations operation, the United States of America (USA) changed its legislation to encourage the participation of private companies (FAA, N/A; FRICK; NIEDERSTRASSER, 2018).

The private sector flourished and in the next two decades preponderated traditional companies with strong government connections, such as Boeing, Lockheed Martin and Arianespace. However, the configuration of this market has been transformed since the beginning of this century. Startups have emerged focused on the launching sector, being SpaceX, Blue Origin, Virgin Galactic, and Rocket Lab significant examples (DAVENPORT, 2018).

The overall size of the space economy, which combines public budgets, satellite services, land equipment and navigation services, was USD345 billion in 2018 (FFA, 2018). These numbers tend to grow and are estimated to exceed USD 1 trillion by 2040 (BOAML, 2017; MORGAN STANLEY, 2019). The activities that requires space infrastructure are increasing and will demand a greater supply of launches. (WEF, 2020).

Despite the attractiveness of the market and advances in technology, the number of successful companies is reduced (FRICK; NIEDERSTRASSER, 2018). This issue is little studied from a business perspective, since much of the research in the space sector is dedicated to technological aspects (MILLER, 2019). In this sense, it is worth emphasizing that the development of a technology must be accompanied by a business model so that there is sustainable innovation (TEECE, 2010).

In this article, we will introduce the evolution of Rocket Lab's business model, identifying and analyzing key events that have resulted in significant changes in the company' business model. The purpose is to offer a broad view of the business strategy that enabled Rocket Lab to start from an amateur stage and reached operational and commercial maturity. The study of this case can inspire decision makers, both in the public and private sectors.

Next, we will make a brief historical contextualization of the space sector, followed by a literature review on business model. Later, we will describe the method. After that, we will present and analyze the results. Finally, we will offer a discussion finalized by a conclusion.

2 GENERAL CONTEXT

The space age was born due to competition between countries. Only recently has the commercial aspect become significant value. The context in which Rocket Lab operates is the result of a historical evolution. To understand it, we have organized the evolution of the space sector in five phases.

The first phase, which was from V2 in 1944, to the last man on the Moon in 1972, became known as the "Space Race", characterized by intense competition between the USA and the Union of Soviet Socialist Republics(USSR). In addition to the dispute between the superpowers, the technological advances are also due to the leadership of two scientists: Werner Von Braun, for the USA, and Sergey Korolev, for the USSR. Both were visionaries ahead of their time and understood the potential of space exploration(BBC, 2005). During this period, military objectives had priority over scientific and commercial objectives. Although state-owned company COMSAT created INTELSAT and NASA launched some weather satellites, commercial use of space was still embryonic. Commercial communications were still experimental as in the case of the use of AT&T's Telstar 1 (1962) satellite. (BBC, 2005; YLE P, 2019).

From the last man to the Moon in 1972, to the dissolution of the USSR in 1991, we have the second phase. Governments and the military remain key players, but the space sector is no longer relying on visionaries of the caliber of Von Braun and Korolev (BBC, 2005). After man was taken to the lunar surface five times, the public interest diminished, which contributed to the reduction of the public budget. At the same time, as the U.S. government's demand for launches was high, it encouraged the development of the private sector. In 1989, McDonnell Douglas conducted the first commercial orbital launch in the U.S. (FAA, N/A; PYLE, 2019).

The third phase goes from the dissolution of the USSR in 1991 to the last flight of the space shuttle in 2011. With the reduction of the public budget, private public partnerships (PPPs) have become a trend. Purely private financing was still limited, as investors perceived a high risk in the space activities (FAA, N/A; PAIKOWSKY, 2017; WEINZIERL, 2088; PYLE, 2019). The space sector has gained new visionaries, represented notably by Elon Musk, Jeff Bezos, and Richard Branson, all successful entrepreneurs with a mindset formed in a globalized and digitized world. It is at this stage, in 2006, that Peter Beck founded Rocket Lab (DAVENPORT, 2018; NOTED, 2018).

From the last flight of the space shuttle in 2011 to the launch of the Falcon Heavy in 2018, we have the fourth phase, when the private sector consolidates. Visionary entrepreneurs associate their projects with the survival of humanity and renew the interest of the general public. For governments, financial resources remain scarce, but space exploration is seen as strategic. After the last flight of the space shuttle, the U.S. was nearly ten years without the ability to put astronauts into space and depended on the Russian spacecraft Soyuz. The solution found was to vigorously support the private initiative (FRISCHAUF et al., 2017; PYLE, 2019). Finally, on May 30, 2020, U.S. astronauts Robert Behnken and Douglas Hurley, aboard the Crew Dragon spacecraft, were launched by SpaceX's Falcon 9 Rocket and reached the International Space Station (NASA, 2020). Technological maturation leads to a lower perception of risk and greater interest from private investors (Space Angels, 2019). At the same time, the miniaturization of components allows the construction of smaller and smaller satellites, enabling the use of simpler rockets, as is the case of rocket Electron, from Rocket Lab (PYLE, 2019).

The current phase begins with the launch of the Falcon Heavy in 2018, an important milestone in the capacity of new companies in the sector. Billionaire visionaries and government agencies have long-term plans for the exploration of the Moon and Mars. The technologies that will emerge to meet these objectives will allow the opening of new markets, such as asteroid mining and tourism (PYLE, 2019).

While in the Space Race the US and the USSR were the only protagonists, currently the number of relevant nations is significantly higher. In the military field, the main disputes are between the U.S., China and Russia. Satellites provide critical services and governments need more satellites ad systems to provide redundancy, increasing the strategic importance of the private space sector (NATO, 2018).

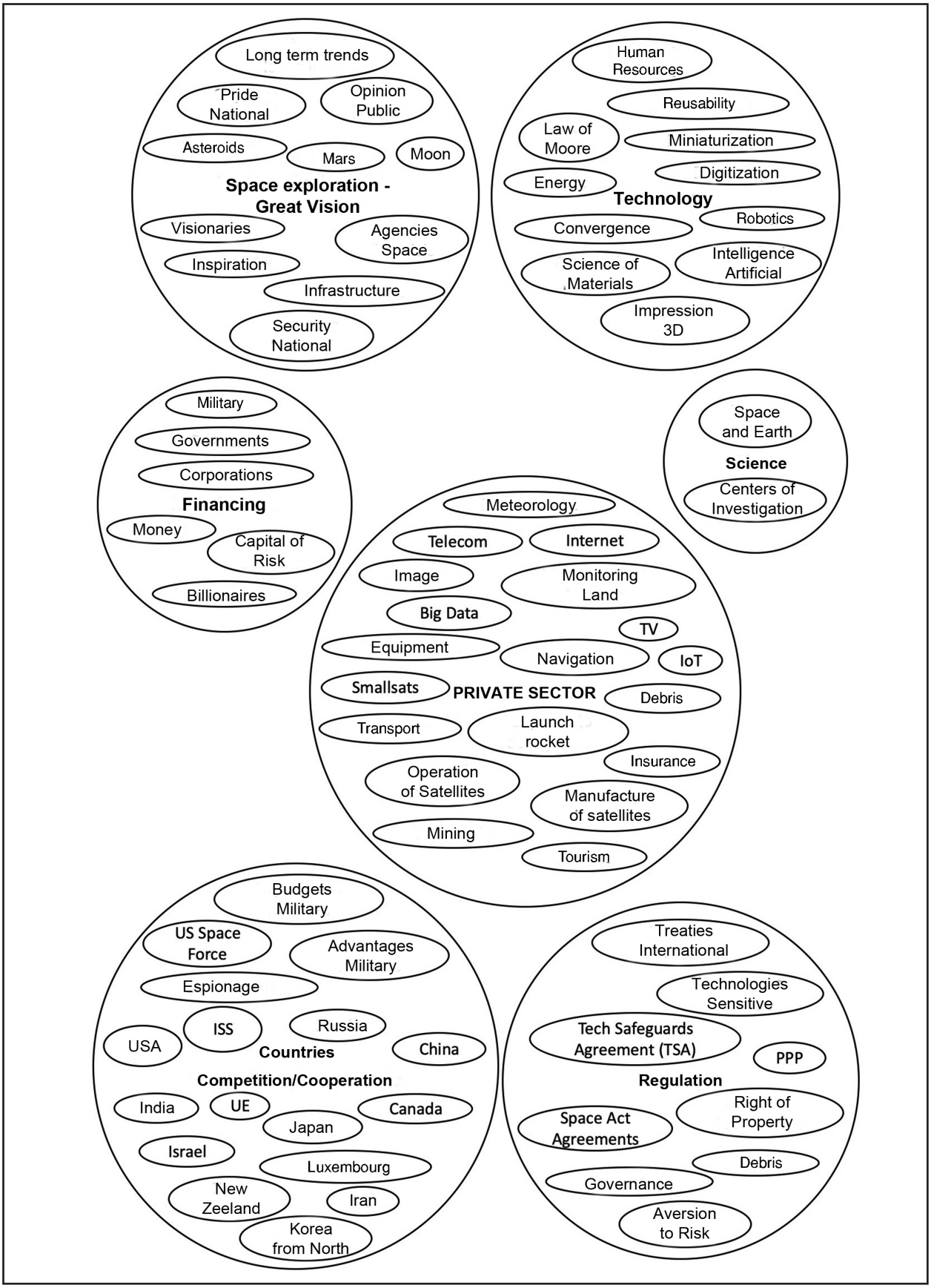
International collaboration is limited by legislation derived from national security interests. Even among allies, technology transfer is a sensitive point, as is the case with Rocket Lab. Although the company is North American, its subsidiary in New Zealand is obliged to follow Technology Safeguards Agreement (TSA). Regulatory issues should have more impacts as the danger of space junk becomes more evident (FFA, 2018; NATO, 2018).

In the current phase, the space sector is quite diversified, and can be seen as a true ecosystem of innovation, business and entrepreneurship (ORLOVA et al., 2020; PAIKOWSKY, 2017).

The ecosystem perspective goes beyond the limits of the traditional vision of "industry", incorporating both the supply and demand side. This broad perspective considers all actors that impact the activities of a sector, including actors of various natures, such as technical, commercial, legal, social and financial. This perspective facilitates the identification of key actors, since it offers broad visualization and understandings, suitable for basing strategic decisions (ADNER, 2006; IANSITI; LEVIEN, 2004; VENKATRAMAN; LEE, 2004; METCALFE; RAMLOGAN, 2008; AUTIO; THOMAS, 2014; TSUJIMOTOA; KAJIKAWAA; TOMITA & MATSUMOTO, 2017). Emphasizing the private sector, Figure 1 presents an outline that consolidates key contextual aspects to be considered in business strategies.

Working in this complex environment, is Rocket Lab, case used for this research. The presentation of the history and peculiarities of this company are inserted in the Results and Analysis section. Next, we will deal with the theoretical concepts about business model that will be used in the analysis of the evolution of Rocket Lab.

Figure 1 - Outline of the ecosystem of the space sector.



Source: The author.

3 BUSINESS MODEL

A company's business model defines how it creates, delivers, and captures value. It represents the entrepreneur's hypothesis about what the client needs and how the company should be organized to profit by meeting these needs (TEECE, 2010).

The study of business models derives from business strategy studies. The emergence and strengthening of this perspective results from the economic changes of recent decades, particularly the intensification of global trade and the availability of information. This economic transformation has given consumers greater options and bargaining power, causing companies to prioritize customer needs.

At the same time, the perception was consolidated that a technological advance that allows the development of a new product or service must be connected to a business model that shows how that product or service should be launched on the market and generate profit. Otherwise, a huge technological development can become a fiasco if due attention is not paid to how it will be brought to market. A well-designed business model is seen as a competitive advantage (TEECE, 2010; ZOTT et al., 2011).

In the case of the space sector, the increase in private sector participation has changed the way of negotiating in this sector. In this line, we understand that the study of the business models of private companies, such as Rocket Lab, can contribute to the understanding of the current context.

It is important to highlight that the business model develops over time, especially in a context of uncertainties regarding technology and the market. When starting a new company, there are difficulties in defining its business model, although it develops as more information is obtained (ANDRIES et al., 2013). The "Value Proposition" offered by the company plays a central role in structuring the business model, being one of the first ideas that the entrepreneur develops. As the entrepreneur interacts with his stakeholders, this proposal evolves and impacts on the construction of the remaining of the business logic (REYMEN et al., 2017).

Among the conceptual understandings about the business model (MORRIS et al., 2005), we will adopt what was proposed by Osterwalder and Pigneur (2010), which is widely accepted in the academic community and known in practice by the name CANVAS. One of its advantages is the clear definition of the components of a business model. According to this perspective, a business model can be decomposed into nine dimensions, which will be evident in the "Results and Analysis" section.

4 METHOD

To achieve a broad understanding of Rocket Lab's business logic history, in this study two steps are worked on: critical event identification and content analysis.

In the first stage, we identified the critical events, that is, the actions or decisions taken by the companies. Considering that one of the sources for event identification is the analysis of documentation (VAN DE VEN; POOLE, 1990; REYMEN et al., 2015), in the case of this research, we first resorted to Rocket Lab[1]'s own website, where the relevant facts since January 1, 2013, are available.

However, as significant part of the current success of the company is due to facts that occurred in its first years of life, it is necessary to research older events. In order to do this, we use the Wayback Machine, a system made available by the Internet Archive, a not-profit organization that has been archiving websites since 1996. This collection represents a valuable source of data for scientific research, with more than 330 billion webpages, among other items. In the case of the study of business strategies, particularly for the understanding of the evolution of business models, archived data from websites offer a broad and chronologically organized perspective (ARORA et al., 2016).

To survey the history of events, we follow three steps. First, we search the term "Rocket Lab" in the "Wayback Machine" field of the "https://web.archive.org" website. This search returned the site http://rocketlab.co.nz/, the old company

[1] https://www.rocketlabusa.com/news/updates.

website. Then, using the various snapshots of the website "http://rocketlab.co.nz/" made available by the Wayback Machine, we extracted the relevant facts of the period, usually listed under the heading "news". Finally, we added complementary information, originated from interviews of the company's founders for the media (WALSH, 2008, BRADLEY,2016, KEALL, 2017).

The second step is based on the chronological list of events obtained in the previous step. Each event has an intrinsic meaning that allows us to understand a given context (BOTT; TOURISH, 2016). This research takes a process approach, that is, it investigates a sequence of events and searches for patterns that describe how things evolve over time (LANGLEY, 1999; VAN DE VEN, 2007).

Based on this understanding, we performed a Content Analysis (DURIAU et al., 2007) on these data. During this analysis, we first identified the events that mark a strong change in the business logic of the case under study, which allowed us to divide the evolution of the company into phases. Continuing the analysis, for each phase we have interpreted their respective events in the light of the dimensions of the business model proposed by Osterwalder and Pigneur (2010). Finally, we designed the CANVAS templates for each phase.

5 RESULTS AND ANALYSIS

Adding the facts extracted from the Wayback Machine with those available on Rocket Lab's current website, we identified 147 events. The interpretation of the sequence of events led us to divide the evolution of the company's business model into four distinct phases. After each phase, we present the results with tables that summarize the main events of the period, on which are based the analysis and design of the CANVAS model of the respective phase.

5.1 First phase: Aspirations (1994 – 2006)

This phase is the one that precedes the founding of the Rocket Lab. Table 1 presents its main events. In the global context, we can highlight the foundation of Blue Origin (2000), SpaceX (2002), and Virgin Galactic (2004). The arrival of these startups in the space sector served as a source of inspiration and motivation.

Table 1 – Main events of the first phase.

Date	Event
1994	Peter Beck works in Fisher & Paykel appliances store while developing rockets as a hobby.
2001	The Callaghan Innovation Institute, in Auckland, employs Beck, who continues to develop amateur rockets.
2005	Beck travels to the U.S. and is impacted by the entrepreneurial atmosphere, deciding to start projecting the "Atea" (atea means space, in the Maori language) and build suborbital rockets.

Source: The author.

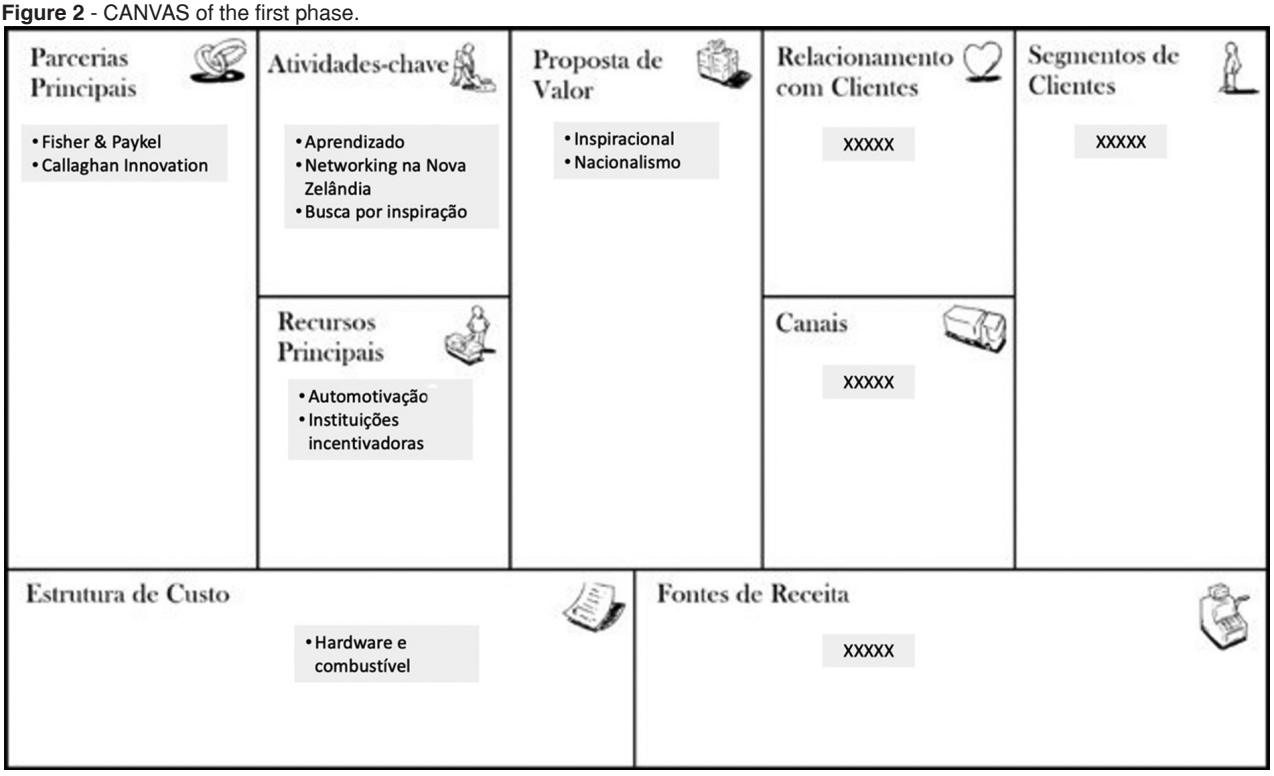
Still without a constituted company, Peter Beck allowed himself to dream and to accumulate knowledge about rockets. He had the sympathy of private companies and the New Zealand government. He adapted his projects to the peculiarities of New Zealand (THE ECONOMIST, 2018) and simultaneously "sold" the idea that the space would be "cool" for the country, which aroused national pride. The tipping point was his contact with the entrepreneurial mindset of the U.S., when he became convinced that he should professionalize his aspirations.

Figure 2 presents the business logic of this context. It is worth mentioning: (1) Value Proposition still quite abstract; (2) Key activities still limited to the Context of New Zealand; (3) there are no sources of revenue.

5.2 Second phase: Test (June 2006 – November 2009)

One can list as critical antecedents of this phase: (1) increased technical knowledge; (2) increase in the number of partners. During this second phase, at the global level, it is worth highlighting the contracts of USD 278 million (2006) and USD 1.6 billion (2008) between NASA and SpaceX, as well as the orbit launching of Falcon 1 (2008). These facts indicated a strengthening of the private sector. In the case of Rocket Lab, the main events are summarized in Table 2.

Figure 2 - CANVAS of the first phase.



Source: The author.

Table 2 - Main events of the second phase.

Date	Event
Jun/2006	Rocket Lab Ltd is incorporated in the USA.
Nov/2006	Beck and his partner, Mark Rocket, who made his fortune with Internet businesses, set goal of developing a suborbital rocket by the end of 2007.
May/2007	Partnership with Lanza Tech to develop rocket biofuels.
Jun/2007	First meeting with the Minister of Economic Development of New Zealand.
Jul/2007	Participation, in Australia, of attempted record-breaking speed by land vehicle.
Aug/2007	Model of the Atea-01 rocket receives great media coverage.
Nov/2007	Beck and Mark Rocket travel to Canada and the U.S. to get to know the market and to do networking.
Dec/2007	Rocket Lab patents a new type of rocket fuel, theoretically less polluting.
Apr/2008	In an interview, Beck and Mark Rocket stated that they were not discussing any partnership with NASA, and would not engage in anything related to the military, even if there was an investment offer.
Apr/2008	Partnership with the U.S. company Celestis to offer the service of launching human ashes into space. A suborbital launch of 1 gram of human ash is priced at USD 495.
Apr/2008	Negotiations with Microgravity Enterprises to offer drinks that have gone into space, such as the bottled water "Space² 0" and the energetic drink "Antimatter".
Apr/2008	Recovery parachute system successfully tested.
Jul/2009	Air New Zealand Gas Turbines collaborates with Rocket Lab in the development of rocket engines.
Nov/2009	First rocket in the Atea-1 series successfully flies for 22 seconds.

Source: The author.

Still without a mature business model, it aimed at suborbital flights and resisted any military connection. There was great uncertainty as to how best to draw business logic. This evidenced by the series of relatively random contacts with foreign scientists and companies, as well as by the negotiations to offer unusual services.

The main events of this phase are the incorporation of Rocket Lab, contacts with the New Zealand government and foreign companies, as well as the flight of the Atea-1rocket. Figure 3 presents the business logic of this phase. The following stand out: (1) Shy Value Proposition (suborbital) and rejection of military clients; (2) expansion of key activities beyond New Zealand; (3) there are no sources of revenue.

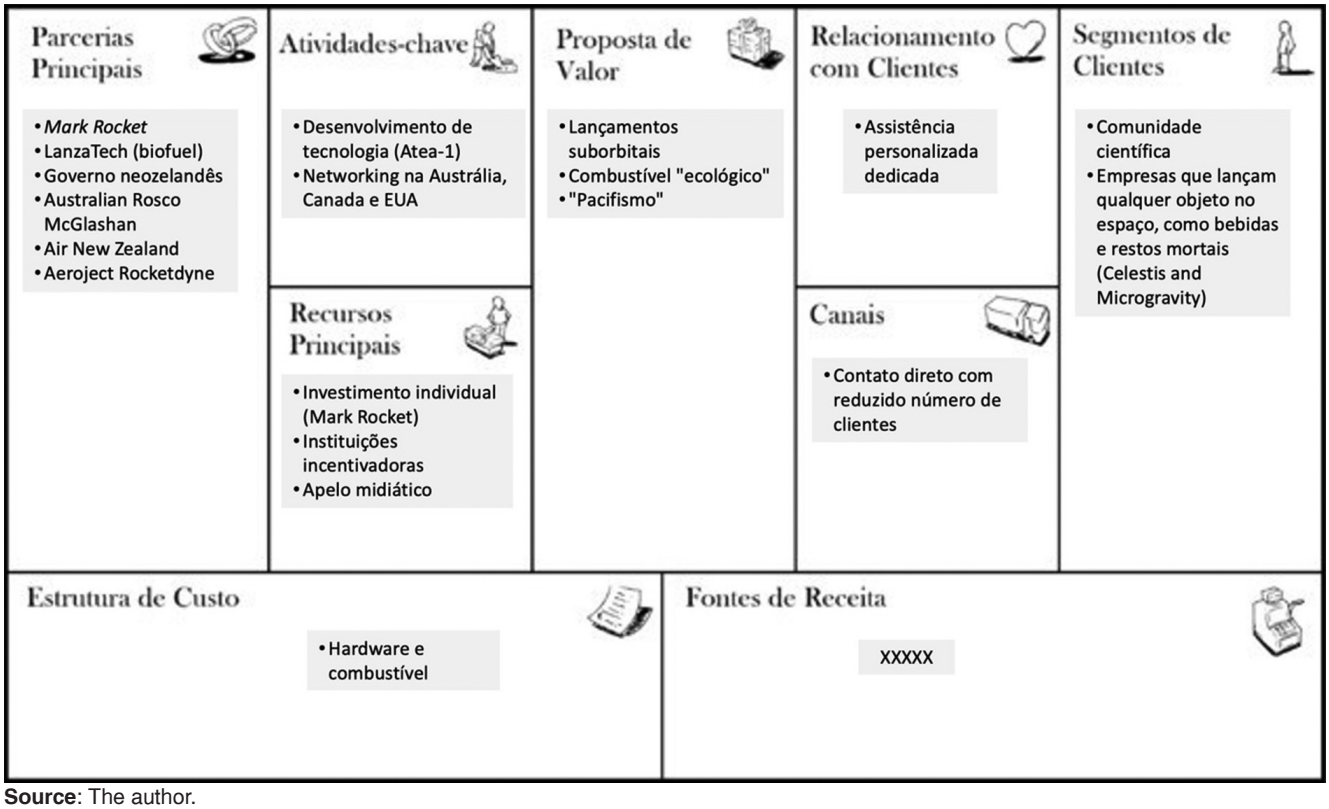
5.3 Third phase: Military (November 2009 – October 2013)

Rocket Lab finally reaches space. Critical background: (1) Atea-1 rocket reaches space; (2) NASA funding for launching startups. Internationally, the launch of Falcon 9 (2010) e o last flight of the space shuttle (2011) are the most striking facts. In the case of Rocket Lab, Table 3 lists the main events.

The success of Atea-1 showed the world that Rocket Lab had reached an advanced technological level. What until recently seemed amateurish, now became a real possibility to launch loads into space. Because rocket technology is intrinsically associated with missile technology, the U.S. military began investing in the company (noting that Rocket Lab, despite operating in New Zealand, is incorporated in the U.S.). In addition to the need to control sensitive technology, the military saw an opportunity to develop small rockets capable of being quickly fired to meet urgent battlefield demands. It was an appropriate marriage between U.S. defense interests and the startup's investment needs.

U.S. military investments have profoundly altered the company's business logic. This new connection with military activities resulted in the departure of one of its founders, Mark Rocket. The company began to focus on military partners and customers, both in the U.S. and Australia.

Figure 3 - CANVAS of the second phase.



Source: The author.

Table 3 - Main events of the third phase.

Date	Event
Apr/2010	Participation in the National Space Symposium in Colorado Springs, USA. The company talks to international companies about possible technology exchanges.
May/2010	Andrews Space Inc, a company specializing in special transportation, approves Rocket Lab as its supplier.
Jul/2010	Rocket Lab receives investment from the U.S. Office of Naval Research (ONR) to research new types of propulsion and fuels.
Dec/2010	Contract with the U.S. Operationally Responsive Space Office (ORS) to study engines and avionics to launch smallsats into low and polar orbit.
Jan/2011	Important successes are achieved in the development of propulsion system, avionics, launch, and recovery.
Feb/2011	Contract with DARPA, USA, to develop new type of propellant.
Mar/2011	Contract with L2 Aerospace to develop new generation of systems for rapid rocket launch.
Jun/2011	Rocket Lab announces the resignation of Mark Rocket as director of the company.
Sep/2011	New research contracts with DARPA and ONR.
Oct/2011	Development, in partnership with InstantEye's L2 Aerospace, of a small, lightweight, portable standalone rocket for battlefield reconnaissance.
Feb/2012	Rocket Lab demonstrates InstantEyes for U.S. and NATO military.
Jun/2012	The HI-Noz carbono phenolic ablative material technology, developed by Rocket Lab is selected to be used in the Patriot missiles.
Nov/2012	Rocket Lab demonstrates new propellant and propulsion system (Viscous Liquid Monopropellants - VLM), which was sponsored by DARPA and ONRG. The VLM is seen by propulsion experts and military personnel as a major technological achievement of Rocket Lab.
Jan/2013	The New Zealand government, through its Callaghan Innovation Institute, delivers funds to Rocket Lab as a way to encourage innovation.

Source: The author.

The main events of this phase are the U.S. military support for Rocket Lab, the development of InstantEyes, the departure of Mark Rocket, and the improvement of the propulsion system. Figure 4 presents the logic of the business of that phase. The following stand out: (1) Value Proposition for orbital flights; (2) the military aspects strongly permeated the company's activities and impacted the choice of customers and partners.

Figure 4 - CANVAS of the third phase.

Source: The author.

5.4 Fourth phase: Business (October 2013 – currently)

The critical antecedents of this phase were: (1) consolidation of launch technology; (2) Rocket Lab's credibility endorsed by its military clients. In this fourth phase, Rocket Lab's business model matures. Table 4 presents the main events of the startup.

Rocket Lab's technological advances combined with the solid partnership with various U.S. military agencies and NASA have given the startup credibility. Particularly relevant was NASA's agreement to use resources, which gave Rocket Lab access not only to the U.S. agency's facilities, equipment and personnel, but primarily to knowledge. Realizing the company's potential, private investors decided to participate. It is interesting to note that Rocket Lab's success preceded the attention given by the New Zealand government to space activities. The New Zealand Space Agency (NZSA) was established ten years after Rocket Lab was founded.

Excited by the initial achievements, Rocket Lab was motivated to expand its objectives, no longer seen as a simple supplier of defense products and services, to position itself as a company that intended to cause a disruption in the space sector. To do so, it would offer Electron for customized smallsats launches by a more diversified segmentation of consumers.

The company's strategic vision followed technological developments. There was the correct perception that the miniaturization of components had allowed the construction of smaller and smaller satellites, which implies that relatively small rockets are effective. As important as the perception of technological developments, there was a clear understanding that the market for smallsats would tend to grow. This insight allowed Rocket Lab to adjust its business model to serve its own niche market and avoid direct competition with large companies in the industry, such as ULA and Space X.

Table 4 - Main events of the fourth phase.

Date	Event
Oct/2013	First round (A-Round) of venture capital investments company Khosla Ventures, based on Silicon Valley.
Dec/2013	Rocket Lab tests its Rutherford engine.
Jul/2014	Rocket Lab announces its plan to revolutionize the global space sector with the creation of Electron, a lightweight, low-cost rocket to make launching smallsats easier.
Mar/2015	Second round of venture capital investments. Lockheed Martin also makes a strategic investment.
Jul/2015	NASA signature to the Commercial Space Launch Act Agreement, which allows Rocket Lab to use NASA resources.
Aug/2015	Rocket Lab creates online system for satellite launch requests.
Oct/2015	NASA signing of $6.95 million contract to launch cargo in low orbit.
Apr/2016	The New Zealand government creates the New Zealand Space Agency (NZSA).
Aug/2016	Following NASA's example, other companies such as Planet, Spiree Moon Express announce that they will use Electron to launch their satellites.
Sep/2016	Completion of the launching field (Launch Complex 1) on the Mahia Peninsula, in New Zealand.
Oct/2016	Beck states: "Rocket Lab wants to be small and agile in the commercial launch business. Electron will make highly frequent launches for USD 5 million each. Other options cost around USD 200 million and still have a long waiting time. We do not see ourselves as low-cost company, on the contrary, we offer premium launches. We offer the customer who usually hitches a ride on big rockets (ride sharing) a launch to the desired orbit at the time he needs it". Beck continues: "A satellite that was the size of a car, is now the size of a refrigerator. But next it's going to be the size of a microwave. This is important because it enables satellite companies to place any infrastructure in space at unprecedented cost and frequency".
Oct/2016	Investor Sir Stephen Tindall says Beck knows how to use language to explain the complexities of space science to anyone, especially investors.
Mar/2017	New round of investments. To date, investments total $148 million and Rocket Lab was valued at USD 1 billion.
May/2017	Contract with Spaceflight, a launch service provider.
Jan/2018	Rocket Lab puts cargo into orbit using Electron.
Apr/2018	Partnered with York Space Systems to develop a standardized launch system for Electron rockets.
Aug/2018	Contract with Cicle Aerospace (Dubai-based company) for 10 Electrons launches.
Sep/2018	Contract with Kleos Space (Luxembourg-based company) to launch radio-transmission monitoring satellites for ships.
Oct/2018	Opening in Auckland, New Zealand, of factory for the intensive production of Electron rockets.
Nov/2018	Rocket Lab puts 7 satellites into orbit for several customers. This mission was dubbed "It's Business Time".
Nov/2018	New round of investments.
Dec/2018	Rocket Lab launches CubeSats for NASA.
Mar/2019	Rocket Lab launches R3D2 satellites for DARPA.
Apr/2019	Rocket Lab announces its "Spacecraft Program" and now offers, in an integrated way, both launch and spacecraft construction services.
May/2019	Rocket Lab launches three satellites for the U.S. Air Force.
Jul/2019	Rocket Lab celebrates the construction of the hundredth Rutherford engine, manufactured using 3D printers.
Aug/2019	Rocket Lab announces plans to reuse its Electron rockets.
Oct/2019	Partnership with Kongsberg Satellite Services to provide complete services including spacecraft design and construction, launch and follow-up from ground stations.
Dec/2019	Rocket Lab completes its tenth mission, reaching the mark of 47 satellites launched, with 100% success for its customers.

Source: The author.

The main events of this phase are the venture capital investments and contracts with de NASA and private companies. Figure 5 presents the business logic of this phase. The following stand out: (1) Value Proposition aimed at customized orbital flights; (2) Expansion of the network of partners and customers.

6 DISCUSSION AND CONCLUSION

Analysis of the evolution of CANVAS models indicates that the core of Rocket Lab's business logic lies in its Value Proposition. From suborbital flights to the offer of integrated launch services, it has changed, but without losing the connection with the initial idea of reaching space. Now, the other dimensions of CANVAS have changed significantly to suit contextual opportunities. This adequacy is in line with the theory about business model, which argues that the most successful companies are those that test, learn and adjust their models over time (OSTERWALDER; PIGNEUR, 2009; TEECE, 2010; ZOTT et al., 2011; REYMEN et al., 2017).

Beck's entrepreneurial spirit was key. Through trial and error, he pursued his vision of reaching space, persisting in the development of his own technologies and understanding the opportunities of the market. The startup was born from an exclusively private initiative, then rare case in the launch sector. The connection with the public sector consolidated after the initial successes in a time that the company still acted amateurishly. Beck changed his initial policy of not partnering with military projects and associated to the U.S. defense sector, reaching competence and credibility to, later, obtain private investments and to enter the civilian market.

To Beck's personal merits, however, we should add other factors. By observing the evolution of the startup's CANVAS model, one can note that there is a progressive enrichment in the "Main Partnerships", which is consonant with the history of the space sector, in which advances depended on the work of interdependent groups, such as research centers, government agencies, and private enterprises.

Falcon 1, when it failed three times, it almost took SpaceX to bankruptcy, but the connections of Elon Musk with investors and with NASA allowed Falcon 1 to be launched one more time and to be successful. Blue Origin and Virgin Galactic hire many NASA scientists, with decades of experience (VANCE; SANDERS, 2015; DAVENPORT, 2018). NASA gives incentives for North American startups to use its facilities, an opportunity well used also by Rocket Lab (VIA SATELLITE, 2015). Despite the fact those are only a few examples, the lesson is that a diversified business environment is paramount for the flourishing of launch startups (CORALLO et al., 2014).

Figure 5 - CANVAS of the fourth phase.

Source: The author.

In the particular case of Rocket Lab, three questions deserve reflecting, (1) Would the startup have been born without the entrepreneurial spirit of Peter Beck and Mark Rocket? (2) Would it have reached the civilian market without passing through a "military phase"? (3) Would the business be sustainable by offering only services related to defense?

The success of Rocket Lab takes place amidst a large competition. There are dozens of companies developing small sized rockets, especially in the U.S. and China; however, the research point the fact that there is a market for some four or five companies only. What investors are looking for is for startups with disruptive concepts and not more of the same (FRICK; NIEDERSTRASSER, 2018; FOUST, 2019; WERNER, 2019).

Summarizing, taking advantage of a favorable context in the private space sector, the business model of Rocket Lab evolves true to the vision of reaching space, that is, its Value Proposition has not lost its essence. Simultaneously, there was flexibility to adapt to the opportunities offered by new partnerships. The search for technological efficacy and the association to military partners gave the needed credibility for investors to place their resources. It was also paramount the interactions in a space ecosystem composed by varied actors.

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