How space companies can explore the advantages and disadvantages of being first mover or fast follower in their respective markets?

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03 Feb 2020

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In the context of the New Space, the space industry is called to mutate and to integrate actors of different types. Emerging markets such as small satellites constellation and space tourism will know a constant increase of new entrants in the industry, attracted by the promise of a constant growth. With the uncertainty inherent in any emerging market, it is important for a firm to be able to evaluate the consequences of its timing in entry market, and to be aware of the advantages and disadvantages arising from this position. It is why in this research, we present first the different dimensions that are implied in the concept of "first-mover" and "fast follower" such as the resources-based view, the barriers to entry, the external environment and the innovation aspects. We have a special focus on the advantages and disadvantages of being "first mover" or "fast follower". Next, the space sector is analyzed empirically to identify the specificities of the sector with a focus on the legal, political, financial and technological aspects. Finally, we make a connection between the academic framework and the empirical factors to clarify the advantages and disadvantages which can represent opportunities or threats, depending of the position of each firm. To conclude, we discuss about the limitations of our model and propose future potential lines of research.

Keywords: First-mover, early entrants, fast follower, later entrants, advantages, disadvantages, space industry, resources-based view, barriers to entry, innovation

Dans le contexte du New Space, l'industrie du spatial est appelée à muter et à intégrer des acteurs de natures différentes. Des marchés naissants comme celui des constellations de petits satellites et du tourisme spatial vont connaître une augmentation croissante de nouveaux entrants dans l'industrie, attirés par la promesse d'une croissance constante. Avec l'incertitude inhérente à tous marchés émergents, il est important pour une entreprise d'être en capacité d'évaluer les conséquences de son choix d'entrer à un temps donné sur un marché, et d'être consciente des avantages et inconvénients découlant de cette position. C'est pourquoi dans cette recherche, nous présentons dans un premier temps les différentes dimensions en jeux imprégnées dans les concepts du "premier entrant" et du "suiveur rapide", comme l'importance des ressources internes, des barrières à l'entrée, de l'environnement externe et des aspects d'innovation. Nous nous concentrons ensuite spécifiquement sur les avantages et inconvénients du "premier entrant" et du "suiveur rapide". Dans un second volet, le secteur spatial est analysé empiriquement dans le but d'identifier les spécificités du secteur, avec un focal sur les aspect légaux, politiques, financiers et technologiques. Enfin, nous lions le cadre académique aux facteurs empiriques pour clarifier les avantages et inconvénients qui peuvent représenter des opportunités ou des menaces, dépendamment de la position de chaque entreprise. Pour conclure, nous discutons des limites de notre modèle et proposons de potentiel axes de recherches.

Mots-clés : Premier entrant, premiers entrants, suiveur rapide, dernier entrants, avantages, inconvénients, industrie spatiale, ressources internes, barrières à l'entrée, innovation

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1. Introduction

In the common analysis of markets, we usually consider that each market is static without taking into consideration the lifetime of each actor : how long has this business been there ? Is it a new entrant, an incumbent ? We scarcely consider the timing of the entry market in the elaboration of business plans, while the position of entrants may generates different types of advantages, as well as disadvantages that are important to consider in managerial position, in order to use the timing to its benefits.

It is why in this research thesis, we will rely on the concepts of “first-mover” as well as “fast follower”, and try to establish what are the different academic currents containing in these notions : how it can be defined, what are the observed advantages and disadvantages arising from past researches. The final objective is not to deliver to executives a general true that will be set in stone, but to help them to have in mind the different components of their environment, so that they are able to analyze their situation, measure their resources and their lacks, and take the best decision considering their potentials.

The study of the advantages and disadvantages of being first-mover or fast follower is particularly exciting in the space industry. Indeed, this industry, with the tendency of what we call the “New Space” is moulting considerably, while maintaining its defense and conservative aspects with the increasing implication of governments, seeing it as a political strategic issues. Mixing public and private actors, the space industry has unique characteristics. The application of the analysis of first mover and fast follower (dis)advantages must take in its formulation these specificities, which does not always respond to the law of supply and demand, and that of free market.

Therefore, our main interrogation will be centered around the advantages and disadvantages for companies to enter first or lately in the space sector, and more specifically: how space companies can explore the advantages and disadvantages of being first mover or fast follower in their respective markets ?

The structure of the thesis will be cut into two mains parts:

- The first one will be dedicated to an academic state of the art : definitions, the criteria that are implied behind. We will then focus on the different sources of advantages and disadvantages of being first mover or fast follower.
- We will then confronted the different advantages and disadvantages presented in the academic framework to the space industry, in order to clarify the different strategy in New Space especially, with applications in the small satellite constellation and space tourism.

2. Academic framework

2-1- First movers and fast followers' definitions

Before going deeper in our analysis, we need first to define the concepts of "first-mover" and "fast follower".
What we can notice first, is that the notion of "first mover" is recurrent, whereas that of "fast follower" is almost non-existent in the academic literature. We can therefore point out that it exists more literature about first mover(s) and its advantages than of fast follower(s), so that there is an asymmetry in the research literature. Frequently, the advantages of later entrants are implicitly mentioned in the first movers' disadvantages.

There are also a variety of appellations. It will depend of the researcher's point of interests. For example, according to Gilbert and Birnbaum-More (1996) the advantageous situation of first mover is quite often the situation of an actor among "early movers" because they consider that the true innovator is not always the first-mover but is more among the group of early entrants. They also use "second mover" or "late mover" for all the firm entering the market after the first mover(s).
"Later entrant" is also a term used. We find also the term "incumbents" or "pioneers" to designate the firms that are already established on the market.

In this way, it seems difficult for the academicians to close strictly these concepts in a fixed definition. Although they can appear intuitive, there are behind several subtleties that we will develop progressively.
Thus, Lieberman and Montgomery (1988) defined the situation of first mover as: "when the pioneering firm earns positive present value of profits as the consequence of its early entry", highlighting the benefits stemming from an entry-time position on the market.
Likewise, Suarez and Lanzolla (2015) defined first mover as "a firm's ability to be better off than its competitors as a result of being first to market in a new product category". They are more specific with the use of product category.
The notions of "first mover" or "fast follower" are finally very complex and when we talk about these concepts, we must clarify the criteria that we are analyzing behind.

2-2- What is it to be first mover or fast follower: a combination of different dimensions

Claiming its position of being first mover or fast follower is not enough to benefits from the advantages of each. We need to take into consideration different criteria, such as internal resources, the innovation aspect, the market environment as well as the barriers to entry; all those being finally a component of the general scope.

Internal capabilities: A company need to consider its internal capabilities. In this way, Lieberman and Montgomery (1998) link the first-mover advantages to the resource-based view (RBV). The idea is to identity the strategic resources in order to develop sustainable competitive advantages. The list of sources composed of technological leadership, preemption of assets and development of buyer

switching costs are developed in the part 2-3, dedicated to the advantages and disadvantages of each position.

Otherwise, according to the resource position barriers view (Makadok, 1998), the holder of a resource is able to maintain a relative sustainable position by being the first to acquire a resource, especially if it takes rational decisions to preserve its advantages. In this way, the holder of a resource will affect the cost for later comers by influencing the price.
There are several resources barriers, such as machine capacity, production experience, technological leads. The resource position barrier efficiency is intrinsically linked to entry barriers. The resource position barrier is the concrete proof of the firm's advantages by the accumulation of different capacities, whereas the entry barrier will build an obstacle between incumbents and potential newcomers and protect the incumbents.

Innovation: Innovation is an important factor to consider. It can be a source of competitive advantage, and at the origin of ruptures which upset the relative positions of companies in term of market share and in term of benefits (Helfer, Kalika, Orsoni 2019). There are different kind of innovation, and the one which can have a considerable impact on the market position is the disruptive innovation. In this way, empirical findings leaded by Christensen, Raynot and McDonald (2015) showed that incumbents outperformed entrants in a sustaining innovation context but underperformed in a disruptive innovation context. They defined the context of disruption by "when a smaller company with fewer resources is able to successfully challenge established incumbent businesses".
On the contrary, an incremental solution do not appear to provide timing advantages either to first or second movers (Henderson and Clark, 1990).
Thus, incumbents focus on improving their products and services for their most demanding and profitable customers, and therefore ignore the needs of others; whereas the new entrants who are disruptive target successfully the overlooked segments by delivering suitable functionalities. It reminds us of the dilemma of innovator (Christensen, 1997): satisfy and invest a demand that doesn't exist yet with the risk of destabilize its achievements or choose inertia?
However, we need to understand that a disruptive strategy does not always lead systematically to a first mover advantages, and that the successful innovator is not necessarily the first but very often among one the early movers (Cleff, Rennings, 2012). We can here make the hypothesis that a disruptor innovator is always a first mover.

Moreover, we need as well to consider the state of the environment before entering in a market. Indeed, there are conditions that promote the technology capabilities, and others which favor fast follower strategies.

External environment:

Unfavorable conditions may lead to lower survival chances, especially for new entrants.
In that respect, Suarez and Lanzolla (2005) highlight two external criteria:

- the pace of technological evolution: it is the rhythm at which the technological innovation is occuring: is it a dynamic tempo or on the contrary in a slow cadence ?
- the pace of market evolution: as for the technological evolution, it corresponds to the demand to a market or for a product category, so that we can ask if a product is quickly or slowly absorb.

Here is the framework developed by Suarez and Lanzolla:

		Criteria 2 - **Pace of market evolution**	
		Slow	Fast
Criteria 1 - **Pace of technological evolution**	Slow	**Calm waters**: when the technology and the market evolve gradually	**The market leads**: the technological change is modest while the market grows rapidly
	Fast	**The technology leads**: innovation improvements go quicker compared to the evolution of the market	**Rough waters**: both the technology and the market evolve rapidly

In that way, the researchers suggest that companies with large-scale marketing, distribution, and production capacity are more advantaged in situations when the market leads. They do not have to innovate first and are better as fast follower, so that they can benefit from the researches of pioneers and then deploy all their sales capabilities.

In contrast, companies with R&D, new product development competencies, and with a huge capacity of investment are favored in situations when the technology leads.

Otherwise, the maturity of the market is also very important. Thus, according to Dobrev and Gotsopoulos (2010), new firms in a new industry is more likely to fail than new firms in a mature industry, because the institutional structures for asking for resources or investments are missing. Here the institutional aspect of a market is a very powerful third party player to take into consideration.

Furthermore, Lieberman and Montgomery (1988) highlight a situation of asymmetry that favors an opportunity for first-mover. The first opportunity may occur because a firm possess a unique resources or foresight. Secondly, the mechanisms generated by the asymmetry will enhance the magnitude and/ or durability of first-mover profits and may finally enable the firm to exploit its position.

The number of competitors in the market is also an interesting point. According to Gilbert and Birnbaum-More (1996), “in an industry where only four firms compete, the third firm to introduce an innovation is unlikely to gain timing advantages. But

in an industry such as life insurance, where a customer literally has hundreds of firms to choose from, the third firm to introduce an innovation may well gain lasting competitive advantage from its early timing."

The barriers to entry: As for the definitions of first mover and fast follower, the notion of barriers to entry is complex to define but is capital when elaborating a first mover/fast follower strategy. Wunkers (2012) makes of barriers to entry one of the four conditions for early entrants to achieve early mover advantages. For him, the first comers must preserve an early market lead stemming from barriers that later entrants will face.
In this way, according to Bain (1956), " a barrier to entry is an advantage of established sellers in an industry over potential entrant sellers, which is reflected in the extent to which established sellers can persistently raise their prices above competitive levels without attracting new firms to enter the industry." It seems like the privilege of a first mover.
Furthermore, Carlton and Perloff (1994) defined it as "anything that prevents an entrepreneur from instantaneously creating a new firm in a market. A long-run barrier to entry is a cost necessarily incurred by a new entrant that incumbents do not (or have not had to) bear". The notions of durability and of time-entry market seem very important to take into consideration, so that first movers appear to be in capacity of building resources that will let them have a sustainable advantage over later entrants.
This hypothesis is confirmed by Makadok (1998). In his study "can first-mover and early mover advantages be sustained in an industry with low barriers to entry/imitation", he confirms that first mover and early movers in a product category will command a highly higher price than later entrants, which will be more sustainable and resistant to the entry of imitators. On the same way, they will have a moderate larger market share than later entrants. Indeed, the switching cost, real or psychological can be perceived too higher to be made by the customers. Moreover, the number of competitors in most product categories is scarcely too much to erase the market share advantages of early entrants, so that the longer a follower waits to enter a market, the more time the first mover has to solidify its competitive advantages.

It exists different type of barriers to entry, and Karakaya (2002) separated its into four dimensions for industrial markets:

- Firms specific advantages: proprietary product technology, sourcing raw materials strategy, established collaborations, cost advantages, better production processes, etc.
  These advantages are hardly imitable for later entrants.
- Product differentiation: the point is focusing on importance of the brand, of the image, and of the customer loyalty. It can be for examples the impact of previous advertisements and marketing campaigns, the customer's switching costs, the access to distribution channels.

- Financial requirements or cost of market entry: we find here barriers as capital requirements to enter markets, capital intensity, sunk costs when entering a new market, including the R&D expenses.
- Profit expectation of entering firms: It concerns the analysis of the potential profitability once entering a new market. For example, the magnitude of market share held by incumbents can be analyzed.

Therefore, we can notice that the internal and external contexts, as well as the entry barriers and technology are interdependent. We will now develop an analysis over the advantages and disadvantages of a first mover and a fast follower.

2-3- First mover(s)' and fast follower(s)' advantages and disadvantages

The entry position generates advantages and disadvantages that we can expose here:

2.3.1 First-mover advantages:

We can clear four types of advantages, composed of:

- **Technological leadership**: When successful, the technological leadership can reduce rapidly the costs and enhance the learning curve of a company (Lieberman, 1987). When the market will increase, the company will benefit from the experience effect and the economy of scale.
  Moreover, the advantage in process technology is more sustainable than of process technology. Patents can protect but in a always more competitive market, it confers a weak protection.
  According to Cleff and Rennings (2012), only technological leadership is limited to a single firm, whereas the other sources can be shared by the group of early entrants.
  In this way, Gilbert and Birnbaum-More (1996) suggest that the implementation of a successful first-mover strategy can occur only in circumstances that favor technological leadership and R&D expenditures. The advantages come with the fragmentation of the industry and the increasing innovation velocity, which remind us of the importance of the external environment.

- **Pre-empting of intangible, physical and spatial assets**: The first mover attract human resources that will enjoy the new competencies developed by the new actor. These intangible assets will facilitate the conception and the commercialization of innovations.
  The first mover can also acquire rare resources and deprive the potential entrants of these assets.
  The preemption in geographic area can allow the company to deter the follower's implementation. However, the researchers observed that a complete successful strategy arising from this kind of strategy is rare. The

effect is better when it is coupled with a powerful distribution network that allows the company to defend itself efficiently.
The access to information within an industry will also affect the availability of timing advantages to a given firm (Gilbert and Birnbaum-More, 1996).

- **Buyer switching costs**: When adopting a new product, the consumer consents an investment and initial transaction costs. Once established in a market, the partners and suppliers that were previously collaborating with a pioneer company can find a financial and psychological cost to change of partner, product or brand.

- **Image of the true innovator**: We can highlight here the psychological aspect. In this way, the first company to develop a product that is perceived qualitative to the consumers will gain a sustainable advantages and will rarely be surpassed by another brand in the consumer's mindset. The first-mover will have the image of the true innovator (Helfer, Kalika, Orsoni 2019). Only a company with a new product that is very disruptive for the consumers, or perceived as superior in quality by an successful incremental innovation can change the position. Finally, it seems that the generated image deriving from a successful strategy of first-mover confers an interesting advantage in term of image, especially the one of being the true innovator.

These four sources of first-mover advantages contribute to create barriers to entry and resource position barriers that must be evaluated by the followers in their strategy.

2.3.2 Sources of second-movers' advantages:

- **Free-ride on first-mover investments**: Second movers can free-ride in a number of area including R&D, buyer education, infrastructure development. They benefit from the learning curve of the first entrant (Lieberman, 1987). They gain experience from the mistakes and success of the first mover. If the first mover is not well-structured, it can be an occasion for the second-movers to easily imitate, and even to improve the product. In general, the cost of development is lower because of the imitation.
  In technological leadership, the degree of novelty and the product complexity have negative effect on first-mover advantage. The second movers can use the solutions developed by the early-movers and develop functionalities that answer to the market preference (Gilbert and Birnbaum-More,1996).

- **Development of customer needs**: The customer needs which arise after the first-mover's introduction can open the door for the second-movers.

These latter can gain from the development of the market, whose they does not have to fund the development.
Markides and Geroski (2005) suggest that the first-mover and second-movers have different mindsets when serving their customers. The first-mover will be focused on its initial product with a technological aspect, whereas second-movers will be attracted by the consolidation from niche to mass market.
In this way, the technological discontinuities can provide gateways for new entry. It remind us of the process for disruptive innovation, which can produce shifts in technology or customer needs.

- **Leapfrogging**: The second mover has the advantage to reduce market, technological and regulatory uncertainty. Second-movers will benefit from the resolution of technological and market uncertainty. In the tries to reach a functional product, the first-mover will spend sunk costs. If the first-mover has no financial reserves, it can lost its initial advantages and its achievements can be recovered by the second-movers.

2.3.3 Sources of first-mover disadvantages:

- **The acceptance in the public and the diffusion costs of the innovation**: According to Rogers (1962), there are different phases for an innovation adoption: at the beginning, only a few portion of the population will be opened to a new technology. In the competition to be first in a market, a company must take into consideration the cycle of diffusion from a niche market to a mass market. The social actor is then a capital factor in the equation. For Rogers, there are fives types of categories: the innovators, the most sensitive to the innovation. They represent 2,5% of the population. Secondly the early-adopters (13,5%), thirdly the early majority (34%), fourth the late majority (34%) and finally the late comers (16%). The passage to a niche market to a mass market is effective between the third and the fourth category. This step called “the chasm” (Moore, 1991) is decisive for the sustainable success of the technology.
  At the beginning of the innovation diffusion, the investments in marketing and communication is therefore uncertain and costly before the firm being able to make scale economies with the huge majority. These costs will be added to the important amount of internal innovation costs and increase the initial cost.

- **Important risks linked to the uncertainty of the acceptance**: The market and technological uncertainties correlated with an underdeveloped market may increase the risk of failure, especially for new firms that do not have the sufficient capabilities (Lieberman & Montgomery, 1998). The environmental uncertainty will create significant disadvantages.

In addition, in a condition of uncertainty, new firms must take long-term investments decisions with secured resources. They will see the result - a success or a failure - only later, and the cost is non-recoverable (Dobrev and Gotsopoulos, 2010).

It seems that the globally disadvantages for the first mover can be sum up in term of sunk costs and uncertainty.

2.3.4 Sources of second-movers' disadvantages:

- **Barriers to entry**: As we said before, barriers to entry must be analyzed before entering a market. The initial investments made by incumbents deter entries: excess capacity and costs structures can discourage potential new entrants. As well product differentiation between the established companies and the potential entrants may force these latter to make extra expenses in order to compensate the absence of innovation effect on the image (Caves, Porter, 1977).

- **Delay in the learning and innovations processes**: It will be difficult for a firm to enter into a market without preliminary experience and internal resources. Thus, according to Wunkers (2012), a follower can overcome the lead of early movers if the firm has a strong local power and sales capabilities. In this way, if the financial strength of pioneers is eroded, the followers will have a cost advantage. To be successful, a fast follower must be prepared.

We have a list of advantages and disadvantages. To complexify our analysis, we need also to consider the temporality of the advantages. Suarez and Lanzolla (2015) shed light on the fact that it exists different temporality to these concepts: durable first-mover advantages, which generate for a firm the improvements of its market share and profitability for a long period; and short-lived advantages that lasts in view of the competition. However, even short term first-mover position can have interest by engending benefits.
Advantages do not last forever and may disappear. Suarez and Lanzolla notice that companies that are able to obtain durable first-mover advantages have the tendency to dominate their product categories for many years. It is why it is important to be able for a firm to develop a strategy that can help it to keep sustainable benefits.

2-4- Limits of the theory

As we said, it exist numerous appellations to designate the position of being among the first to integrate a market or being among the laters. These concepts may seem too general to be useful. It is why it is important when we talk about "first mover" or "fast follower" to clarify the scope, the perimeter and the type of market. The internal capabilities as well as the external context and specificities must be explained.

Furthermore, even though there are researches on the advantages and disadvantages of being first or later entrants, there are less that try to specify the nature of the product. Indeed, not all products have the same life expectancy and the same complexity. For example, a firm which fail to reach a position of first-mover in a product category as a computer or microprocesseurs may face product obsolescence during the time they act as followers because of the velocity of innovation evolution in this market.
Thus, Gilbert and Birnbaum-More (1996) suggest that most studies are focusing on the order of entry rather than on the nature of the new product. Nonetheless, some characteristics of the product can contain innovative aspects that may be determinant in gaining competitive timing advantages.

It seems also very important to consider the totality of the actors that are playing in the market when analyzing its position. Indeed, the researches are mainly focused on the global concepts of “first mover” and “fast follower”. However, the existence of the consumers as an entity and the institutional structures seem to be neglected.

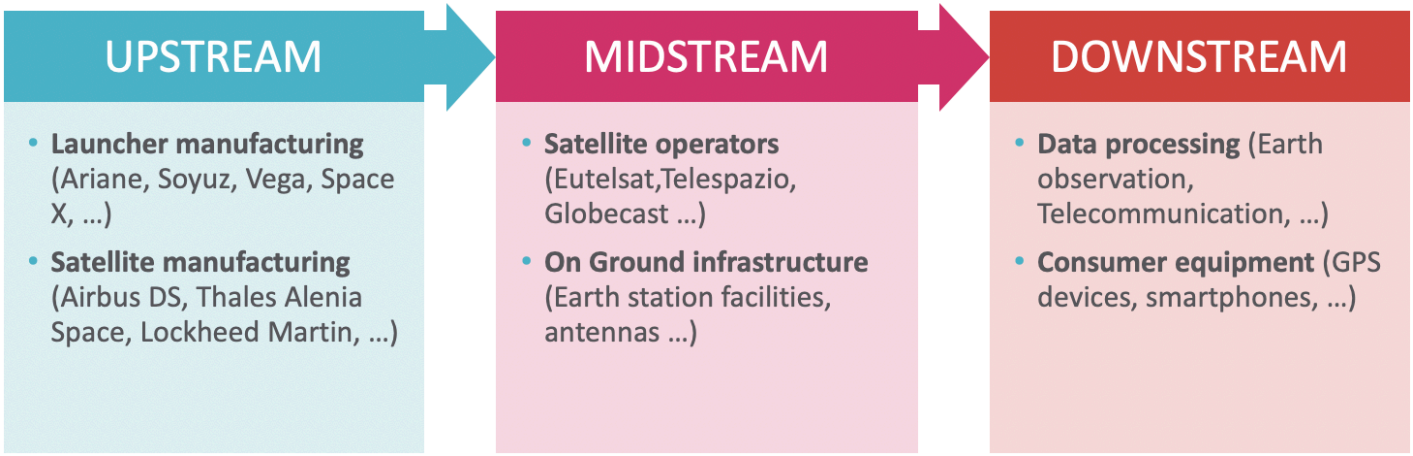
Finally, we always talk about moving. However, it could be interesting to focus on the benefits of inertia. For example, in front of a technological threat, when the technology does not yet reach a critical size, it is not always necessary to react directly (Christensen, Raynot and McDonald 2015).

Considering these limits, we will now deepen our thinking in the space sector, by analyzing first the state and specificities of the market, and then confront our reflection on the satellites constellations and space tourism.

3. Empiric framework

3.1 Space Industry framework

The space industry value chain is currently divided in three main parts:



100 billion $
(PwC, 2019)

30 billion $

200billion $

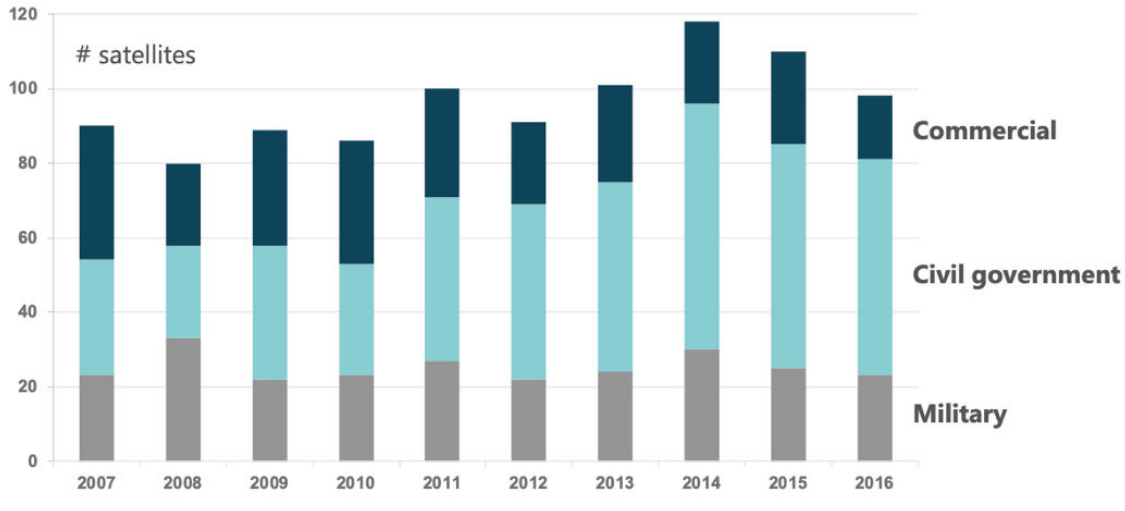
Global space activity can be divided into three distinct markets: military, scientific and commercial. Not all segments are open to competition.

The first two are institutional and cover government or military programs and scientific applications (Earth observation, meteorology, ...). These two markets remain captive, from conception to launch, but can take the form of long-term contracts between private companies and governments. The Galileo program, launched by the European Commission, is one example. Indeed, the European Union has acquired its own GPS system through a constellation of 30 satellites.

The commercial market is open but rather oligopolistic as it is shared by few companies (Airbus DS, Lockheed Martin, Thales, ...). *(L'Economiste 2019)*

Here is a graph of satellites launched by type of market, from 2007 to 2016:

(Eurocons ult Executive report, 2017)



We can see that the majority of satellites are launched for institutional purposes. However, thanks to a market transition which is named “New Space”, we will see that opportunities for private actors is growing up.

3.2 “New Space”: New markets

A recent phenomenon is transforming the space sector. We call it the “New space”. It consists in the proliferation of startups and more generally of private firms, trying to make space more accessible by lowering costs and by developing new technologies.
This revolution is highlighted by major actors funded by well know billionaires as Space X and Blue Origin. However, we have to know that they are thousands of other startups underlying the “New Space” transition.

Famous companies as Google, Amazon, Facebook take space as a new playground. They want to connect the whole world with internet or to observe any point of the planet in high definition thanks to satellites. West conquest in, America has been done by great entrepreneurs and the scheme is now replicated with space. New space is cocktail of Nasa’s wishes to decrease the space access cost, of numeric transition, and of billionaires’ dreams to discover a new world.

New Space has enabled the emergence of new markets as small satellite constellations and Space Tourism.

3.2.1 Satellite Constellations

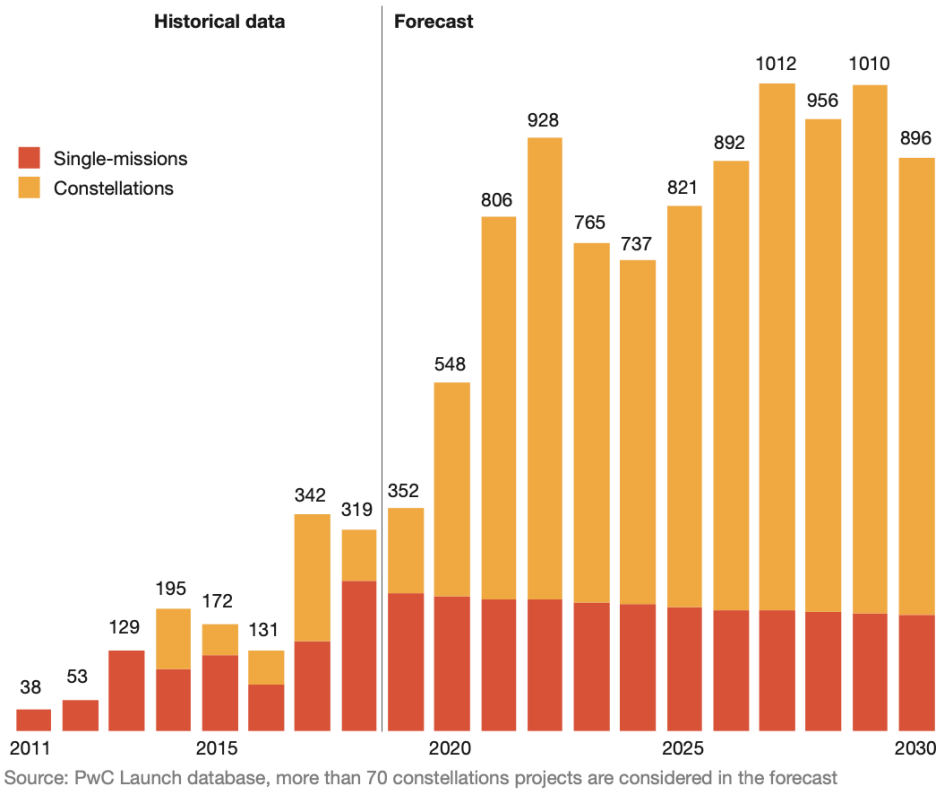
We observe a mutation in the satellite market as big telecommunication Geostationary satellites are losing shares against constellations of small Low Earth Orbit satellites. It is due to the miniaturization of components and development of constellations structures. The “Old space”, satellites are mostly big, tailor-made and sold at high cost. Some constellations of non-geostationary satellites already exist and provide mobile communications services, such as Iridium, which count 66 satellites.

On the contrary, the “New space” satellites are standardized, mass-produced, lighter and cheaper. Companies as Space X and OneWeb are precursors in small satellites constellations. The Falcon 9 rocket took off from Cape Canaveral with a group of 60 small satellites to be placed in low orbit for the Starlink constellation of SpaceX, which targets this broadband market by authorizing up to 12,000 satellites in space. Concurrently, the Soyuz launcher leaved Baikonur with around thirty satellites on board for the OneWeb constellation, for a total of 650 satellites.

These projects aim at answering a growing demand for a most powerful internet connection, everywhere in the world. Amazon or even China are developing their own project which will counts hundreds of satellites. This space transition is a great opportunity for startups specialized in Data and Internet of Things. This is the beginning of favorable period for disruptive innovation in earth applications.

We can see on the following graph that concerning Smallsat (< 500 kg), single missions will slightly decrease over the next decade comparing the substantial grow of small sat constellations.

Smallsat (<500 kg) for single missions and constellations to be launched from 2011 to 2030



Source: PwC Launch database, more than 70 constellations projects are considered in the forecast

This a big turn that satellites manufacture should have already take into account.

However, this proliferation of satellites in the sky does not mean a big grow in space turnover. Indeed, these inexpensive small satellites represent only roughly a tenth of the market value of the next ten years. *(Les Echos, 2018)*

3.2.2 Space tourism

In 2001, the American Dennis Tito opened the chapter of space tourism. He was the first civilian in space after a career as businessman and NASA engineer. He had spent 20 million $ and followed several months of training in Russia. He took off from Baikonur aboard a Soyuz capsule and has spent six days in the International Space Station.

In 2020, we are still not into mass tourism. Few actors are working on long term project which are not mature today.

Elon Musk and his company, Space X, aim at offering touristic space trip from 2023 thanks to the Crew Dragon space vehicle and its reusable Falcon Heavy launcher.

For its part, Richard Branson's company, Virgin Galactic has also launched a tourist travel project in space, after the successful launch of SpaceShipOne in 2003 which reached an altitude of 100 kilometers. But the development of SpaceShipTwo is slow and a fatal crash in October 2014 did not help. Finally, in 2016, the first flight took place 82.7 kilometers above sea level, with three people on board.



Jeff Bezos, boss of Amazon, created the suborbital tourism company, Blue Origin, which offers a reusable launcher named New Shepard which aims at carrying five passengers, and which has eight flights since 2015. The first manned flights are planned for 2020.

Space tourism is led by billionaires who want to put their name in the space history. Being a first mover in this market would also be a great opportunity. Tickets have already been sold to wealthy customers.

3.3 Space market specificities

3.3.1 Protectionism

Spatial independence is seen as critical by many countries. We have seen above, in the space industry framework, that most of the satellite demand comes from public institutions. States have a budget that they allocate by partnering with the private actors they want. Most of the time, they choose to work with local companies. The goal is to keep and develop technologies that will insure their leadership in the space sector.

Since the end of the Cold War, the United States has been the leader in the space sector following the collapse of the USSR. To preserve their technological, economic and security advantages against their adversaries and enemies. United

States opted for a strategy of power through the control of standards. This control is accused by its transatlantic allies of being a tool of protectionist industrial policy. The economic war between the American and European space industries is therefore effective, as the use of this tool is no longer for security reasons but for industrial power.

To face this growing competition, the EU and the ESA are obliged to increase the budgets allocated to the space sector, as shown by the 8% increase for the ESA in 2015. Beyond supporting the demand, this budgetary growth aims to free itself from the technological dependence maintained by the United States. Ultimately, such a policy should enable the EU and ESA to achieve a common space policy, allowing it to concentrate its forces towards the same objective, strengthening the European position.

3.3.2 Substantial Investments

To enter or even to stay in the space upstream market, firms have to do substantial investments in different programs. The cost of entry represents a big barrier of entry.

Elon Musk funded SpaceX 100% by himself. Several tens of millions of dollars have been necessary to develop the first rocket prototype, the Falcon 1. When SpaceX was created in 2002, no Investment funds financed rocket manufacturer. Indeed, investing in this market goes against the strategy of the majority of investment funds, which target rather startups requiring low capital needs, with high growth potential over a horizon of 5 to 10 years. It is therefore a barrier to entry defined by high capital requirements and the absence of entities ready to risk tens of millions of dollars, which explains the inexistence of private companies in the field of space launch.

These high investments explain why new private rocket manufacturer are founded by billionaires. This also the case for Jeff Bezos who funded his space launch company Blue Origin by selling billions of dollars of Amazon shares.

However, we have seen few years ago that is very risky to have only one billionaire fully financing a space company. Stratolaunch was funded by Microsoft co-founder Paul Allen to become a new player in the small satellite launch market. But the death of Mr. Allen in October 2018 makes the future of the Stratolaunch uncertain. The development of the rocket that should fit with the plane has been abandoned.

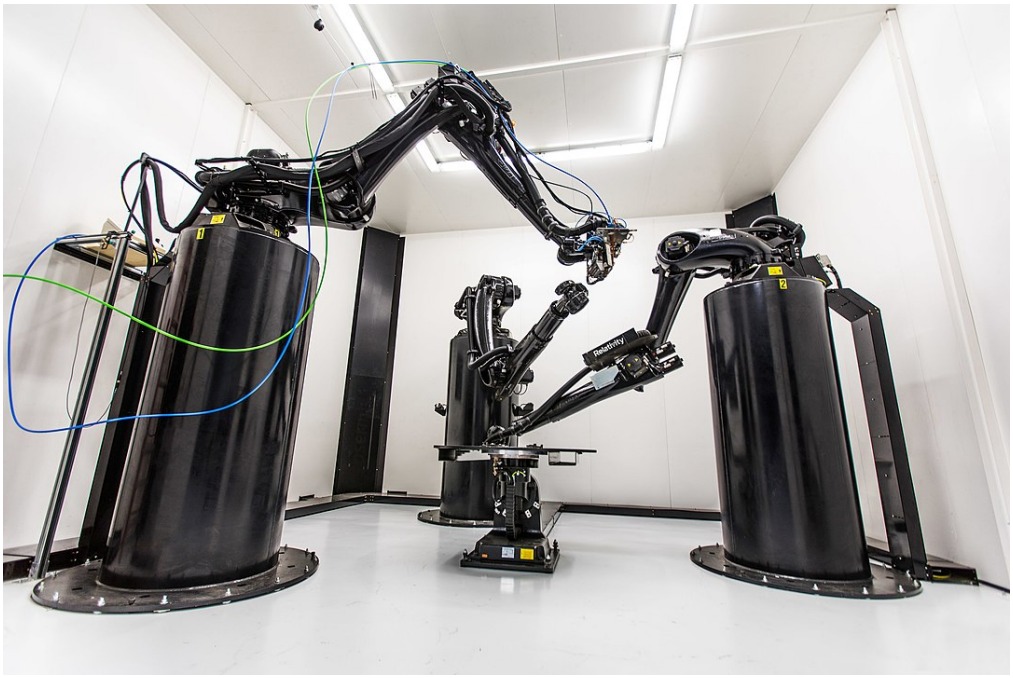
3.3.3 High technologies

The new entrant must be at the forefront of industrial technology. It has to develop and product resistant material to space conditions and very technical systems. It took more than 11 years for Space X to offer a reusable prototype.

Space firms have significant Research & Development needs to compete with new other players in the sector. Technologies are the heart of the competition and can assure a certain leadership.

Indeed, if the cost of launches is an important criterion in the customer's choice, the competence of the teams and the reliability of the launcher used remain the predominant factors. In fact, the more reliable a launcher, the lower the cost of insurance. Thanks to its reliability and competitiveness, Ariane 5 was very successful. However, Ariane Group had to begin the development of Ariane 6 in 2012, 8 years before the end of Ariane 5 program. Even with this anticipation, it's difficult to compete with SpaceX 's technologies, as the possibility to reuse the rocket.

Keeping the technologic leadership become more and more difficult as new private actors enter the market, using industry 4.0 technologies. The start-up Relativity Space has the ambition to fully build a rocket thanks to additive manufacturing.



4. Model

4.1 First mover advantages in the space industry

Technological leadership:

Airbus Defence and Space has realized a partnership with the company OneWeb. They are launching a constellation of 650 small-satellites (Weight <500 kg) to give an internet access to the world population which doesn't have one yet. The OneWeb Satellites production site is the first to use mass production technics on an industrial scale for satellites, at very reduced costs and production times, capable of delivering one or two satellites per day. It shows that technologies can be used not on the product itself, but also in the production means. Thanks to its high-tech American plant, Airbus DS has no technological leadership to answer the demand in terms of small satellites.

Pre-empting of intangible, physical and spatial assets:

SpaceX is a pioneer. Indeed, the company was the first to propose reusable launchers. This innovation led to lower cost and an easier access to space. This prowess was thought as impossible by its competitors' engineers. More than that, SpaceX is also a first mover in small-satellites manufacturing. The company has a project named "Starlink", which aims at competing with the OneWeb constellation. The company is about to launch the biggest satellites constellations ever created. For all these reasons, SpaceX attracts the best engineers in the word. This attractivity is an asset that requires many years of image building. This a virtuous circle as more innovation SpaceX makes, more talented engineers will join the company and enable others great innovations.

Buyer switching costs:

In the space industry, everything is about "project". Once the constellation will be completed, OneWeb will not have obligation to continue working with Airbus Defence and Space on other projects. We didn't find case of switching in the space industry. Switching from a current partner to a new one within a project would for sure be very costly. However, it is not a sustainable advantage for a first mover.

Image of the true innovator:

In the upcoming space tourism market, Virgin Galactic is for sure the most known company to work on a touristic space shuttle project. The ambition of Richard Branson, its founder, is to be the first to organize space travel with civilians. If we guess that this objective will be reached in the next few years, we can be pretty sure that Virgin Galactic will get the image of the true innovator. The concept of "first mover image" is very interesting in this new market as the first mover will achieve an historic step and would be famous and known forever. This image is clearly a competitive advantage against followers. However, this advantage's sustainability will depend on the reliability of the company. A crash with fatalities would lead to a trust decrease with consumers.

4.2 Fast follower advantages in the space industry

Free-ride on first-mover investments:

A first mover has to innovate. Relativity Space is a startup trying to develop a space rocket engine thanks to additive manufacturing. This revolutionary process would reduce the number of components and enable to fully automatize the engine production. If they manage to do it, this achievement will serve as a Proof of Concept for followers. Space firms spy each other and knowing the feasibility process of an innovation enable to avoid many investments. So, it can be considered as an advantage for fast followers.

Development of customer needs:

The space tourism model developed by Richard Branson is designed to stay below the earth orbit. This model will attract a certain type of customers whereas other will wait for a different offer, fitting more with their requirements. A first mover cannot address all consumers from the beginning. This is why there is an opportunity for followers in space tourism, to consolidate their offer from niche market to mass market.

Leapfrogging

Small satellite constellations are risky as we have a lot of uncertainty concerning the satellite sustainability. Indeed, there are obviously more fragile than larger ones and a premature decommissioning would lead to a failure of a whole project. Followers can wait for first mover to try to remove uncertainties about the technology and the market.

4.3 First mover disadvantages in the space industry

The acceptance in the public and the diffusion costs of the innovation

What tourist will be ready to take risk aboard a space shuttle for the few first launch? Being a first mover as Virgin Galactic means facing public acceptance over the technology. This acceptance comes later when the reliability is proven.

4.5 Fast follower disadvantages in the space industry

Barriers to entry

Programs in the space industry take many years to complete and requires a lot of Research and Development. Substantial investments are needed as it is the case for the Ariana 6 launcher and its 3 billion development cost. It’s hard for follower to catch-up a first mover. There are also delays in the learning and innovations processes. Experiences and skills are mandatory assets to hope facing a first mover competitor.

5. Conclusion and recommandations

In this research, we explore the different dimensions implied by the concepts of “first mover” and “fast follower”. These dimensions are each very important in order to understand deeply the consequences of the timing of entry market. To facilitate the comprehension, we chose to mainly focus our analysis on the advantages and disadvantages of being first-mover or fast follower. Indeed, it does not exist a strict definition of the concepts of “first mover” and “fast follower”. In this way, it is not always easy for a firm to analyze clearly its position. This last can be confused in the limitation of its scope and perimeter: should it take into account the whole market or only a product category ? When can we really define if a firm is the true first entrant in a market ? It is why we chose to see it through the prism of advantages and disadvantages, which have a well-developed literature and a less controversial currents of thought than the other dimensions.

In this way, this research is based on a framework that sum up the main advantages and disadvantages that we can meet recurrently in the academic literature. We focus our research on two promising markets in the new space that will need to define the position of each actor in order to take strategic decisions: the small satellites constellations and the emerging space tourism. The small satellites constellations market is maturing, promising and will face many competitions, and the space tourism is still in a phase of R&D.

During the application of our framework, we found difficulties to answer to some categories that are difficult to fill without access to corporate information. Indeed, it is not easy to estimate the costs of a company and its irrecuperable expenses compared to a competitor. Moreover, the evaluation of the advantages and disadvantages are not always dependent of the firm’s will, but is linked also to a general context, especially since the space industry is very particular with the intervention of legal and political aspects. The specificities of the space industry may change slightly the strict application of this framework. Indeed, the researches that we relied on are themselves based on markets that do not explicitly mention the intervention of institutional actors.
Furthermore, although this framework can be convenient to have a first analyze of the advantages and disadvantages of each position, it is limited by the multiple aspects contained in these seemingly simple notions.

For the managerial implications part, our research can be used in order to evaluate the different parameters that come into play in the timing of entry market, as well as to understand the importance of internal capabilities and external environment.

For further research, we hope that this interdependence between internal characteristics and general trends in the market can be resolved and that we can determine if it exists accurate determinant that allow a first-mover or fast follower to benefits sustainably of its respective advantages.

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