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Creativity for Innovation

In a general context, the terms creativity and innovation are often used as synonyms to refer to a process whose objective or result is the production of a novelty. However, these two terms do not address the same aspects of the development of a novelty, even though intuitively, when we consider them as steps in a process leading to the realization of a novelty, we place creativity before innovation. If we choose to consider them as two currents that can be developed in parallel with this same process, we very quickly believe that there must be many exchanges between them and therefore that they must be considered as complementary.

In this book, we will discuss creativity as a system and not only as a process, linking it directly to an expected objective of innovation. We therefore make the *a priori* choice of a creativity that precedes innovation. We will see that this consideration based on the idea of a system makes it possible to consider more complex and especially cyclical relationships between the stages of creativity and innovation. However, before coming to these considerations, it seems necessary for us, in order to properly address these distinctions and complementarities between the concepts expressed by these two terms, to review their definitions, since certain nuances are made depending on the fields and authors. We will also rely on the different forms or variations in the way innovation is approached and to better make the link with certain techniques and methods to support creativity.

1.1. Definitions of creativity

A large number of researchers from very different fields of research (arts, history, philosophy, psychology, management sciences, sociology, etc.) have taken an interest in creativity and have tried to define it. Although a comprehensive overview of the proposed definitions seems impossible for us to achieve, it is easier to regroup them by "family". In this way, it is possible to approach and present definitions of creativity from a global virtual set that brings them all together, and then to consider its different partitions (subsets) and intersections. It is a question of qualifying them according to the definitional elements that distinguish them and connect them.

Thus, an initial partition of the set of definitions of creativity that can be read can be divided according to whether the authors consider creativity from an individual or collective point of view [SIM 08], i.e. from the perspective of the team/group [OLD 96] or the organization [CAR 11]. Depending on the approaches, these two points of view may or may not be compatible. Beyond this first distinction, three different perspectives on creativity emerge. It can be considered as a capacity, process (i.e. a particular form of capacity), set of methods or result of the implementation of at least one of the above qualifiers. If we are interested in mental processes, the framework will be described as individual [GUI 67, HER 13, MAC 78, MED 62], and if we are in a collective framework, we will often talk about organizational processes [AMA 88, CAR 11, LER 15, WOO 93]. In any case, fundamentally, if we look at creativity in practice, there will be no significant consequences between the act of considering it above all as an attitude or posture [BEH 12, MAG 06, SMI 90, WIN 75], a capacity [AMA 88, DEG 99, JON 72, MED 62] or a process [CAR 11, HER 13, MAG 06, OSB 88], as a set of predispositions perceived as such [ANZ 81, KU 14, MCI 12, ROB 06], which must be cultivated and developed, or as a set of methods and techniques to be mastered to promote its implementation [BON 87, HER 13, KLI 13, SWI 04], or as the result of such implementation [AMA 88, KOE 89, MAG 06, WOO 93]. Then, we can see some distinctions depending on how we approach creativity. It is possible to associate it directly or not with: a process or phase known as "ideation", i.e. the generation of ideas [AMA 88, JON 72, LER 15, MAC 65], a new production [MAC 65, MED 62, OSB 88, WOO 93], a more or less significant sum of combinations and associations of existing abstract or concrete elements

[KOE 89, MAG 06, MED 62, OSB 88], an original work or production [AMA 88, DEG 99, JON 72, OSB 88], very often qualified as such or with regard to a utility in relation to a problem or situation, i.e. in relation to the real world [AMA 88, LUB 94, MAC 65, WOO 93], and if it is a question of organizational creativity, if possible leading to innovation [BUR 13, LEL 10, LOU 13, OSB 88].

The proposed scheme of the *chignole* (drill bit) (Figure 1.1) brings together this sum of definitions that can be considered separately, all at the same time or in any other grouping corresponding to your preferences or application frameworks. We wanted to end it with a link to innovation, because this is part of our primary consideration in our view of creativity in this book.

Similarly, we place ourselves within an organizational framework for the practice of creativity, without neglecting individual creativity or the means to implement it. This is not very original. At the enterprise level, creativity, if encouraged, must lead to the cooperation of people from complex and sometimes quite distinct environments [SUI 08] in order to contribute to the production of an innovation [BAR 88, IAN 04, MOO 96]. This requires a collective organization that requires a lot of effort and above all a strategy for developing exchanges between individuals. Creativity can then result from a set of interrelationships developed between different people, within teams [AMA 88, OLD 96, ROB 00], as well as in terms of networks of more extensive actors [MAG 06, SIM 08, WOO 93]. If well managed, these interrelationships can produce innovations, make it possible to disseminate, transform and create many kinds of knowledge [BOD 96, LEL 10, NON 97], but if poorly managed, they can just as easily stifle individual creativity and consequently that of organization [UZZ 05]. Creativity within an organization therefore aims to generate original and useful ideas, but must also be able to play a role in mediating the organization's new knowledge so that the ideas and knowledge developed can be disseminated, understood and lead to innovations [BRI 17a]. Organizational creativity then consists of an internal process aimed at getting new products accepted within the company [DUR 06]. In this sense, there is a better understanding of the role that creative sessions play in gaining acceptance for certain changes in organizations. S. Brion and C. Mothe [BRI 17a] clarify this point by pointing out that risk-taking is better accepted and gives better results if it concerns creativity,

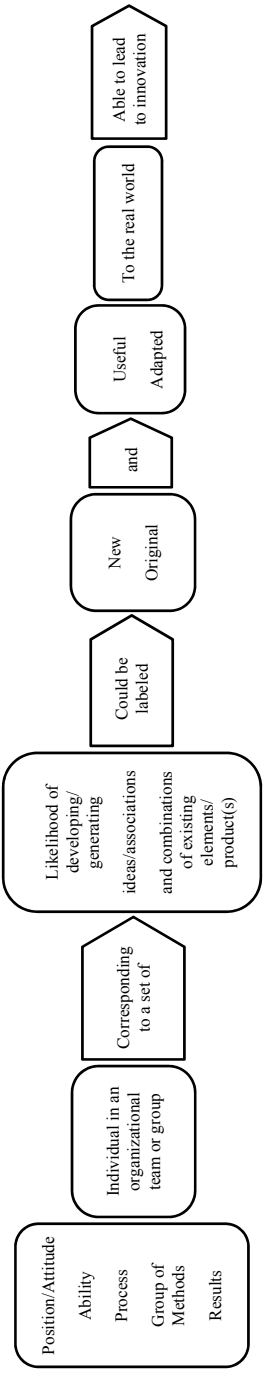

Figure 1.1. *Definition of creativity in the form of a chignole (drill bit)*

i.e. “the development of ambitious and bold ideas”. The process of transforming ideas into innovation must therefore contribute to significantly reducing this risk taking as the new process, product, service, etc. is developed [BRI 17a]. To do this, the development of creativity within an organization must take into account all of its characteristics, including the variety of its components. It seems to us that J. -Y. Barbier and C. Viala’s model of multi-level organizational creativity [BAR 13] illustrates all these elements to be taken into account when implementing a successful creativity process within an organization (Figure 1.2).

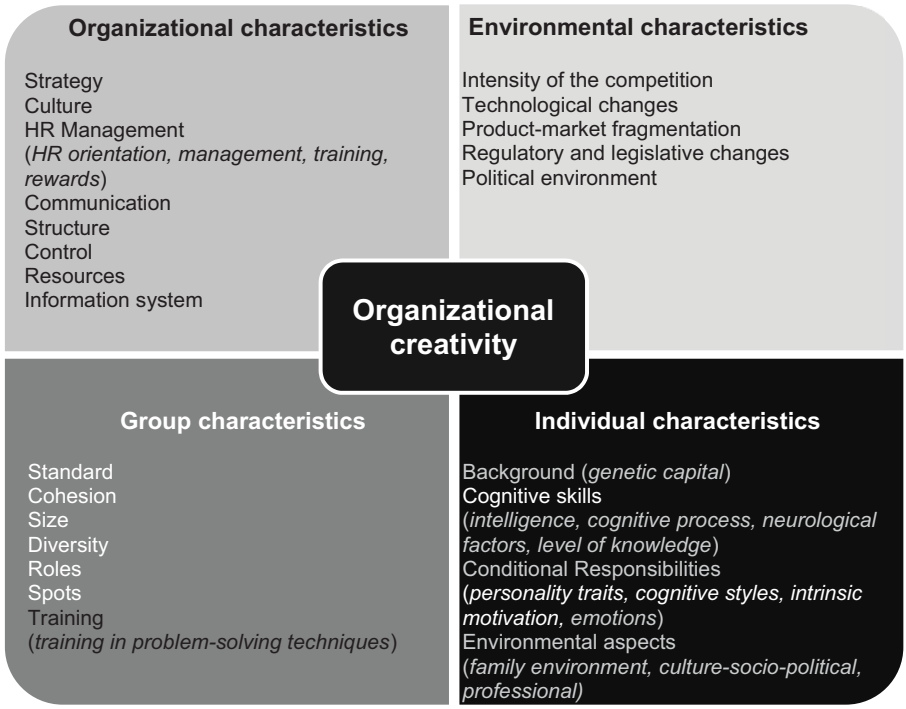

Figure 1.2. *Multi-level model of organizational creativity [BAR 13]*

Finally, the characteristics of novelty, originality, usefulness and adaptation to an innovation framework will be the subject of further processing throughout this book. As the title indicates, we will also address creativity when we can call it agile. We remember that we use the term agility here to describe an ability to change maneuvers in a very short time, i.e. agility in the sense of C.W. Richards [RIC 96]. The elements structuring

the schema of the creativity hierarchy and the multi-level model of organizational creativity are therefore considered in a perspective of continuous movements, undergoing acceleration and other changes that a company must control as well as possible in order to remain able to adapt to new rules of the game. The idea of maneuver is then to be associated with a movement corresponding to a form of innovation.

1.2. The different forms of innovation

As in the case of creativity, there are many definitions that have been proposed for innovation. We will not dwell here on their variety, but we will simply retain a definition of innovation at the crossroads of the Schumpeterian interpretation and the *Oslo Manual* proposed by the OECD. This is primarily the adoption of the widely accepted definition of innovation in the *Oslo Manual* [OEC 05]:

> The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. [OEC 05]

Then, it is necessary to add the fact that it is the entrepreneur who chooses what will be the subject of the innovation [SAL 86] which, from then on, until it becomes a success, can only be considered as an objective (of innovation) and not as an outcome (innovation). In the business world, this success has been characterized by J. Schumpeter as "economically viable" [SCH 34]. That being said, even though the economic dimension is not always predominant, we keep in mind that for innovation to occur, it is necessary for a minimum community of individuals to adopt it. To do this, there must be appropriation and translation of the novelty within a network of more or less important actors, of which the adopting individuals will be part, but will not be the only participants [LAT 05].

With regard to forms of innovation, we have already stated, on the basis of the *Oslo Manual's* definition of innovation, that these could be product, service, process, method or organization innovation. However, innovation can also be viewed from a different perspective than one that focuses on the element that is the subject of the innovation and the environment that is supposed to adopt it. To this end, we will focus on product, service and

method innovations when the method focuses on how to use or gain acceptance for the product or service. In this more limited context, we can consider several categories or forms of innovation.

1.2.1. *Incremental innovation and radical innovation*

Traditionally, when addressing the issue of product/service innovation, we begin by expressing the difference between continuous or incremental innovation and radical or disruptive innovation. Incremental innovation is simply a continuous series of improvements made as laboratory or field experiments, technological advances, societal changes, etc. continue. For example, changes in the design of a product or in the way it is offered to its audience are made in successive layers that can be anticipated in the short term. Within the framework of a product, after a certain number of improvements, all the products meeting the same need tend to be reduced and above all to be designed according to a small number, or even a single dominant design. This notion of dominant design was proposed by Abernathy and Utterback in the 1970s [UTT 75]. In this sense, a dominant design may include a series of characteristics dictated by the market-leading product, which thus create similar habits and expectations on the part of users and imitative effects on the part of competitors, but it may also result from practices specific to users for which the products tend to be better adapted or from standards imposed by a state or sector of activity [FER 17]. The term design includes the aesthetic as well as the technological or methodological characteristics of the product that may be affected by the dominant design. The products all end up looking the same (almost all cars consist of four wheels, a body, an engine, two front seats, one of which is for the driver, etc.); they can be grouped into broad product classes with identical characteristics (two-wheel, three-wheel, four-wheel scooters; open and closed scooters, etc.); the technologies and materials used to design them being the same, or can be classified among a small number of families; the methods used to produce them, present them (quartz watches, manual winding, automatic winding, hybrid winding, etc.) and sell them (online sales, shop sales, hybrid sales: click & collect, drive, etc.) are relatively identical.

Faced with these design routines, a disruptive innovation always ends up emerging following the arrival of a new entrant on the market, the emergence of a new technology or a particular effort made by an actor

already present to stand out from its competitors [GOR 17]. If a new design is successful, a break with the dominant design appears and therefore, if the new solution is a success (and therefore an innovation), we will speak of a disruptive innovation. This innovation is risky, but new entrants and players in difficulty regularly use it to survive or continue to survive. It is the form of innovation par excellence, since it makes it possible to create or regain a dominant position in a given market. That said, there are other ways to create such a break, for example, innovation from below or from above.

1.2.2. *Innovation from the bottom up*

Bottom-up disruptive innovation first meant a lower-cost technology, which poorly or partially met the expectations of the users of the technology or associated product/service, eventually imposed itself through improvements over the old dominant technologies on the market. This situation has since been extended beyond technological change alone, but we keep this case to make it easier to explain what innovation from below is. A technology that is "mediocre" in terms of quality or performance, but less costly than dominant technologies, is continuously improved and therefore follows a continuous innovation curve so that the more it grows in quality and performance, the faster its development accelerates until it eventually reaches or even exceeds a minimum quality output of market users. At this stage, "traditional" users leave the old technology (or product) for cost reasons, no longer perceiving a sufficient qualitative difference. This type of innovation can also be described as disruptive innovation in the sense of C. Christensen [CHR 00], who first proposed a formal description. Although following a continuous and therefore predictable curve, low-cost technology often ends up surprising other market players "trapped" in their technologies and related investments. If the difference in quality between the two types of technologies (low-cost and other) becomes negligible compared to the majority of users, a disruption is created (users switch massively to low-cost technology) and there is at best only a small share of the market left for users who demand high-cost technologies with high performance. So there is a break. An example of this type of innovation is the computer market: fixed computers are gradually being replaced by laptops (Dell has been able to create a significant place for itself in this niche), which in turn are competing with notebooks and increasingly with smartphones.

This phenomenon is associated by C. Christensen with what he calls the "innovator's dilemma" [CHR 00]. At the beginning, there is a market and innovators who master cutting-edge technologies and, thanks to them, occupy most of the market. Then, a new solution using a relatively less efficient technology is proposed on the market and succeeds in satisfying a minimum group of users (a niche), with limited resources and ready to make technological compromises (fewer performances and/or functions at a much lower cost). If the niche of users with limited financial capacity allows low-cost technology to survive and develop, then there is a risk of disruption for the old "innovators" who dominate the market. Why do existing innovators get caught up in this new technology when it is generally well identified? C. Christensen argues that historical innovators end up focusing on continuous innovation type development, because they tend to focus on the most demanding customers on the market: they are the ones who express innovation needs. Over time, less demanding customers are becoming more and more numerous and are looking for cheaper and less complex alternatives to use. As for innovators, by focusing on the most demanding users, they are forced to invest in order to maintain their market position and are reluctant to change technology in view of the investments made and the increasingly high performance achieved. It is a vicious circle into which all innovators risk falling.

Another form of the bottom-up innovation that has met with some success is quite well known under different names: reverse innovation [HUS 16], frugal innovation [HAU 16] or *Jugaad* innovation [RAD 13]. The term "reverse innovation" first expresses the importance of innovation. It no longer comes from research and development laboratories in developed countries, but from regions where research and development resources are very limited, most often from developing countries. To name it, we like the French expression *innovation système D* (resourcefulness system) [HAU 16], even though it is rarely used, because it seems to us to best express the way it is conducted. It was C. Ghosn who proposed the expression "frugal innovation" to translate the expression *Jugaad* innovation that had emerged in India [RAD 15]. This type of innovation corresponds to the development of new products or technologies at lower cost, most often very simple, but of good quality that meet market standards. There are several ways to do this, which can be expressed in the form of six principles [RAD 13]: (1) find opportunity in adversity; (2) do more/better with less; (3) think and act flexibly; (4) keep it simple; (5) include the marginalized and the excluded; (6) follow your heart/intuition. The first principle aims to transform

problems into opportunities while developing a low-cost solution. It can be illustrated with the Revolve kit, designed in India, which is used to convert the halting traffic into energy, especially when driving in the city. Each time you brake, the energy induced is transformed into electricity, allowing you to have a car with a hybrid engine that saves 30% fuel [RAD 13]. The second principle (do more/better with less) can be illustrated by the solution of the French company Qarnot Computing, which has transformed computers into radiators. This allows a room to be heated at a lower cost while limiting noise and regulating the heat produced by computers. The third principle, which suggests flexibility, can be illustrated with the case of the washing machine for clothes and potatoes of the Chinese company Haier. In this case, a Chinese farmer complained to this company that his washing machine was constantly clogged. The technician sent on site understood that the problem came from the fact that the washing machine was also used to remove mud from the potatoes once they were harvested. This practice was identified and transformed into an opportunity by the company, which quickly offered a machine for washing clothes and cleaning potatoes, which was a commercial success [RAD 13]. The fourth principle (keep it simple) can be illustrated by the Q Drum water bottle designed in South Africa, which, because of its cylindrical shape, can carry up to 50 liters of water by pulling it and rolling it on the ground rather than carrying it. The fifth principle (include the marginalized and the excluded) can be illustrated by the case of the car Dacia Logan, which was first designed for people who were not able to buy a car in developing countries, and was then successfully offered to other countries. The last principle (follow your heart/intuition) simply asks you to test things you believe in without relying on a trend or market research. The Big Bazaar chain of stores is cited as an example by N. Radjou *et al.* [RAD 13]. The founder of this chain, K. Biyani, after having tried unsuccessfully to set up a Western hypermarket in India, followed his instinct without taking other advice into account and recreated the atmosphere of an Indian bazaar inside a hypermarket, which worked very well and led to the creation of a chain of stores bearing this name.

As we have seen, frugal bottom-up innovation starts from the experience of a look and intuition of people who evolve in a difficult and often poor environment. If we summarize this way of reasoning as briefly as possible, it is a question of returning to the essence of the need with a robust but very simple response that makes it possible to reduce costs as much as possible. There are often simple solutions to problems that are part of the local

culture, but ignored by engineers. For example, the Mitticool refrigerator, which runs without electricity and was developed in India, uses the same principle as the gargoulette (or botijo, a porous clay jug that evaporates to cool the water it contains) to operate [DOU 15]. This refrigerator could therefore have been designed in the south of France, Spain or any other country with an equivalent water cooling system. Frugal innovation was therefore born as the lateral thinking of obsolete technologies from the bottom up, but it is no longer a robust technology combined with a new experience that is at the heart of the thinking; it is a simple and robust technology that can be useful to a very large number of people.

1.2.3. *Disruptive innovation from the top down*

The innovator's dilemma is not only about rejecting innovations from below, but also when a new technology comes from above. The top-down scale is related to the cost of the product/service, either in terms of development, from the innovator's point of view, or in terms of purchasing from the customer's point of view. The most common case concerns the emergence of a technology that is potentially very high-performing, but at a very high cost. As a result of research, development and/or economies of scale, its cost eventually decreases and competes with technologies that have been dominant in the market until now. The condition for the development of high-cost technology depends on: either, as for low-cost technology, first of all the existence of a niche of customers for whom performance or another criterion is more important than the excessive cost of the technology they can pay for (this is the case for digital photography, which was initially invented by Kodak, which did not dare to develop it, and was then taken over by the telephone manufacturers), or with a very high investment capacity (this is currently the case for Tesla and its electric cars, for example, or for the reading lights that took a little over 10 years to compete with paper books). For this type of innovation to work, it is necessary that the new product or technology combines reliability and ease of use with other benefits considered important by some users who can afford it. Apple has been successful in this type of innovation several times. For example, with the different versions of the iPhone, it has targeted a high-end market by promoting an attractive and practical design as well as an experience and performance superior to that of most of the market [EYC 17].

In the ultra-high-end innovation variant, it is even a question of avoiding any comparison of the product or technology offered. Its use in itself must be recognized and valued as such. Its price is only one of its components, but it contributes to the justification of an image of belonging to an elite. Ultra-high-end innovation must therefore be based above all on working on the image associated with the product/technology and its price must be adapted to this subjective representation of the consumer's mind. In the ultra-high-end segment, consumers buy outstanding performance, and in its luxury version, they buy a form of recognition in terms of image and appearance [KAP 12]. It is possible to summarize the key components of luxury in the form of six criteria to be met: (1) be loved; (2) be superfluous and therefore not indispensable; (3) be rare; (4) be of very good quality; (5) be associated with an art form; (6) have a positive income elasticity (if the price increases the demand) [BOU 13].

Two product design principles can be associated with this type of innovation: the scarcity principle and the "Veblen effect". The principle of scarcity can be translated into five phenomena: (1) proprietary information where at least initially only one privileged group is aware of the existence of the product/service; (2) limited/privileged access which is determined by a certain status, sponsorship, a minimum but significant amount to spend, an exclusive place of sale, etc.; (3) the limited time of the offer or access (after which it will no longer exist or be offered); (4) limited quantity, from a limited number to limited series and numbered to unfair (tailor-made); (5) suddenness where it is the perception of the speed of decrease of the quantity that will create rarity [LID 11]. The Veblen effect is named after economist T. Veblen, who apparently reported the first [LID 11]. This effect, also known as the "snobbery effect" [DEH 15], can be expressed as follows: the increase in the price of a product or service and its demand increase together. Once a certain threshold has been reached, the price increase results in an increase in demand and vice versa. The higher price suggests a high quality and *at least* plays on the phenomenon of privileged access mentioned above. This effect can be considered more limited than one could call the "limited Veblen effect": a significant increase in the price of a product/service does not necessarily translate into a decrease in demand. B. Cathy points out that after a 40% increase in the price of Zenith watches (in 2002) all at once, sales of these same watches did not fall [CAT 07].

1.2.4. *Innovation by market extension*

Behind this strange title, we propose to place the innovations resulting from a blue ocean strategy [KIM 08]. We do not use the term disruptive innovation here, because this type of innovation does not necessarily create a break in a market, even though this may still be an indirect consequence. This innovation by market extension is described by its authors as value innovation or non-disruptive innovation [KIM 17], because the main objective of this strategy is the creation of a new market space. In fact, a change of reference mark is made and a new positioning is made to occupy the spaces thus freed. To innovate with a blue ocean strategy, it is necessary to rethink the market in terms of product and consumer attributes, which is why we call it a benchmark change. It is a question of both reaching consumers "forgotten" by the current market and reaching them by positioning products in neglected areas. To do this, the authors and promoters of this strategy, W.C. Kim and R. Mauborgne, proposed in particular to rethink the attributes of a product using a tool called a "strategy canvas". This framework is supported by an abscissa axis that lists a series of attributes and an ordinate axis that allows these attributes to be assessed loosely on a scale that ranges from zero (or very low/low) to high (or very high/strong). It can be used to define a new product type as a new product range. In general, this scale has five main levels, but positions on intermediate degrees are almost always considered.

This tool makes it possible to assess the competition in terms of position at a given time. It allows market players' investments in a range of products to be highlighted. The most complicated part is to identify the attributes (criteria or domains) that will be used to express these positions. The estimation of values associated with attributes is done at the intersection of two points of view. The first is to place the values of the attributes according to the quality or variety proposed. The second is to make this estimate based on the producer's investment and expenditure costs. This makes it possible to reason in terms of savings achieved and the displacement of some of these savings by investing in other neglected or non-existent attributes in the market. In general, strategic frameworks are a mixture of these two ways of approaching the question of positioning a new range of products or a new product. The perception of the product's attributes is first and foremost that of the customer. However, once the attributes have been selected and two to

four product/product lines are identified and placed on the canvas, the producer's point of view takes precedence. The idea is then to look for a positioning that is still available, but which must be lower on average than those of the products/current ranges, in order to invest in strength, then other important attributes for forgotten customers. That is why we have qualified this type of innovation in the title as a top-down movement (from top to bottom for most market attributes, then from bottom to top for some new attributes).

Among the examples that have become classic examples of strategy canvas is the case of Yellow Tail wines (Figure 1.3) developed for the United States by the Australian company Casella Wines. We will use this example again to better consider the function of the canvas. First, a list of criteria characteristic of the competition and areas of investment in this sector is drawn up (bottle price, use of enological terminology, advertising and media, aging potential, prestige and tradition of the vineyard, complexity of taste, range of wines on offer) [KIM 08]. From this list of seven attributes, two ranges of proposed wines are identified as partially culturally representative of those offered in stores in the United States: premium wines and budget wines. If we look at the value curves representing these two ranges on the canvas (Figure 1.3), we see the spaces available for a third range of wines. The Yellow Tail range will occupy this space.

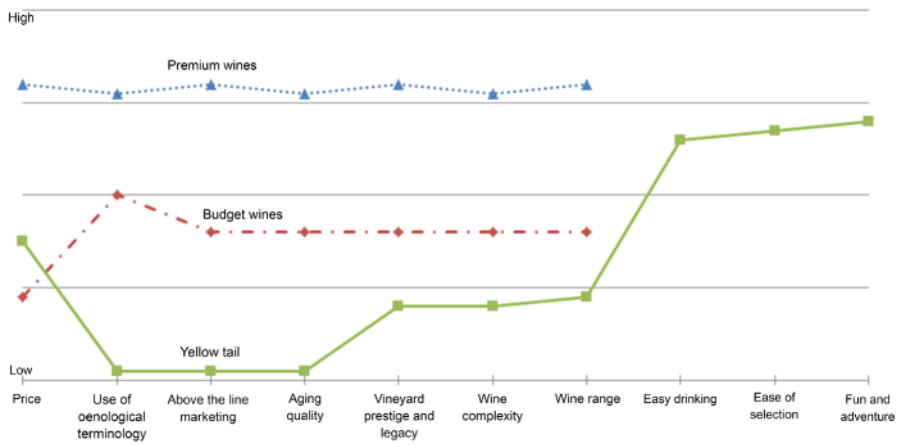

Figure 1.3. *Strategy canvas of Yellow Tail [KIM 08]*

The invention of this range then made it necessary to identify customers who were not interested in the table wine and quality ranges. This amounted to taking into account the selection criteria of a neglected, but quite numerous group of connoisseurs of alcohol (beers, ready-to-drink cocktails, strong spirits, etc.) who did not buy or very rarely bought wine. Then, we had to find two or three attributes that could better match them: easy to drink/love, easy to choose, carrying an image of fun and adventure. Similarly, it was also necessary to estimate the importance or lack of importance that these consumers would be willing to give to the other attributes. Thus, if we estimate the value of the first two ranges of wines, according to the seven attributes listed, on a scale of values between 0 and 4, then on average premium wines obtain a score of about 3.1 and budget wines a score of 1.6. On these same attributes, the Yellow Tail range is considered with an average score of about 0.6. Even with the range of budget wines, the difference in average is significant. If we take into account the last three attributes that will serve as investments in the Yellow Tail wine range, then the average value of this range increases to about 1.4. For budget wines, even though we give minimal values to these three attributes (i.e. 0.1), we obtain an average of 1.3 while the average for the range of premium wines with this same reasoning is still about 3.3. Therefore, according to this strategic framework, the development of a range of Yellow Tail wines would cost, at worst, only slightly more than that of a traditional range of budget wines.

If this story is known, it is because Yellow Tail wines have sold very well in the United States (4.5 million cases in 2003 according to [KIM 08]). As with any success, others have copied this model by playing on one or the other of these nine attributes, until they saturate this rather old “blue ocean”. As an example of this range of wines, we can mention the Be Pink wine from the GRM company, Ice Tropez and Black Tropez from the Tropez group, French Tonton from the company of the same name, etc. Other attempts have also been made, but have not been successful, such as Paper Boy Wine (an ecological paper wine bottle) and Burgonéo. These failures may be linked to the gradual saturation of the market, which had initially been extended (blue ocean), but other reasons can also be put forward. For example, in the case of Burgonéo, A. Asselineau mentions, in particular, the conservatism of intermediaries in the sale of wines that refused the new concept of Burgundy wine that is easy to drink and choose [ASS 10].

Another explanation for this type of failure is given by W. C. Kim and R. Mauborgne [KIM 17] who insist that, to avoid failure, members representing the entire value chain should be involved in projects. Otherwise, the risk of misunderstanding is very high. It is therefore necessary to consider the creative process of a blue ocean, also under the perspective of organizational mediation. The only alternative to this diplomatic option is taxation, i.e. the forcible passage or circumvention of actors who would divert the project or cause it to fail.

Another form of the value-added innovation that shares several common features with the blue ocean strategy is that of a voluntary search by a market player for a satisfactory technology that over time has become safe and whose cost has been greatly reduced. In fact, this type of innovation would be halfway between frugal innovation and value innovation. This is the development strategy that G. Yokoi has called "lateral thinking of obsolete technologies" [TAK 10]. This consists of meeting a need similar to the high-performance technologies in progress, by adding new experience, by using a less efficient but well-controlled technology whose cost is much lower than other technologies on the market. The best-known successes of this type of value innovation are those of Nintendo: Games & Watch, Game Boy and Wii. In all the three cases, the technology was simpler and less expensive than its competitors, but a different gaming experience was offered to compensate for the technological gap with the conference. Games & Watch provided the first "portable game console", Game Boy (black and white) provided many hours of play (and not just one or two as was the case with its color competitors) first and then to connect from one console to another (which allowed a game like *Pokémon* to be introduced), and the Wii offered a new range of games that allowed a new experience where you could immerse yourself in the game by making gestures similar to those of the character played. In addition to the new experience that creates value, we find the most important criteria for a buyer in an innovation cited by W.C. Kim and R. Mauborgne: simplicity, ease of use, a friendly image and the effectiveness of the product [KIM 17].

To conclude this journey though innovations by market extension, we simply cite the technique of imagining impossible and improbable partnerships proposed by J. Dru [DRU 16] in order to consider new outlets for products outside their "classical" field of application. If interesting ideas emerge, it is enough to consider an innovation in collaborative mode.

1.2.5. *Some other forms of innovation*

Not all innovations create a break with current production and technologies, nor even a new market. However, the term mental increment or continuum is not really enough to fully understand how they are thought and developed. For example, innovations can be considered according to the elements that are modified. From this point of view, it is possible to differentiate modular innovations or innovations from components of so-called structural architect innovations. Modular innovations focus changes and improvements on the components of an object or system, but do not involve rethinking its layout; relationships and positions are almost unchanged. In contrast, architectural innovations propose new configurations, by linking components differently, removing some and linking them to other components [GOT 17]. Thus, the configuration of the inside of a quartz watch has nothing to do with that of a mechanical watch. Architectural innovations can be considered as innovations halfway between incremental innovations (very often modular) and radical innovations such as the substitution of one technology by another [LOI 13]. Depending on the nature of the changes made and the success achieved, they lead to more or less significant market disruptions.

From another point of view, innovations can be considered in relation to the newness they bring, especially if it is a question of product innovation. For example, it is possible to innovate without touching the product itself, but through the way it is perceived by its user. This is referred to as reformulated products [CHO 83]. Top-down disruptive innovations that create a rarity of an existing product correspond to this type of modification. Outside the framework of luxury and rarity, changes are made in the packaging, communication and supply chain associated with the product. With regard to these reformulated products, others can be repositioned. In this case, the components of the product are redesigned (modular or architectural modifications); the main functions of the product remain unchanged [LAH 85], but new ones may be added [CHO 83]. Another solution is to rethink an old or even forgotten product. We can then talk about revival innovation [DRU 16]. It can be the use of a forgotten technology or product such as Corning's scratchproof glass, which became Gorilla Glass. No opportunity had been found for it for 50 years before its CEO managed to convince S. Jobs to use it to equip the lenses of

his iPhones [DRU 16]. Other examples of such innovation can easily be found. The adult scooter is an interesting example, as it is both a case of revival innovation (the scooter concept) and a repositioning on the adult market of a product that was only oriented towards the children's market. In addition, the scooter's very architecture had to be partially redesigned to make it foldable. Thus, several modes of innovation for the renewal of a product can complement each other to lead to real innovation. There are still other types of innovation such as innovation by imitation. These are not cases of plagiarism, but processes of improvement that have been successful in transposing them to other related products, or new functions that are copied or new markets discovered by some and on which others then try to position themselves as well, but by using a technology different from the original one or any other methodological or conceptual variation. For example, very soon after the success of the "foldable" adult scooter, new foldable city bikes appeared. Similarly, after the success of the Wii and its "nunchuk" controller to experience the game more intensely, Sony and Microsoft have equipped themselves with different technologies, but making it possible to meet this same need, with the PlayStation Move & Motion Controller and Kinect respectively. In the case of blue oceans, we can take the example of Yellow Tail wines; once the success has been achieved, historical market players or new players wishing to enter this market have seen an opportunity. In general, the products imitated in this case can be considered using the "strategy canvas". The imitations will take as a model one of the ranges on the market (an old or the new one). If they take a historical range as a model, they will borrow one to three attributes from the new range. On the wine market, we will mention the case of French Tonton (a quality wine, with a touch of humor that is easy to choose), WineStar (a quality wine in a can, easy to transport and to choose) or rosé wines offered by Lidl under the titles Rosé Premier (First [growth] Rosé), Rosé Canicule (heatwave Rosé) and Rosé À la Gloire du Chat (Rosé to the Glory of the Cat) with wine labels bearing the effigy of P. Geluck's cat (budget wine, easy to choose and offering a touch of humor). If the new range is taken as a model, then the imitations will try to bring at least one or two new attributes. For example, to stay within the wine category, we can cite two cases that have taken the beer model, like WineStar did, to reach a new audience: Be pink, whose grapefruit-flavored rosé wine is presented in the form of easy-to-carry aluminum cans, and Ice Tropez, which is offered in the form of bottles or cans of beer flavored with wine that are as easy to drink as a soda or beer.

We end this journey through forms of innovation with collaborative and open innovation. H. Chesbrough proposed the expression open innovation [CHE 03] to name new models of innovation in which the company does not carry out its research or develop its business alone. According to this author's premise, international competition now requires companies to collaborate in order to reach a critical threshold in order to remain competitive in their field(s); this premise can be challenged, especially if we consider the R&D resources available to at least the GAFAM (Google, Apple, Facebook, Amazon, Microsoft) and BATX (Baidu, Alibaba, Tencent, Xiaomi). This open innovation can take the form of collaboration leading to patent applications with distributed or shared ownership. A more open variant is that of open-source innovation in which there are no more patents filed, intellectual property being registered in the form of full free licenses or under conditions. This type of license was first developed in the IT sector with the success of free software, but was quickly extended to other fields. The principle is to open the rights of exploitation and improvement of an invention to any person or company wishing to be part of the community of operators and developers of this invention. This is the case for many developments under free license(s). In this form of licensing, it is possible to exploit an invention, under certain conditions. For example, the General Public License (GPL) gives free access to and use of the programs developed, provided that transformations and additions are shared with the rest of the community outside commercial applications [BRO 15]. The Free Software Foundation imposes four conditions: (1) freedom to run the program for all purposes; (2) freedom to study the operation of the program and adapt it to its needs; (3) freedom to redistribute copies of the program (which implies the possibility of both giving and selling copies); (4) freedom to improve the program and distribute these improvements to the public, for the benefit of the whole community. The creative commons licenses offer a full rights assignment license and six restricted or combined variations with slightly different requirements from those of the Free Software Foundation: (1) obligation to cite clearly and explicitily the name of the author of the initial project; (2) right to use outside any commercial benefit unless the author's authorization is obtained; (3) prohibition of the work or object in a composite package and other derivative works; (4) obligation to share, under the same or a similar license, improvements and transformations made.

The possible variations are: (1), (1) + (3), (1) + (4), (1) + (2), (1) + (2) + (4), (1) + (2) + (3). In the field of biotechnology, we find other examples such as the plant variety certificate, which proposes a total transfer of rights in order to have an alternative to the barriers imposed by patents [TRO 06]. In addition to these forms of collaborative innovation, there is also participatory innovation in the sense that the company proposes to co-innovate by soliciting its partners, customers and other actors involved in the field of interest, including some of its co-competitors [CHA 13]. This collaboration can concern the so-called participatory design, especially if users are included in the reflection and design phases or, during a call for broad collaboration, to collect large amounts of data and information (crowdsourcing) or crowdfunding [LEL 10].

1.3. The metaphor of the fighter plane to link creativity and innovation

We have just reviewed a number of aspects of creativity and ways of looking at innovation. We will now link these two sets using a metaphor: that of a fighter aircraft race. It focuses on forms of innovation and the aerial maneuvers that can be associated with them. It is based in part on an information loop as a model to express the links between a pilot, his information environment and the decisions he must make in the context of aerial combat. We will present this aspect, but then move away from the metaphor of combat, and limit ourselves to a less violent struggle: it will be a metaphor based on a race between planes. We will see how we will transpose it into the world of video games in order to better draw parallels with changes in the organization of creative groups; something that a metaphor more rooted in reality would not allow. We will therefore start this part by presenting a loop modeling an informational process in the middle of an air battle.

1.3.1. *The OODA loop*

The OODA loop (Figure 1.4) is an acronym for the verbs: observe, orient, decide and act. It was developed by an American fighter pilot, J. Boyd, who then participated in the design of fighter aircraft for the American army

beginning in 1963 [COR 02]. This OODA loop provides a model to understand how a pilot in a combat situation can gain control over his opponent.

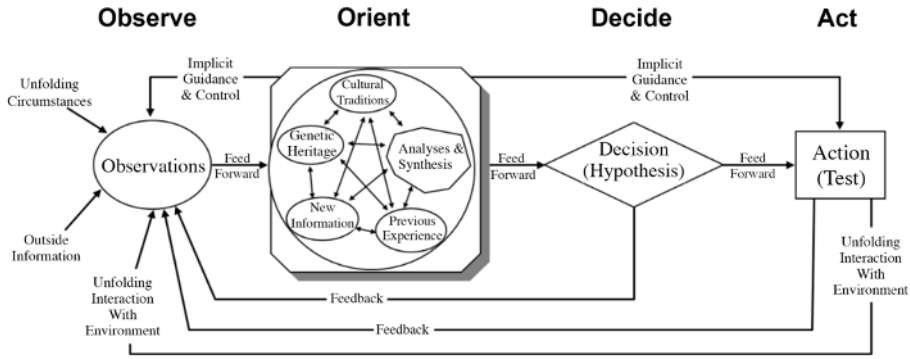

Figure 1.4. *OODA loop [COR 02]*

Figure 1.5. *Mig-15 (left) and F-86 Sabre (right)*[1]

It is therefore necessary to approach it from a series of paths and not alone. Each route allows additional information to be acquired until one of the two fighters is saturated and no longer acts in a really or very predictable way. The origin of this loop comes from a question by J. Boyd about the results, *a priori* surprising, relating to the high proportion of successes achieved by American pilots on their counterparts fighting for North Korea during the Korean War (June 25, 1950–July 27, 1953).

1 Images under creative commons license: https://commons.wikimedia .org/wiki/File:North _American_F-86_Sabre_-_Flickr_-_p_a_h_(3).jpg, https://commons.wikimedia.org/wiki /File:Mig_15_(27978597105).jpg.

In fact, during this period, the ratio was nine victories to one in favor of the Americans, although their aircraft (mostly F-86 Sabres) were considered less efficient than those of their enemies (including a majority of Mig-15 Fagot; see Table 1.1).

	F-86 Sabre	Mig-15
Speed	964 km/h	1,075 km/h
Climbing speed	46 m/s	50 m/s
Scope	1,260 km	1,960 km
Ceiling	14,720 m	15,200 m

Table 1.1. *Technical comparison of the performance of the F-86 Sabre and Mig-15*

Taking into account the most common characteristics, the Mig-15 outranked the F-86 Sabre. Once the number of flight hours for pilots on both sides (difficult to measure) was set aside, Boyd identified two other factors that explain this ratio of victories in favor of the Americans. The American pilots were less tired than the Mig-15 pilots because their aircraft had hydraulic mechanics to support the pilot in his maneuvers; these pilots also had an anti-g suit, unlike their counterparts who were fighting for North Korea. Thus, as the maneuvers carried out by two pilots in battle progressed, the one flying the Mig-15 got tired much faster than the pilot of the F-86. This human factor then became a determining factor in the fight.

The OODA loop tries to integrate this type of factor into its modeling. At the entrance and exit of the loop, the different interactions and circumstances relevant to the conduct of maneuvers in the environment are taken into account. The fatigue factor, the surprise factor or any other factor expressing, for example, a technical problem that occurs or an opponent's action, can be integrated into the loop at this time. The rest of the elements acting in the loop are information and the pilot's ability to manage it according to his experience, his culture, his analytical skills, the decisions he can make, these choices and the time he takes to make them.

According to the OODA loop model, information is essential to success, but information is not the only determining factor in the fight. Once informed, you must be able to process the information quickly and make a perceptive decision, if possible surprising (to disrupt the opponent) and fast

enough to damage the opponent's OODA loop, until you can paralyze his decision-making ability and defeat him. Victory is not won in a single course of the loop, but after a series of iterations of the loop. If the actions of one of the opponents are predictable and the other acts fast enough to take advantage of this advantage, then the other will be forced to react and not to act, unless he can reverse the situation. Conversely, the pilot who succeeds in setting a trap (in terms of maneuvering) in which the other falls is in a position of strength with a more serene management of his OODA loop than that of his opponent.

1.3.2. *The space for imagined aerial maneuvers*

We will now associate the forms of innovation previously discussed with different combat maneuvers or, more generally, aerobatics. According to this metaphor, a product or range of products will be represented by at least one aircraft (we will explain later on cases of aircraft duplication). As this metaphor must be used to identify positions, as well as to better understand certain maneuvers, the plane will leave behind a small trace of smoke. The course (or combat) area is the sector to which the products whose evolution you want to follow correspond. We will call this maneuvering space dogfight innovation space, in reference to the term used to talk about very tight aerial combat. That being said, we still need to define the space in which these maneuvers are imagined.

It is a three-dimensional space. The y-axis (the one that will represent the flight altitude) will correspond to the price of the product as perceived by its potential buyer or, failing that, to the production cost of the product. The ground will be located at a level –1 (a full scale below that representing zero cost) that will not be reached by any aircraft. We propose an altitude scale from level –1 to level 53. To determine the price value associated with a graduation, we propose to refer to the median market price and put it at level 10. It is then sufficient to divide this price by 10 to obtain the value of each of the lower graduations (starting from zero, of course). Grades 11 and 12 are established with the same unit of measurement. Then for the graduations from 13 to 24, we propose to double the value of the unit, to quadruple it for the graduations from 25 to 36, to multiply it by 8 for the graduations from 37 to 48 and by 16 from 49 to 52 (the last level 53 represents a price

higher than the maximum of the 52 scale)[2]. The abscissa axis is associated with two variables. First, at time t, it classifies the products you want to represent in relation to the market-leading product in the targeted sector. For each cell, the axis starts at 106 and ends at 7 and not at 0, which allows the aircraft to be placed without overflowing on the previous ranges and at the same time to point to empty/free spaces. According to this axis at time t, an aircraft representing your product/product line is placed on the axis according to the shares of a market share it occupies. At a minimum, it is necessary to represent at least the leading aircraft (market-leading product) and the next two, provided that at least one of them represents a relative market share of at least 7%. Thus, there will be boxes where no aircraft will be represented. In other cases, the nose of the aircraft is used as a reference point to position it on this axis. The second variable that acts on this axis is time. It is represented by a shift of six graduations in the direction from left to right in which *a priori* all planes will fly. Thus at time t + 1, the positions of the aircraft (products) are reassessed, but their estimated positions (market shares) are shifted by six graduations, thus allowing the expression of a movement, even for the slowest aircraft (i.e. the leading aircraft). Time t + 1 will be either the end of a year or the year in which a new version of one of the three products that were market leaders at time t is released. In order to identify empty spaces (such as "blue oceans"), the most efficient space on the market will be used to determine the relative value of others[3]. Finally, the axis expressing the width of the space represents the categories of individuals targeted by the products according to gender and the axis of the products. We propose to create age categories with an eight-year range as the separation unit[4]. This graduation begins with the 85+ category, then decreases in six-year increments (80+ years, 72–79 years, 64–71 years, …, 16–23 years, 8–15 years, 0–7 years). You can increase the distance between each of the corridors thus delimited with thresholds of 12 years, for example (this reduces the set to eight categories instead of eleven), but it

2 These values can be taken into account over the years of inflation measurement in order to limit the effects of what will pass for a type of upward flow. You can settle for 37.

3 There is always a price range for which the number of sales or consumers in a particular category is more significant than the others. It is the number of consumers or the sum of sales (rounded up to the next highest unit of measurement) of this category and price range that should be used as a reference to calculate the relative percentage of market occupancy of the other boxes in the dogfight innovation space (see previous footnote).

4 Of course, other forms of categorization of individuals are possible, but the one of ages seems to us to be the easiest to use.

is necessary to continuously represent categories of individuals by group of years. In the first place, we propose to place male individuals from 0 to 7 (or 11) years of age and thus go up to 80 (or 84) years of age and over. Then, repeat the graduation in the reverse order with female individuals (0–7 years, 8–15 years, 16–23 years, …, 72–79 years, 80 years and over).

This last delimitation allows the creation of flight lanes. In order for aircraft to be able to fly in it, we propose that the distance between two graduations should allow at least six aircraft to be aligned (four in length, six in width and six in height). A corridor is first defined by the y-axis (that of the categories of individuals). In the case of small markets, essentially targeting one to four categories of individuals, the "core market" corridor(s) are defined as described above, while the other corridors are merged into groups of two adjacent corridors. To do this, it is necessary to consider the full height of the corridors and the market shares by category of individuals for all altitudes (prices). Thus, in order for two corridors to be merged, the market share corresponding to the sum of the altitudes of these two corridors must not exceed 15% of the total market sales represented by all the corridors in the dogfight[5] innovation space.

Once the aircraft evolution space has been defined, we can associate the maneuvers with forms of innovation. First of all, modular incremental innovation is not associated with any particular maneuver, because this type of innovation simply plays the role of the aircraft's fuel, which is supposed to glide even slowly (it has no attraction force towards the ground). Architectural innovation is associated with a number n of barrels. The number of barrels will be between one and three. It will correspond to the nearest integer resulting from the square root of the number of the main components of the old architecture that have been removed, replaced or completely changed position (regardless of the number of changes greater than nine, the number of barrels will be three). The maneuvers associated with other forms of innovation must logically be deduced from the displacement between time t and t + 1. For example, frugal innovation aimed at drastically reducing costs will result in a "piqué" maneuver, which will be a spiral piqué if it also gives rise to architectural innovation and will end with a recovery in order to achieve the obtained market positioning. We will

5 To obtain a representation even closer to that of an air battle, the abscissa axis must not be straight, but follow an arc of a circle whose complete rotation will be carried out after four iterations and whose radius must be at least two planes long for the corridor nearest the center.

add to these maneuvers a small clarification concerning the use of an old technology (lateral thinking of obsolete technologies) or an old object that has been brought up to date (revival innovation). In both cases, there will be a dive followed by a slight rise to the final position, which in aerial vocabulary is called a "low yo-yo". To achieve this, it is sufficient to first make the aircraft dive to an altitude (price position) three steps lower on the cost scale than its final position (time t + 1)[6] and whose inflection point will be on the time scale on step 3 of that of the added 5 to create the illusion of movement. The rest of the movement consists simply of bringing the aircraft from the inflection point to its final position (at t + 1).

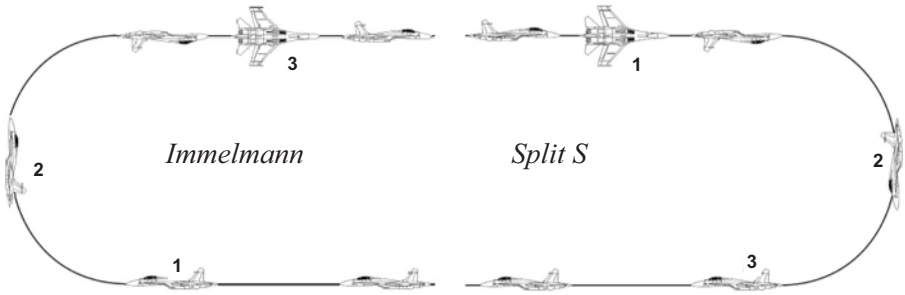

Figure 1.6. *Split S and Immelmann chained*[7]

In the case of an innovation of the revival type, we propose to represent it using three types of figures according to the price positioning which is that of the aircraft at t + 1. If the price positioning is, at t + 1, at least one level higher than the one it occupied at t, the aircraft's maneuver will correspond to the sequence of a Split S (with a descent of one level) and an Immelmann (with a rise of at least two levels). If the price positioning is, at t + 1, at least one level lower than the one it occupied at t, the aircraft's maneuvering will correspond to the sequence of an Immelmann (with a one-level climb) and a Split S (with a descent phase of at least two levels). If the product positioning at t + 1 is the same as at t, then we propose a Split S and an Immelmann sequence (Figure 1.6). We are almost finished with this metaphor using aerial maneuvers to follow the evolution of the products. Since products will remain on the market for many years, whether improved

6 Unless it causes the plane to crash, of course. In this case, the inflection point will be at the zero level of the scale.

7 Sources: https://en.wikipedia.org/wiki/Immelmann_turn and https://en.wikipedia.org/wiki/Split_S.

or not, in order to represent the new products on offer, it is necessary to consider other aircraft. In addition, some products may reach several categories of individuals. If there are two contiguous categories, it is sufficient to place the aircraft on the boundary of these two categories. In other cases, the aircraft will be duplicated as many times as necessary. A color will be assigned to each type of product, and therefore of aircraft, in order to easily identify those belonging to the same squadron. Thus, we will have strange cases where, from a position occupied by a single aircraft, two aircraft will appear to occupy a different corridor (the same product sold first to one category of individuals is now proposed, as it stands, to two categories). If this case is strange, it is enough to say to yourself that the planes piloted are piloted in a video game that allows you to better imagine this kind of situation. If the products of the same company are different, this distinction may be made by assigning a label with the name of the product to the aircraft concerned. Similarly, a partnership, if it takes place between companies, will be expressed per product, and therefore per aircraft. We propose to associate this aircraft with two colors (one per socket) and to distinguish this type of partnership aircraft; we propose to associate it with a two-seater aircraft, the others being single seaters. In the case of an open source innovation development, the aircraft may be a two-seater spotted aircraft with at least six colors.

1.4. Conclusion

We have seen the various definitions of creativity commonly used. We have seen that these definitions can be combined. Creativity could include a posture, ability and process for producing original ideas or other products that could lead to the development of an innovation. Similarly, we have seen that creativity can just as much be considered from an individual or organizational point of view. From an organizational point of view, creativity is then assigned two functions: one is to produce new things and the other to accompany change by proposing a form of knowledge mediation within an organization. Then, we discussed innovation and its various forms. This journey through the forms of innovation was intended to show their differences and some ways of putting them into practice. Since many categories of innovation are presented in the form of associated movements, we were able to consider the metaphor of the aircraft in flight to better link creativity and innovation.

This metaphor, which may seem complex at first glance, aims to perceive the presence of hidden routines in product design better on the one hand and to link monitoring and innovation strategy better on the other hand. By following the principles of the OODA loop and imagining product development maneuvers using the metaphor of air combat, it is not only a question of being well informed about one's environment, but also of knowing how to react quickly according to maneuvers adapted to adverse positions. If a company always improves its products in the same way, then its new products can be anticipated by the competition, which will then be able to develop more efficient or better positioned alternatives a step ahead. The company in question will therefore eventually transfer the initiative to another well-informed, rapid player and less predictable. The fact that it is a fight or an air race (if you prefer to place the planes on an axis of abscissa graduated from 0 to 100) constantly renewed allows us to consider creativity in terms of agility in the sense of C.W. Richards [RIC 96]. It is a question of reacting quickly and appropriately. But to do so, you also need to be well informed about your environment. We must fight against the comfort and complacency that can arise within an organization. In an organization that wants to be creative, this is the worst thing that can happen to it [ASH 16, 62].