



# RESPONSIBLE INNOVATION

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ΙΝΝΟΥΑΤΙΟΝ





## RESPONSIBLE INNOVATION

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## INTRODUCTION

There is now an almost general consensus that humanity's current economic development model is unsustainable. Its consequences in terms of greenhouse gas emissions, the consumption of non-renewable resources (fossil fuels, raw materials, etc.), soil, water and air pollution make maintaining this economic model unsustainable in the short and medium term.

For decades, optimists thought that technological progress would provide ever-new solutions to the problems posed by our economic model: technology would make it possible to find energy in areas increasingly difficult to access; it would enable us to find and utilise previously unusable raw materials; it would make it possible to combat the effects of pollution, etc. This belief is now widely challenged. On the one hand, the environmental damage and global warming are progressing at such a speed that it seems hazardous to entrust the task of meeting the challenge of sustainability to technological progress alone; on the other hand, past experience has shown that even when technological progress pursues commendable objectives to reduce the environmental impact, it can generate "rebound" effects that are difficult to control.

The idea that it will be necessary to radically transform the economic model is therefore gradually taking hold. This belief is no longer an idea reserved for radical environmental activists. It is prevalent among leaders, as shown by the adoption of the European Green Deal in December 2019. In this Pact, which constitutes the roadmap of the European Commission for 2019-2024, European leaders assert their intention to create "a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use"<sup>1</sup>.

This in-depth transformation cannot be a topdown approach imposed only by States and public players. It requires the mobilisation of all economic players, as reflected in the use of the term "Deal" and as stated in the communication issued by the European Commission when this programme was adopted: "A new Deal is needed to ensure that citizens, in all their diversity, national, regional and local authorities, civil society and business work hand in hand with the EU institutions and advisory bodies"<sup>2</sup>.

Companies must therefore participate in this transformation and play a leading role in it. Until recently, companies were required to have a corporate social responsibility (CSR) strategy. Conventional CSR required companies to look beyond pure profitability and take into account the interests and demands of their stakeholders (employees, shareholders, public authorities, suppliers, customers, non-governmental organisations, etc.). These conventional CSR strategies

<sup>1.</sup> European Commission (2019) Commission Communication. The Green Pact for Europe. Brussels, 11/12/2019

<sup>2.</sup> Communication of the European Commission on the adoption of the Green Pact for Europe

Square

led some companies to change their practices, but only in response to the demands or pressures of stakeholders. The bar is now set significantly higher: the finite nature of resources, the economic crisis, the decline in biodiversity and social pressure require us to go beyond the traditional CSR approach: it is now a matter of "contributing to the ecological transition"<sup>3</sup> proactively, by challenging the existing business model and by encouraging customers to adopt more sober methods of consumption. This higher level of requirement is set to become the standard in terms of CSR and will give rise to a deeper internal transformation within companies: it will raise questions about the Supply Chain, the HR model and the recognition of performance at work, how marketing is done, how innovation is conceived and managed, etc.

This focus will examine the consequences of this new CSR standard for innovation strategy and management methods. Does the requirement of a company's "contribution to the ecological transition" (CET) have consequences on the way in which companies must design and steer their innovations?

How can we ensure that the way innovation is carried out meets the requirements of a company's CET?

This focus will be divided into three parts.

The first will present an overview of innovation theories and practices to date. It will show the ambivalent relationship between innovation and responsibility. For a very long time, the need for responsibility was not taken into account, either in the theories of innovation or in practice. Indeed, as this section will show, until recently innovation practices tended to accentuate certain abuses of environmental and social issues.

The second part will provide a definition of responsible innovation. It will propose criteria to qualify an innovation as "responsible" and will also try to classify the different types of responsible innovation by type of innovation.

The third part will provide concrete recommendations to companies wishing to engage in a structured responsible innovation approach. It will present the convictions of Square Management, a strategy and organisation consulting firm, and will illustrate that responsible innovation requires companies wishing to adopt it to fundamentally rethink their innovation cycle.

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CET: Companies' "Contribution to the Energy Transition"; Focus Square Management: "Companies and Sustainability: Being Clean or Contributing to the Transition" - November 2021

# CORPORATE INNOVATION AND RESPONSIBILITY: TWO HISTORICALLY SEPARATE CONCEPTS

### 1.1 INNOVATION THEORIES AND STRATEGIES FOR A LONG TIME IGNORED SUSTAINABILITY ISSUES

An analysis of innovation strategies and of academic research that modelled their main characteristics shows that the concern for responsibility was not taken into account until recently.

These innovation strategies aimed exclusively at providing the innovative company with a competitive advantage over its competitors, in order to optimise profit and/or maximise sales.

### 1970s

The innovation strategies that emerged in the 1970s were based on the concept of technology

push, or science push, according to Foster<sup>4</sup> (1986): the aim was above all to adapt the company to technical progress; innovative organisations were those that managed to integrate new techniques into their production and offering development processes. To meet the challenge of mass growth, the main focus was on increasing volumes. In this context, thanks to the effects of series, innovation chiefly served to achieve productivity gains, which could be translated into cost savings that could in turn be translated into a more aggressive pricing strategy than that applied by the competition. This approach can be found in the academic studies of Abernathy and Utterback<sup>5</sup> (1978) and in those of Anderson and Tushman<sup>6</sup> (1990). Innovations were primarily technological and aimed at relative performance to surpass



<sup>4.</sup> R. N. Foster, L'innovation: Avantage à l'attaquant, Interéditions, Paris, 1986.

<sup>5.</sup> W. J. Abernathy and J. M. Utterback (1978), "Patterns of Industrial Innovation", Technology Review

<sup>6.</sup> P. Anderson & M. L. Tushman (1990). Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change. Administrative Science Quarterly, 35, 604.

existing systems. Iconic examples of this type of innovation incorporating new techniques into production and offering development processes were floppy disks, barcodes, Post-ITs and inkjet printers.

### 1980s

The innovation strategies theorised in the 1980s corresponded to markets in the process of globalisation, experiencing growth that started to become saturated from the middle of the decade onwards. Innovation strategies at that time were based on two concepts: market pull and time-based competition. Market pull consists in isolating development opportunities linked to the competitive environment and responding to more targeted needs, based on teachings prior to Gaillard<sup>7</sup> (1997). This can involve applying product diversification strategies or targeting niche strategies, according to the Porter model<sup>8</sup> (1982). Companies use technology to differentiate themselves from the competition in various ways, according to research by Henderson and Clark<sup>9</sup> (1990). Time-based competition, a term coined by Stalk<sup>10</sup> (1988), consists in intensifying the pace of product and service development in order to position the company faster than the competition. Timebased competition and market pull are often associated with innovations such as the Walkman and video game consoles, which epitomise this era and this combination of market pull and time-based competition.

### 1990s

Innovation strategies in the 1990s were strongly influenced by the crises that rocked the beginning of this decade: the impacts of the October 1987 stock market crash, the 1991 Gulf War, the downturn in the real estate market, etc. Naturally, the aim was to overcome these crises. These innovation strategies were also designed in response to increasing competition between companies arising from the ever-increasing opening up of borders to international trade<sup>11</sup>. The content of innovation strategies at this time evolved and adapted to an economy in which mass production was becoming less of a clear advantage than the ability to vary production and adapt swiftly to new developments. Innovation accelerated the transition from an era of products to an era of services. It was also at this point that obsolescence strategies became widely used. At the end of this decade, efforts focused on the fuzzy front end, in other words on the upstream phases of the innovation process and on exploration. With the challenge to open up new markets came a race for inventiveness. Several theoretical models of innovation management circulated at this time, including the CK<sup>12</sup> theory by the researchers Hatchuel and Weil. Emblematic innovations such as the WEB1, the pocket PDA, the Tamagochi and the NOKIA 1011 were the result of these new innovation theories and strategies.



<sup>7.</sup> J. M. Gaillard, Marketing et Gestion de la Recherche et Développement, "Recherche en Gestion" collection, Economica, Paris. 1997.

<sup>8.</sup> M. E. Porter, (1982) Choix stratégiques et concurrence: techniques d'analyse des secteurs et de la concurrence dans l'industrie. Paris: Economica.

R. Henderson & K. B. Clark (1990). Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. Administrative Science Quarterly, Vol. 35, No. 1, Special Issue: Technology, Organizations, and Innovation.
 Stalk, G. (1988). Time-The Next Source of Competitive Advantage. HBR.

<sup>11.</sup> Single European Market in 1992, Uruguay Round agreements in 1994, Creation of the WTO to replace the GATT agreements in 1995.

<sup>12.</sup> The CK theory emerged from the MINES ParisTech engineering school as part of the Design Engineering option. The C-K theory makes it possible to describe and explain the reasoning of a designer when imagining and designing a new product, service or process. In addition to this explanatory power, this theoretical framework provides powerful generative mechanisms, making it possible to overcome cognitive barriers and thus increase our ability to invent.

### 2000s

The innovation strategies in the 2000s sought to reconcile two seemingly contradictory concepts: the need to bring about disruptive innovations, on the one hand, and to manage a much more uncertain environment, on the other. Markets were saturated, competitors came from various business sectors, start-ups were challenging traditional companies and there was a creative dynamic. This was a period of intensive innovation according to Le Masson, Weil and Hatchuel<sup>13</sup> (2006) in that innovation was increasingly radical and repetitive. Innovation strategies were increasingly sophisticated, in a bid to break with what had gone before. To illustrate this sophistication, inter-company competition between 2000 and 2010 played out by the hybridisation of low-end disruption and newmarket disruption strategies (Christensen)<sup>14,15</sup>. As well as creating disruptions, the aim was to do so in a successive manner. One by One innovations were no longer sufficient, as they could be copied. They left strategic gaps in the market opened by the innovator, which risked being swiftly filled by the competition. Innovating on an One by one basis prevents the accumulation of learning from one project to another, which increases the cost per project and the overall economic risk. "Repeated innovation", on the other hand, generates a corporate dynamic that enables the systematic reuse of new knowledge from one project to another and from one area of business to another. Innovations are no longer designed on case-by-case basis but part of a

Global innovative strategy to innovate continuously, any number of times. Repeated disruptive innovation creates new markets and destroys previous ones, thereby reducing the competition's ability to respond. To make these repeated disruptions a reality, innovation managers, a new role created in large firms, implement lineage strategies for designing ranges of products and services (Chapel, Le Masson 2006). Lastly, these new approaches were combined with a logic of systemic innovation according to Adner and Kapoor<sup>16</sup> (2010). Systemic innovation concerns the design not only of offerings but also of infrastructure and of a political and sociological framework favourable to the launch of the innovative offering. Academic works therefore talk about the creation of innovation ecosystems using technical language according to Adner<sup>17</sup> (2012). In order to last over time, the challenge was now less a question of mastering technology than of being able to build innovation ecosystems; i.e. integrating and managing allies able to innovate in their business lines and destabilise the existing socio-technical framework for the benefit of shared and then repeated disruptive innovation. Apple symbolises this era best.

### 2010s

It was not until the 2010s that academic works and theories about innovation began to take into account the imperatives of corporate responsibility. This shift is explained by the changing expectations of some consumers, who wanted



<sup>13.</sup> Le Masson P., Weil, B., Hatchuel, A., 2006. Les processus d'innovation : conception innovante et croissance des entreprises. Hermes science, Paris.

<sup>14.</sup> Christensen, Clayton M., and Michael E. Raynor : The Innovator's Solution : Creating and sustaining Successful Growth: Harvard Business School Press, 2003.

<sup>15.</sup> Le contenu des stratégies low end disruption et new market disruption sont détaillées en partie 1.2.

Adner, r., & Kapoor, r. (2010). Value creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations. Strategic Management Journal, 31(3), 306–333. http://www.jstor.org/stable/40587479

<sup>17.</sup> Adner, R. (2012). The wide lens: A new strategy for innovation. Portfolio/Penguin.

## FOCUS ON

For Apple, the important thing is not so much to be the first, but rather to work with innovative partners to offer something that downgrades whatever already exists on the market. The MPMan was the first portable MP3 player, launched in 1998 by SaeHan. Yet it was the iPod, released in 2001, that became the benchmark for such products. While the concepts were originally comparable, what first set the iPod apart was the integration of FireWire technology, which enabled a higher transfer speed than the USB used at the time by the MPMan.

Then, in 2003, in order to accelerate the market penetration of the iPod, Apple announced iTunes Music Store. The goal was to simplify and free up music consumption. In doing so, Apple moved from a product logic to a platform logic by expanding its ecosystem through new partnerships, in particular with record labels. In 2008, the iPod represented 48% of the market share of MP3 players.

When the iPhone was released in 2007, it was also not the first smartphone sold. The Nokia 9000 with Internet connection appeared in 1996, followed in 2002 by the Sony Ericsson P800, which included a camera. Once again, success depended on reconfiguring the existing ecosystem to ensure that the offering emerged in the best possible conditions. As such, partnerships were signed with telecommunications companies to offer infrastructure enabling a smooth experience.

Apple thus signed a partnership with AT&T, in particular. At the same time, the design opened up to developers outside of Apple, in order to enrich the future iPhone offering with a multitude of applications. The strategy consisted in migrating iPod users to the iPhone. This ecosystem expansion logic was the same from the iPhone to the iPad in the same decade and then the next, particularly with the AppleCard and Apple Arcade in 2019.

to access more sustainable products and services, as well as by the gradual increase in political and regulatory pressure for a more sustainable development model.

In France, the Grenelle environmental law (Grenelle 1) was enacted in August 2009. The failure of COP15 in Copenhagen in December of the same year was a wake-up call. In August 2015, the agreement by 193 countries on the Sustainable Development Goals (SDGs) enabled real acceleration. In its wake, the Paris Agreement at COP21 pushed for innovation in development

models, with quantified commitments to reduce greenhouse gas emissions. It has also been responsible for encouraging states to reconsider the issues of economic, industrial and energy sovereignty at the heart of their strategies, in order to protect society and the environment. The context of innovation strategies is thus evolving towards what management science researchers refer to as **competition through innovation in an administered economy**<sup>18</sup>. Governments seek to promote innovation in sustainable products and services with the



<sup>18.</sup> https://www.academietechnologies.fr/libre\_propos/lacompetitioneneconomieadministreeinterviewdechristophemidler/

aim of creating competitive advantages for their companies and, more broadly, for their countries<sup>19</sup>.

Emblematic of the first theoretical current is the research carried out by Kevin Levillain<sup>20</sup> on the governance model of innovation. The aim is to reconcile a profitable, sustainable and acceptable development of the company within its ecosystem. To this end, this theoretical model proposes giving the company raison d'être as a means of considering its responsibilities within its ecosystem. This raison d'être, supplemented by environmental and societal objectives, defines a purpose that obliges the company to participate in building a desirable shared future. For Kevin Levillain, this means "modelling the purpose as all the properties of future strategies to be designed"<sup>21</sup>. Underlying this complex sentence is the notion that that corporate governance issues merge with innovative design issues . Administrators and Top managers must be directly involved in exploratory activities and design activities of desirable futures. They thus step outside of their traditional roles as operational managers. To use the subtitle of Kevin Levillain's major work: it is about aiming for "a governance model through innovation". This work, carried out at the Ecole des Mines engineering school in Paris, was partially incorporated into the provisions of the PACTE law. The results have, to date, been very encouraging, as more than 1,000 purpose-driven companies are already listed in France<sup>22</sup>. Some of these

companies, albeit a small proportion, are accompanying this transformation into a purpose-driven company with a transformation of their innovation governance.

The second theoretical current involved overhauling design activities to incorporate frugality and inclusion. Its most emblematic variations are fractal innovation<sup>23</sup> and deployment engineering<sup>24</sup>.

Fractal innovation aims for minimal use of natural resources, limits material flows and simplifies production infrastructure and development costs in order to propose more sustainable and inclusive solutions. Renault's Kwid car is an emblematic example of fractal innovation. This vehicle, sold for €3,500 in India, is pleasant, safe and modern and can be configured by the customer on a mobile application. This startling result was made possible by the deployment of fractal innovation principles at all stages of the vehicle's design.

Deployment engineering aims to create an environment conducive to the adoption of sustainable innovative offerings. In this approach, the deployment of the innovative offering is managed iteratively. This involves adapting the technology during the scaling-up process. It also involves adapting uses and anticipating future versions that will be proposed to customers. Several methods derive from this approach, including the UserCentric Simulation for the Deployment of Disruptive Innovation<sup>25</sup> method.



<sup>19.</sup> The US government's support for Tesla Motors and the European Commission's initiative in favour of the "European Bauhaus" are examples of States' determination to promote more sustainable innovations.

<sup>20.</sup> Kevin Levillain. Les entreprises à mission : Formes, modèle et implications d'un engagement collectif. Gestion et management. Ecole Nationale Supérieure des Mines de Paris, 2015. French. ffNNT: 2015ENMP0010ff. fftel01178862f 21. "Les entreprises à mission, un modèle de gouvernance par l'innovation", Kevin Levillain Vuibert

<sup>22.</sup> https://www.observatoiredessocietesamission.com/

<sup>23.</sup> Innover à l'envers; Repenser la stratégie et la conception dans un monde frugal. Christophe Midler, Bernard Jullien, Yannick Lung. 2017.

<sup>24.</sup> F. von Pechmann (2014): L'ingénierie du déploiement d'une plateforme disruptive: Le cas du véhicule électrique. Ecole polytechnique thesis.

<sup>25.</sup> Félix Von Pechmann et al. "Comment prévoir le succès d'une innovation de rupture? Le cas du véhicule électrique", Décisions Marketing, vol. 81, no. 1, 2016, pp. 81-98

Today, major players in sustainable mobility use deployment engineering concepts, such as car manufacturers and the RATP, which used this model in the deployment of its electric bus platform. The table below summarises the evolution of innovation management theories.

Table 1 inspired by the teachings of Professor Christophe Milder. Correspondence of innovation strategies with economic cycles

	The 1970s	The 1980s	The 1990s	The 2000s	The 2010s
Economic contexts	Varied growth	<ul><li>Globalization of markets</li><li>Start of market saturation</li></ul>	<ul> <li>Saturation of markets</li> <li>Overcoming the crisis through innovation</li> </ul>	<ul> <li>New digital revolution</li> <li>Competition by intensive innovation cycle</li> </ul>	<ul> <li>Pressure on economic players by States on issues of sustainability</li> </ul>
Innovation Models	<ul> <li>Increase in volumes</li> <li>Series effects</li> <li>Technopush</li> </ul>	<ul> <li>Product diversification</li> <li>Niche strategy</li> <li>Large-scale effects</li> <li>Strategy of obsolescence</li> </ul>	<ul> <li>Competition through quality</li> <li>Design to Cost</li> <li>From products to services</li> <li>Strengthening of the <i>Fuzzy</i>- <i>Front-end</i></li> <li>C-K Theory</li> </ul>	<ul> <li>Repetitive innovation</li> <li>The race for radical innovation</li> <li>Low hybridisation end disruption and New Market disruption</li> <li>Systemic innovation</li> </ul>	<ul> <li>New governance for responsible innovation: purpose-driven company</li> <li>Strengthening of downstream process</li> <li>Fractal innovation</li> <li>Deployment engineering</li> </ul>
Emblematic innovations	Floppy disks, bar codes, Post-Its, inkjet printers, Renault 5	Walkman, video game consoles, CellPhone DynaTac 8000, SONY video camera	WEB1, Pocket PDA, Tamagochi, SMS, NOKIA 1011	Google, iPod, Facebook, Youtube, iPhone, iPad, AirBnB, UBER	TWIZY, hoverboards, KWID, ART L210-10 reusability, PACT Ioan Arkéa

### 1.2 INNOVATIVE PRACTICES IN RECENT DECADES HAVE ACCENTUATED THE UNSUSTAINABLE EXCESSES OF THE ECONOMIC MODEL

An analysis of the innovation practices adopted by companies in recent decades shows that innovative practices have rather accentuated the unsustainable excesses of the economic model. These innovation practices have in fact tended to provoke four phenomena:

- The sophistication of existing products
- Increasingly fast product range renewals

- The proliferation of new product categories
- Faster adoption of new products

## 1.2.1 The sophistication of existing products

Product sophistication is often used by companies to differentiate their products and services. It offers a way of gaining an advantage over competitors. This sophistication translates into an accumulation of functionalities and configurations, defined by management science researchers as a *functional expansion*<sup>26</sup>. Figure 1 shows the number of features added to a



<sup>26.</sup> Pascal Le Masson, Kenza El Qaoumi, Armand Hatchuel & Benoît Weil, A Law of Functional Expansion Eliciting the Dynamics of Consumer Goods Innovation with Design Theory in Proceedings of the 22nd International Conference on Engineering Design (ICED19), 2019.

product series between the product design date and 2014. It shows that 113 new functions were added to the smartphone in just 18 years; 21 new functions were added to the GPS browser between its creation in 2006 and 2014.

Apart from these few examples, Figure 1 illustrates the unsustainable nature of an innovation strategy by functional expansion; when this strategy is accompanied by effective marketing, it often ends up generating an incremental demand in favour of the latest available version of the product without any concern about whether the previous version still works and meets the needs of customers and without taking responsibility for recycling the previous version. This functional expansion is an escalation of demand for new products:

"We believe that the more consumers learn about new characteristics on the market, the more they ask for them: this is what we call "overlearning" and this is what makes it possible to maintain a dynamic market"<sup>27</sup>.

Figure 1. The functional expansion induced by innovation strategies



Figure 2. Increasingly fast product range renewals Pace of new product design at Renault Source: C. Midler



27. Kenza El Qaoumi. L'expansion fonctionnelle, nouvelle mesure de l'innovation. Analyse empirique et modélisation postlancastérienne de la transformation des biens de consommation. Gestion et management. Université Paris Sciences et Lettres, 2016. Thesis excerpt p.210.



## 1.2.2 Increasingly fast product range renewals

The renewal of product ranges provides another illustration of these intensive innovation strategies. Analysis shows that the pace of new offerings has constantly accelerated in recent decades; this acceleration has been enabled by efforts to shorten design deadlines, which has constituted one of the major objectives sought by companies seeking to optimise their innovation strategies. This acceleration in the renewal of product ranges is particularly notable in heavy industry, notably in the automotive sector<sup>28</sup>. Figure 2 provides an illustration of this innovation strategy within the Renault group. It shows that since 1945, the group has gone from designing one new vehicle every 5 years or so to 7 to 10 vehicles per year.

This acceleration in the pace of product range renewal is not limited to heavy industry. The fashion industry has the same characteristics. The global success of major players such as Zara, H&M and Shein has been built on their ability to renew their product ranges with extreme speed in order to respond as quickly as possible to fashion trends. This business model is, however, attracting increasingly strong criticism for its unsustainable nature.

## 1.2.3 The proliferation of new product categories

The last 15 years have also been marked by the rise of disruptive innovations, leading to a proliferation of new product categories. These disruptive innovations can be classified into two types (see Figure 3, p.17):

- On the one hand, low-end disruption; a low-end disruption strategy creates innovation by challenging the operating fundamentals of a market or business model in order to overhaul its cost base and the experience delivered to the customer; this is the innovation strategy adopted by lowcost players and by new entrants who are able to penetrate a market "from the bottom" while offering a fresh customer experience: the most emblematic example of low-end disruption innovation is Amazon in its early stages.
- On the other hand, new-market disruption; a new-market disruption strategy creates completely new offerings that compete head-on with existing offerings, often very violently: the most emblematic examples of new-market disruption innovation are the iPod, iPhone and iPad by Apple.

These two types of disruptive innovation are not always synonymous with progress and sustainability. Low-end disruption strategies disrupt sectors, in particular by deconstructing the labour market. This is the case, for example, of the platforms responsible for the explosion in the number of workers in insecure employment. New-market disruption strategies are an invitation to over-consumption through a proliferation of new offerings and experiences. In addition, low-end disruption and new-market disruption strategies are sometimes combined, as in the case of AirBnB, which disintegrated first the youth hostel market and then the hotel



<sup>28.</sup> Christophe Midler, Rémi Maniak & Romain Beaume, *Réenchanter l'industrie par l'innovation: l'expérience des constructeurs automobiles*, Dunod, 2012.

market and which has not only encouraged consumption in accommodation but also, by extension, in air travel, which has a high carbon impact.

### 1.2.4 Faster adoption of new products

Innovation practices in recent decades have also contributed to increasing households' ability to adapt to innovation.

This ability to adapt has led to more intense and shorter consumption cycles, especially as companies have sought, through their marketing strategies, to accelerate the adoption of innovations<sup>29</sup>. Figure 4 shows the speed at which certain major innovations entered the US consumer market: nearly 60 years were needed for electricity to reach its ceiling penetration rate; about 35 years for radio and 30 years for colour television. Only 15 years were needed for the Internet and the cellphone.

Ever more innovations, ever more complicated and ever more swiftly brought to market. Innovation strategies therefore contribute to an economy of infinite growth that fails to take into account the planet's limited resources. Hence the need to put in place more responsible innovation models so that innovation participates in meeting the challenge of making our economic model sustainable.



Figure 3. Low-end disruption, new-market disruption and sustaining innovation



<sup>29.</sup> Rita Gunther McGrath, The pace of technology adoption is speeding up, Harvard Business Review, 2019.



Figure 4. The ever-increasing pace of adoption of innovations

<sup>30.</sup> L'innovation, stimulant de la croissance économique? Belfius Banque et assurance, 2017.

# 2

## RESPONSIBLE INNOVATION: DEFINITION

This section presents the criteria for defining responsible innovation. It also provides a grid for classifying the different types of responsible innovation.

The concept of responsible innovation appeared in scientific literature in 2011. Ingham<sup>31</sup> proposes the following definition: "responsible innovation means the voluntary and proactive integration of social and environmental factors into strategies and the development, production and marketing of more efficient solutions aimed at creating societal value (economic, social and/ or environmental)".

The concept of responsible innovation was subsequently adopted by the European Commission. Since 2014, the concept of responsible innovation has been associated with responsible research and defined as follows: "RRI (Responsible Research & Innovation) is a continuous process that aims to place research and innovation in line with society's values, needs and expectations" (Rome Declaration, 2014).

It is therefore not a question of "responsibility" in the legal sense, nor in terms of risk management or negative externalities. Neither does it mean "responsibility" in the sense of being accountable for one's actions, such as an obligation of transparency, for example. RRI sees sustainable innovation more as a commitment, or even an ambition, to think about research and innovation for the common good. It is an ethical stance.

Adopting an RRI approach means taking into account societal and environmental challenges and needs and strengthening one's capacity to act for the benefit of all, including future generations. RRI considers innovation as a tool to improve the human condition and that of the entire living planet.



<sup>31.</sup> M. Ingham, "Vers l'innovation responsable: pour une vraie responsabilité sociétale", de Boeck, 2011.

## IMPORTANT

### **RRI ACCORDING TO THE EUROPEAN COMMISSION**

Responsible innovation within the meaning of RRI (Responsible Research & Innovation)

- 1. It is not just social innovation
- 2. It is not CSR
- 3. It is not simply working with social science researchers
- 4. It is not about launching ecodesign, decarbonation or circular economy approaches without more in-depth thinking

**RRI means cross-cutting, open and collaborative technical and scientific innovation that concerns all companies and that requires a radical change in mindset.** The most precise definition we can use is that of Dr. phil. René von Schomberg, Former Official of the European Commission (former member of the Directorate-General for Research and Innovation of the European Commission), RWTH Aachen University.

Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society). (2013)<sup>32</sup>

Today, the concept remains complex and multifaceted. We can note, however, that responsible innovation, according to the observatory of responsible innovation, consists of three dimensions: a culture of testing in order to be responsible faced with the risk of market rejection; an approach that values democratic deliberation so that innovation is discussed and is consensual, thereby encouraging collective empowerment; and a logic of sharing knowledge, which proposes a culture of sharing resources.

For the European Commission, Research and Innovation cannot be separated. This definition stems from the fact that innovation is often the result of years of R&D. For the European Commission, RRI stands out from simple "social innovation" as it implies a technological and scientific aspect.

For pragmatic purposes we will present below our own definition, which is intended as a synthesis of what we have experienced and read.

### 2.1. WHAT IS RESPONSIBLE INNOVATION? DEFINITION CRITERIA

An innovation is considered responsible if it meets three cumulative criteria. It must be profitable, sustainable and acceptable.

### - A profitable innovation

The concept of innovation remains widely misunderstood. For many, invention and innovation are one and the same.In reality, 83% of inventive



<sup>32.</sup> VON SCHOMBERG, René, « A Vision of Responsible Innovation », dans R. Owen, J. Bessant et al. (dir.), Responsible Innovation : Managing the Responsible Emergence of Science and Innovation in Society, Londres, John Wiley, 2013, p. 51-74.

projects launched on the market are not successful and are not therefore transformed into an innovation. The challenge for innovative projects seeking to reduce impacts is therefore to avoid market rejection, leaving them as "orphan" innovations<sup>33</sup>. From this point of view, being responsible means seeking to improve this ratio and have the public adopt these inventive projects, not just express an appetite for them. A responsible innovation must therefore be profitable.

### - A sustainable innovation

An invention can be transformed into an innovation without being permanent or long-lasting. However, the challenge of responsible innovation is to last over time, to overcome planned obsolescence, to extend the life cycle, to participate in a circular economy or, better still, to regenerate by means of evolving offer. The aim is to sustain what we put on the market so as to have the least possible impact on physical resources. Obviously, the life cycle must also contribute to reducing the impacts of biological resources during the period of use. Finally, innovation must also be conceived so as to avoid exhausting scarce resources, failing which its own life will also be limited. A responsible innovation must therefore be sustainable.

### - An acceptable innovation

Finally, an invention may be transformed into an innovation and be sustainable, as explained above, while also being discriminatory, failing to contribute anything to human progress and even having a negative impact on society. To contribute effectively to the development and large-scale deployment of a sustainable economic model, an innovation must contribute to transforming society for the better, generating more inclusion and solidarity, contributing to the resilience of different areas and regions, pacifying society, etc. Finally, therefore, a responsible innovation must also be acceptable.

### 2.2. WHAT ARE THE DIFFERENT CATEGORIES OF RESPONSIBLE INNOVATION?

After having proposed our own definition of responsible innovation by focusing on the characteristics of the innovation, this section presents a proposed classification of the different types of responsible innovation possible for a company today.

This is based on the two theoretical trends in responsible innovation that have emerged since the 2010s and that are briefly presented above in part 1.1 of this focus: responsible innovation through the overhaul of governance and responsible innovation through the overhaul of design activities. Our proposed classification combines these two theoretical approaches to present four broad types of situation (Figure 5 p. 23)<sup>34</sup>.

Quadrant I corresponds to the situation of companies that have reached the highest level of maturity in terms of responsible innovation. These are companies that have overhauled their governance and purpose, that have applied the consequences of this overhaul to the governance of their innovation strategy and that have also adjusted their innovation processes and design



<sup>33.</sup> Marine Agogué. Modéliser l'effet des biais cognitifs sur les dynamiques industrielles: innovation orpheline et architecte de l'inconnu. Gestion et management. Ecole Nationale Supérieure des Mines de Paris, 2012

<sup>34.</sup> In the interests of simplicity, the authors have dispensed with the conventional numbering order of the different quadrants in Figure 5

methods to pursue greater frugality and inclusiveness (fractal innovation, deployment engineering, etc.). According to Square Management, this quadrant I corresponds to the objective that any medium-sized or large company should today set itself as part of its strategic ambition of sustainability. Its purpose, corporate governance and innovation governance focus on sustainable objectives and its innovation processes and design methods are aligned with these objectives. Where these overhauls have been carried out as extensively as possible, the entire business model can probably become sustainable.

Quadrant II presents a hybrid and potentially inconsistent situation. The companies in this quadrant have overhauled their corporate governance and innovation governance and adjusted their purpose with a view to sustainability; this approach allows them to strive for responsible innovation but is incomplete insofar as they have not implemented their innovation processes and design methods accordingly: their innovation processes risk being partially ineffective or even providing development opportunities that are incompatible with the objectives defined by the company's purpose.

Quadrant III also presents a hybrid and potentially inconsistent situation. Companies in this quadrant have adjusted their innovation process and design methods by adopting methodologies that aim for frugality and/or inclusiveness (fractal innovation, deployment engineering, C-K Theory). They design and innovate more responsibly (by using technologies that reduce their environmental impact, by exploring functions to limit waste and promote usage generating cultural and meaningful changes in favour of preserving natural resources, etc.). However, they have not carried out the fundamental strategic transformation consisting of re-examining the company's purpose to meet the major societal challenges facing their ecosystem and have therefore not overhauled their corporate governance; nor have they transformed their governance of innovation. The maturity of their conversion to responsible innovation is therefore less advanced than that of companies in quadrant I.

Quadrant IV illustrates the situation of companies that have not yet changed their approach to innovation. Companies in this guadrant have not changed their corporate governance, purpose or governance of innovation to pursue sustainability, nor have they transformed their innovation processes and design methods. This quadrant does not necessarily indicate "bad will" or businesses opposed to new CSR concepts; many companies with good intentions are currently situated in quadrant IV. Without overhauling their governance and innovation processes and design methods, however, any attempts they make to generate responsible innovation (combining the criteria of profitability, sustainability and acceptability) will have little concrete success and may even appear as greenwashing in the eyes of their stakeholders.





Figure 5. The different categories of responsible innovation





# 3.

## RECOMMENDATIONS FOR RESPONSIBLE CORPORATE INNOVATION

The recommendation of the strategy and organisation consulting firm Square Management is that companies should now aim to position themselves in quadrant I of figure 5, as shown in the previous section. They must aim to optimise their corporate governance, their innovation governance and their design activities. By combining these optimisations, they can create the conditions needed to effectively evolve their business models towards sustainability<sup>35</sup>.

This document will not discuss how to overhaul corporate governance or how to set a company on the path to transform it into a purpose-driven company. We will focus on the process of overhauling the governance of innovation and the optimisation of design activities.

These two optimisations cannot be carried out with minor adjustments. They must, in our opinion, be subject to an in-depth approach involving not only the company's employees and management, but also the broader members of the company's innovation ecosystem (suppliers, technical partners, etc.). To this end, we recommend adopting a three-step approach. The first step consists of taking stock of the existing innovation strategy. The second step involves drawing up an action plan aimed at responsible innovation. The third step consists in deploying this action plan by focusing on two areas: overhauling the governance of innovation, on the one hand, and overhauling the design activities, on the other.

### 3.1 CARRYING OUT A DIAGNOSIS OF THE CURRENT INNOVATION STRATEGY AND ITS LIMITATIONS

In Square Management's experience as a business adviser, the root cause of flaws in governance of innovation and the underperformance of design activities in order to achieve sustainability often lies in an inappropriate or unclear innovation strategy. This lack of clarity



<sup>35.</sup> Thierry Rayna & Ludmila Striukova (2016) 360° Business Model Innovation: Toward an Integrated View of Business Model Innovation, ResearchTechnology Management, 59:3, 2128

in the innovation strategy often results in innovation governance and design activities being kept separate, failing to integrate transition issues or being out of alignment with the company's general strategy. We therefore believe it is first necessary to clarify how innovation strategy can be inconsistent or unclear. We propose conducting this diagnosis in 5 steps, as described in figure 6.

Figure 6. Responsible innovation strategy diagnosis in 5 steps:



Before describing these 5 steps in greater detail, it should be pointed out that in order to measure the gap between the existing situation and an optimal situation, we use a Square Management reference framework freely inspired by the robust and consensual definition of Professor Sihem Ben Mahmoud Jouini, according to which an innovation strategy is an "orchestration of the co-evolution of offerings and skills that feed back into the strategic vision"<sup>36</sup>.

This reference framework makes it possible to analyse an existing innovation strategy by breaking it down into three points (see figure 7): analysis of the strategic vision, analysis of skills and analysis of existing offerings.

The Square Management diagnostic approach is based on this reference framework and is broken down into 5 steps. The first 4 steps all follow the same sequence of data collection, interviews and processing. The 5th step is a summary.

- Step 1 consists of analysing the consistency between the formulation of the innovation strategy, the strategic vision and the company's purpose, if it has one. The purpose of this stage is to identify any paradoxes, limitations, unclear or missing information. This stage is carried out by Square Management consultants specialised in Innovation management, based on existing documentation and interviews.
- 2. Step 2 consists of analysing the company's vision for innovation. Under the term "vision", the idea is to understand the role of innovation and the ambitions the company has with regard to it. Does this "vision" takes into consideration the challenges facing the company with regard to sustainability, in particular the environmental and societal challenges? More importantly, is this consideration objective (i.e. quantified, monitored and enforceable) or is it



<sup>36.</sup> Sihem Ben Mahmoud Jouini under the direction of Christophe Midler, Stratégies d'offres innovantes et dynamiques des processus de conception: le cas des grandes entreprises générales de bâtiments français, 1998.



Figure 7. Framework for analysing an innovation strategy

only superficial and vague? The aim of step 2 is to verify whether this vision of innovation is legitimate and desirable. As such, this analysis of the "vision" goes far beyond an analysis of the aims and ambitions of the innovation department; it covers the whole company and seeks to qualify the ambition and role that the company attributes to innovation in order to reinvent its business model and become sustainable. Like the previous step, this step is conducted based on an analysis of existing documentation, interviews and an assessment model that constitutes a Square Management reference tool.

- 3. Step 3 consists of analysing the company's system of offerings. What products and services are currently offered by the company? What products and services will be offered in the future, given current or emerging innovation projects? Is this system of offerings an accelerator for the transition to sustainability? Are current or emerging innovations sustainable: do they have the characteristics to be profitable, sustainable and acceptable? This step is conducted by analysing existing documentation, interviews and the aforementioned Square Management assessment model and reference tool.
- 4. Step 4 consists in analysing the skills required for responsible innovation. Is there a consensus and a sufficient level of maturity within the company and its innovation ecosystem (strategic partners, technological solution suppliers, specifiers, etc.) to enable it to innovate responsibly? The analysis must assess the ability of the company and players within its innovation ecosystem to set up responsible innovation processes and to adopt innovative design methods in order to pursue sobriety and sustainability. This step is conducted by analysing existing documentation, interviews and the aforementioned Square Management assessment model and reference tool.
- 5. Step 5 consists in summarising the previous steps, carrying out an inventory of the innovation strategy and assessing its level of responsibility. This phase is established with an assessment model and an associated Square Management reference tool as presented in Figure 8 and Table 10. This shows the potential for improvement in the three aspects of a responsible innovation strategy (vision, skills and offerings) that is then used to build the action plan.



Figure 9 provides an example of a graphical presentation of an innovation strategy diagnosis. In the example presented in figure 9, the company obtains an excellent score for the viability of its offering; on the other hand, the diagnosis shows a significantly less favourable situation in terms of vision and skills. In this case, the company still has a significant way to go on the path to responsible innovation. The shortfalls highlighted in the "skills" section show that the

teams have difficulty in translating a "vision" of innovation into responsible innovative projects due to a lack of specific methodologies and poorly interfaced or incomplete innovation processes. The company subject to this diagnosis is, in fact, in the situation of quadrant II: well advanced on management issues (the company has already chosen to become a purpose-driven company), but has not yet completed the overhaul of its design methods.

A SHARED VISION How does the company propose a shared TO RECONCILE PROFITABILITY and meaningful future? AND SUSTAINABILITY How does the company generate fair outcomes? How does the company support stakeholders under **IS THE SYSTEM OF OFFERINGS** its responsibility in order to contribute to the transition? **CLEARLY DESCRIBED.** How does the company propose offerings that reduce SUSTAINABLE AND VIABLE? impacts? How does the company contribute to the resilience **IS THE SKILLS SYSTEM** of its ecosystem? CLEARLY DESCRIBED, How is the company organised to deliver on its promise ACCEPTABLE AND FEASIBLE? of responsibility?

Figure 8. Our Square Management analysis framework for a responsible innovation strategy

Figure 9. Example of a summary of an innovation strategy diagnosis based on the reference framework





Table 2. Square Management reference framework, weighting of responses in the summary of the diagnosis

SCORING AXIS	QUESTIONS	SCORE	REPONSE 0	REPONSE 0,25	REPONSE 0,5	REPONSE 0,75	REPONSE 1
Vision & legitimacy	How does the company offers a common and Meaningful future?		Promise of profitability	Promise of cultural change to limit the environmental impacts	Promise of profitability by reducing societal and environmental impacts	Commitment to co-evolution towards a sustainable economic system in the medium term	Commitment to the long-term co-transforma- tion of the economic system
Vision & desirability	How does the company generate fair outcomes?		Promotes the actions of impactful actors	Engages with stakeholders to maximise the adoption of their responsible innovations	Excludes any action that makes profitability incompatible with sustainability	Steers any development without weigh- ting profitability, acceptability and sustainability	Leader of an ecosystem reinventing the economic system
Offerings & sustainability	How does the company support players for which It is responsible to contribute to the transition?		Acculturation of employees to climate risks	Inclusion of employees in the responsible innovation process	Contribution of employees and customers in the innovation process	Construction of a costed change policy at the sector level	Leadership of initiatives in an ecosystem of impact- reducing entrepreneurs
Offerings & viability	How does the company propose offerings that reduce impacts?		Optimises the profitability of existing offerings	Optimises the environmental impact of existing offerings	Optimises the environmental and societal impacts of existing offerings	Invents cost-effective solutions in the interests of society and the living planet	Co-invents profitable solutions for the living planet and for society
Skills & acceptability	How does the company contribute to the resilience of its ecosystem?		Anticipation of risks for its organisation	Anticipation of risks for its ecosystem	Organises dynamic capabilities	Builds dynamic capacity strategies by sector	Builds a closed solidarity ecosystem
Skills & feasibility	How is the company organised to deliver its promise of responsibility?		Structuring of technological monitoring	Structures a network of external and internal technological facilitators	Structures a network of external and internal technological and human and social science (HSS) facilitators	Structures Experts clusters for open technological and HSS research	Structures open technological and HSS Research Centers with internal researchers and guests

### 3.2 BUILDING AN ACTION PLAN

The action plan is constructed according to the limitations identified during the diagnosis phase. The aim is to clarify the responsible innovation strategy and, from there, to define how to overhaul innovation governance and design activities.

## 3.2.1 Overhauling innovation governance

The overhaul of innovation governance concerns two aspects: "internal" innovation governance, involving the organisation of innovation within the company, and external governance, involving the organisation of the company's innovation



within its ecosystem, including suppliers, partners, etc.

### - Overhaul of internal governance

A company that wishes to effectively engage in a responsible innovation approach needs to think about how to organise itself so that its innovation escapes the pitfalls of conventional innovation presented in part 1 of this focus: a strong tendency to produce innovation that is mainly incremental; a frequent drift towards disruptive innovation whose objective is mainly commercial and which does not take into account the limited nature of the planet's resources.

The aim is to put in place governance making it possible to generate a more ambitious innovation in the collective interest, addressing social, economic and environmental difficulties, etc.

Our conviction at Square Management is that the nature of innovation governance must change in order to be able to produce new knowledge and skills that will be useful not only in the short term but also in the medium and long term. To this end, our recommendation is to structure innovation governance into 5 functions as described in figure 10.

A Research function (R): this function produces knowledge in a controlled manner. Research must answer the company's questions about sustainable technologies and about environmental, economic and societal phenomena. This research can be both quantitative and qualitative in nature, depending on the scientific disciplines involved. As responsible innovation takes place at ecosystem level, this Internal Research activity also steers forward-looking activities with partners. A Concept Research function (CR): this function produces responsible Concepts, including the identification and expansion of sustainable opportunities and the exploration of new sustainable revenues within the company and its partners.

A Concept Development function (CD): this function transforms responsible concepts into responsible experiences that correspond to as many environments and partners as possible. This is a key experimentation stage that measures the strength of adoption of the responsible innovation project.

A Development function (D): this function delivers sustainable solutions contributing to the transition while complying with deadlines, costs and risks and which delivers by generating the minimum possible impacts.

An Innovation function (I): this function orchestrates the entire responsible innovation process

Figure 10. Organisational description of the standard governance of responsible innovation. This type of organisation is inspired by the work of researchers at the Ecole des Mines<sup>37</sup>



<sup>37.</sup> P. Le Masson, B. Weil, A. Hatchuel, 2014. Théorie, méthodes et organisations de la conception. Transvalor Presses des Mines, Paris.



and coordinates the other 4 functions. Its role is to monitor, direct and decide. This function must lie at the heart of the new governance so that the company's activities are sustainable.

This new type of organisation for managing responsible innovation must itself be assessed and controlled in order to measure its contribution to sustainability. Purpose-driven companies have a mission committee to analyse the match between innovation work and the purpose. In addition, an Independent Third Party assesses every two years whether the company is compliant with its own reference framework to meet its commitments. If the company does not have purpose-driven company status, the Innovation function will be the main driver behind the responsible innovation process. In our opinion, this innovation orchestration function must give rise to an innovation committee in which general management participates. The role of this committee is to monitor, guide and decide which innovative projects will contribute to overhauling the company's business model so that it becomes sustainable.

Naturally, this organisation is endowed with specific innovation processes and design methods that we will look at in part 3.2.2.

For optimal results, this overhaul of "internal" governance to steer responsible innovation must be simultaneously accompanied by an overhaul of the governance of "external" innovation. In fact, responsible innovation can only be generated in Open Innovation and according to the rationale of an Innovation Ecosystem.

 An overhaul of "external" governance in order to be able to innovate responsibly at the level of the innovation ecosystem

The challenge of this overhaul is to structure a responsible innovation ecosystem. A company never innovates alone but in an ecosystem made

up of partners, suppliers, even public authorities, customers, etc. Governing responsible innovation thus means steering explorations of these stakeholders, with a view to creating convergences of profitable, sustainable and acceptable offerings.

Optimal "external" governance steers the convergence of interests common to all players in an innovation ecosystem. The innovation functions of the different stakeholders can then form an inter-company committee to conduct joint explorations.

The role of this inter-company innovation committee may also be to organise dialogue between the Research (R and CR), predevelopment and development activities of all the companies forming the ecosystem. The purpose of this steering is to align the members of the ecosystem with a common responsible innovation strategy and to share means and resources.

The two conditions for success are the definition of fair value sharing between stakeholders and the creation of ecosystem resilience, which requires solidarity between stakeholders. In the words of Kevin Levillain, this amounts to "managing two dimensions, expansion (of concepts) and solidarity" (p.147).

In reality, the innovation committee dedicated to the challenges facing the ecosystem in each company also steers all co-development partnerships for its own company. In addition to other companies, partnerships are created with schools, universities, colleges, institutions, coopetitors, media, influencers, etc. The dedicated committee manages all relationships to structure an ecosystem aimed at sustainability.

Finally, the innovation committee must identify the role of the company within the ecosystem for all responsible innovation issues. Is the company in a position to guide the responsible innovation ecosystem? Is it an innovative contributor to this ecosystem? Is it a subcontractor of this ecosystem?

Once the role of the company is identified within the ecosystem, the challenge is to assess the value and nature of its contribution at the chosen frequency. In a purpose-driven company, the purpose monitoring committee can also play an advisory role on ecosystem issues. In order to pursue sustainability, the governance of the responsible innovation ecosystem must address issues relating to steering the 5 types of challenges: financial challenges, inventive and economic challenges, organisational challenges, technical and legal challenges and finally, reputational challenges. Below is an illustration of the players and challenges structuring a responsible innovation ecosystem (see figure 11).

Figure 11. Steering the innovation ecosystem in the pursuit of responsibility



### 3.2.2. Overhaul of design activities

As regards their design activities, companies often face two types of difficulties: on the one hand, difficulties related to the inappropriate or incomplete application of innovation processes; on the other hand, difficulties related to the methods used in design activities. This section 3.2.2. provides a few recommendations to overcome these two types of challenges as part of an overhaul of design activities aimed at developing responsible innovation. These recommendations are based on the belief that responsible innovation must, in the same way as "other" design initiatives, be carried out according to a sequenced "pathway" of exploration, pre-development, development and deployment. In order to generate responsible innovation, however, it is necessary to redefine the objectives and methods used in each of the different phases of this innovation pathway.

The exploration phase is the phase in which new ways for creating economic value for the company are created. To be part of a responsible



innovation approach, this exploration phase will aim either to identify ways for optimising and reducing impact, or to seek new responsible offers, or to design new sustainable business models. The overhaul of this exploration phase as part of a responsible innovation approach aims to no longer leave conceptualisation activities to chance or to a few creative talents campaigning for a more sustainable economy but, on the contrary, to formalise and mechanise the collective innovative design effort aimed at sustainability.

Responsible innovation requires the design of very new and disruptive objects outside normal frameworks of thought. We believe that the C-K theory is particularly well adapted to this exploration phase as part of the responsible innovation pathway.

The pre-development phase is aimed at encouraging the adoption of innovative offerings. This phase involves measuring and maximising internal (within the company) and external (suppliers, partners, etc.) adherence to the innovative project in order to estimate and increase its profitability potential. The pre-development phase is intended to reduce the uncertainty inherent in the introduction of innovation: it mobilises sociological tools and leads to the design of a Minimum Viable Ecosystem as described in part 1. In a responsible innovation pathway, this phase is particularly critical: it involves validating whether the responsible orientation of the innovative project is sufficiently "attractive" to bring about an innovation that will be both profitable, sustainable and acceptable. Many projects and ideas with responsible ambitions cannot become responsible innovations because they do not succeed in attracting internal and external support. Square Management recommends, in this pre-development phase, using a new approach to the economic steering of innovation: the Full Value model<sup>38</sup>, for which the firm also proposes an ad hoc approach<sup>39</sup>.



<sup>38.</sup> Benjamin Blanchard, Tony da Motta Cerveira, Rémi Maniak, Christophe Midler. Full Value: de l'évaluation au pilotage de la création de valeur des innovations. Innovation Design/Polytechnic Project Observatory, 2019



<sup>39.</sup> Tony da Motta Cerveira, Julien Borderie. Focus pilotage économique des projets innovants. Square Management, December 2020.

The development phase is a technical, experiential and economic specification phase with a view to its industrialisation. Adopting a responsible innovation approach results in a significant change in the way in which this development phase is conducted. This involves adjusting agile development methods so that they become sustainable, for example<sup>40</sup>. It involves integrating the constraints of digital sobriety linked to future uses of the innovation. It also involves taking into account the environmental and social constraints in the design of industrial manufacturing processes. It obviously also means taking into account new methodological approaches to fractal innovation (seen in part 1).

The deployment phase is a follow-up and design phase ranging from industrialisation to the launch of the innovative product and the first round of market feedback. The aim is to adapt the innovative product to maximise its value for all players in the ecosystem. In a responsible innovation approach, this deployment phase aims to increase the scope and impact of responsible innovation so that it can transform the company's ecosystem as much as possible. In the context of deploying a responsible innovation, the challenge is to be as transformative as possible, in other words to convert a maximum number of stakeholders to sustainability and to include as many excluded players as possible.

### Figure 13. Responsible innovative design methods and ambitions



<sup>40.</sup> https://www.alliancy.fr/concilier-agilite-innovation-responsable

## · ( THE C-K THEORY

The C-K theory was initially developed by the École des Mines de Paris in the late 1990s, under the direction of Armand Hatchuel and Benoît Weil<sup>41</sup>, researchers at the CGS. Today, the C-K theory is used by "Upstream Engineering" teams and innovation departments in many companies. It is taught at prestigious universities and grandes écoles including Stanford and the École Polytechnique. It constitutes the most robust approach to ecodesign. There is consensus that this is the only scientific approach that explores by rationally integrating technological, economic, sociological, environmental and legal variables. The C-K theory is not reserved for specific business sectors or unique design situations. It is also used by EDF, SAINT-GOBAIN and BNP Paribas, in the design of both services and products.

Its success is explained by its formalism, which makes it possible to break the fixation effect<sup>42</sup>. The fixation effect is a cognitive bias that limits our creative ability. Take, for example, the standard experiment used by the CGS researchers to illustrate the fixation effect. Different audiences were asked to solve a simple problem: "Imagine as many solutions as possible, as varied and as original as possible, to ensure that a chicken egg dropped from a height of ten metres does not break." Regardless of the training of the innovators ~80% of their concepts were "restrictive". All respondents followed the same three generic paths: cushioning the shock, protecting the egg and slowing the fall. The respondents were unable to think outside of an agreed logic that prevented the resolution of new problems, and proposed few different approaches. One of the lessons of the C-K theory is that the fixation effects can, in particular, be limited if the group follows an intensive learning approach before formalising proposals. Learning then becomes the driving force behind conceptualisation. By learning new things, it is possible to formulate new things. The ability to generate ideas is directly linked to the ability to learn. This explains the name of the theory: Concept – Knowledge.



<sup>41.</sup> https://www.cgs.minesparis.psl.eu/presentation/chairetheorieetmethodesdelaconceptioninnovante/



<sup>42.</sup> Marine Agogué, Mathieu Cassotti. Understanding fixation effects in creativity: a design-theory approach. 6th Workshop of the Special interest group on Design Theory of the Design Society, 2013, Paris, France.

4.

## CONCLUSION

The idea of writing this focus came about as a result of the observation that companies are now frequently questioned about their purpose and their raison d'être. Faced with emergencies linked to the climate transition, their role can no longer solely be to generate profit. They must now contribute to the energy transition and, more broadly, play a positive role in the social and environmental challenges of today's world. This calls into question the company's entire strategy and all its key functions: not only CSR, HR and compliance but also finance, marketing, operations, the supply chain and innovation, which, through its central role in building the company's future, has a key role to play in transforming the company's business model towards greater sustainability.

This focus has targeted the exploration of responsible innovation. The first part showed that the concepts of innovation and responsibility were for a long time kept separate: academic works on innovation did not include the imperatives of responsibility. It was only from around 2010 that academic works on responsible innovation began to appear. Similarly, a concrete analysis of the innovations produced by companies in recent decades shows that innovation has tended to accentuate the unsustainable nature of the global economic model.

The second part of this focus offered a definition of Responsible innovation. We believe that innovation is responsible when it combines three characteristics: profitability, sustainability and acceptability. In light of the analysis of various academic works, we believe that in order to be able to pursue this objective of responsibility and combine the characteristics of profitability, sustainability and acceptability, companies must, at the same time, transform the governance of their innovation by taking sustainability objectives into account in their purpose and in the goals they entrust to their innovation, and transform their design practices and methods.

The third part of the focus set out the recommendations of the strategy and organisation consulting firm Square Management for companies wishing to adopt responsible innovation. This part proposed an approach consisting of three successive steps: a diagnosis of the existing situation, an action plan aimed at transforming the company's innovation into responsible innovation and support for deployment. The authors of this focus are convinced that responsible innovation is a major issue for companies. There can be no sustainable business model without the innovation function becoming "responsible". Similarly, making innovation responsible is a powerful driver for internal transformation within the company, both for managers and employees. It makes it possible to "anchor" the theme of responsibility at the very heart of the company's strategy and contributes to overcoming the ever-present risk of making only marginal adjustments to the business model, insufficient in view of the issues at stake.





Founded in 2008, Square Management is a strategy and organisation consulting group including 9 firms in France, Belgium and Luxembourg. Adway, Circle, Flow&Co, Forizons, Initio Belgique, Initio Luxembourg, Tallis, Vertuo and Viatys are consulting firms specialised by profession, business sector or level of intervention.

This unique and specific organisation fosters proximity, commitment, agility and expertise within each firm. The complementary nature of the firms, employing more than 800 consultants, enables Square Management to address its clients' most complex projects. Square Management advises its clients by providing them with expertise in 9 key areas.

### DATA

Square Management develops Data strategies and ensures their operational implementation through the management of Data Management, Data Analysis and Data Science projects. Our expert and pragmatic approach aims to enhance and secure companies' data assets.

### **DIGITAL & MARKETING**

Square Management advises companies in all sectors in developing their digital strategies and marketing strategy, improving their customer experience, optimising the performance of their business model and maximising the use of digital technology in their marketing practices.

### **ENTREPRISES & FINANCE DURABLES**

Square Management helps clients in the financial sector take sustainability risks and new regulations in this field into account. Drawing on this experience and on the expertise of other DOMEX, the firm helps companies in all sectors to articulate and implement their sustainability strategies.

### INNOVATION

Square Management helps its clients transform their innovation process. Our consultants adopt a tailored approach to help clients design, industrialise and govern their innovation to ensure the sustainable growth of their company and its transformation into a socially and environmentally responsible entity.

### **ORGANISATION & EFFICIENCY**

Square Management helps its clients to improve the efficiency of their organisation and processes and to better steer their performance and their major transformation programmes.

### **PEOPLE & CHANGE**

Square Management helps its clients acquire, unite and develop the human capital of their organisation. In order to create more engagement within teams, our work focuses chiefly on adapting working methods to operational and cultural changes, the effectiveness of human resources departments and the development of skills.

#### **REGULATORY & COMPLIANCE**

Square Management advises its clients in the implementation of new regulations, as well as in the optimisation and strengthening of control systems. This area of excellence relies on a community of 130 expert consultants who, in addition to their work with clients, also carry out important investigative and publication work.

#### **RISK & FINANCE**

Square Management oversees financial and nonfinancial risk management programmes, as well as the transformation of Risk and Finance functions in the face of changes in prudential systems and the emergence of data management issues.

### **SUPPLY-CHAIN**

Square Management supports manufacturing and service companies in the design, deployment and optimisation of their supply chain, from purchasing to the last mile. Our experts implement best practices in terms of logistics, digital technology and data in order to guarantee operational excellence in the supply chain and fulfil the promises made to end customers.

This focus on responsible innovation consists of three parts. The first shows that corporate innovation theories and strategies for a very long time ignored sustainability concerns; on the contrary, innovation tended to reinforce the unsustainable nature of the business model. Only very recently have innovation theories and strategies begun to include sustainability concerns. The second part provides a definition of responsible innovation and describes the different forms that responsible innovation can take. The third part presents recommendations for companies wishing to engage voluntarily in responsible innovation; these recommendations concern both the governance of innovation in the company and design methods. This focus illustrates the expertise developed by Square Management within its "Innovation" area of excellence.



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