

PART 1

The Relationship between Innovation and Export in SMEs

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The Innovation–Export Relationship: A Complex Vision

The relationship between innovation and export is the subject of particular attention, both in the professional and academic worlds. Several studies have shown that innovative companies are also those most present internationally, and vice versa. However, the support systems dedicated to these activities tend to offer differentiated support, exclusively oriented towards either innovation or export. Moreover, within the companies and organizations themselves, the people in charge of one or the other activity are different. Thus, from an operational point of view, the vision of innovation and export remains relatively compartmentalized, although there is a tendency to combine support systems dedicated both to innovation and export. These trends are linked to the theories mainly developed in the scientific literature adopting a causalist vision of the innovation–export relationship. However, this causal vision is sometimes challenged by empirical studies in favor of another vision in terms of complementarities, which tends to show that innovation and export form a virtuous circle that creates synergies. This chapter, therefore, puts into perspective the operational difficulty of implementing an innovation–export relationship in business support with regard to the theories mobilized in the academic world. The underlying complexity of the innovation–export relationship thus encourages a paradigm shift away from the causalist system towards a vision in terms of synergies favoring emergence.

1.1. The innovation–export link: a controversial debate

1.1.1. *In the industrial world: a compartmentalized vision*

When you look at the numbers, it turns out that innovative SMEs (i.e. companies driving both product/process/service innovation and organizational and business innovation) are more likely to be engaged in global markets than non-innovative companies. A report on the behavior of European SMEs (FedEx 2015) shows that fast-growing SMEs were almost twice as likely to export as declining or stagnant SMEs. At the European level, a survey from the OECD (2009) shows that internationally active SMEs are three times more likely to introduce new products or services than their purely domestic counterparts, and they grow more than twice as fast. From 2012 to 2014, innovative companies were more numerous among exporting structures than non-exporters, with the gap being greatest in the case of product and process innovations. Exporting SMEs thus introduced twice as many product and process innovations as non-exporting SMEs (OECD 2018). Outside Europe, this trend also appears to be similar. For example, in 2011, it was reported that 60% of Canadian exporting SMEs introduced at least one type of innovation (product, process, organization or marketing) versus only 35% of non-exporters (Seens 2015). Thus, the numbers speak for themselves, and it appears that small innovative companies have a greater international presence and vice versa.

This observation suggests the existence of a close relationship between innovation and export activities, which has indeed been identified both in the scientific literature and at the institutional level. Moreover, for several years now, there has been a tendency to propose a coupling of innovation and export support systems (European Commission 2007). This is what Love and Roper (2015) highlight in their study, insisting on the importance of considering the systems jointly to maximize their joint benefits. They also recommend offering coordinated support with a single agency responsible for both innovation and export. However, this type of study is still not widespread. Indeed, it would seem that despite the potential benefits of an innovation–export coupling in support of SMEs, few export support systems integrate an innovation dimension. They are generally concentrated almost exclusively on aspects related to international trade.

These observations are indeed confirmed by the field. A comparative study integrating a hundred or so internationalization¹ support systems worldwide (Enjolras *et al.* 2015) highlights several observations. First of all, these systems are of different natures. They offer companies several types of support: awareness/information, financial support, promotion of the information, financial support, network promotion or individualized support.

For the remainder of this study, we define the following notations:

- I: represents the type of support “provision of information”;
- F: represents the type of “financial” support;
- N: represents the type of support “networking”;
- In: represents the type of “individualized” support.

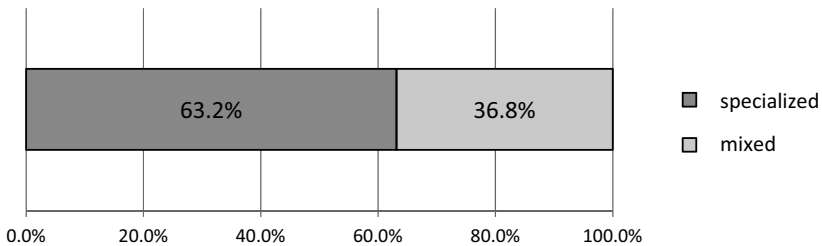


Figure 1.1. *Distribution of mixed/specialized systems (Enjolras et al. 2015)*

It is important to note that a single facility may offer several types of support. Each facility may, therefore, appear in more than one category. Figure 1.1 shows the distribution of specialized programs, that is, those offering only one type of support, compared to mixed programs offering two or more distinct types of support. A clear majority of export support systems offer specialized support (63.2%).

Figure 1.2 shows the distribution of systems by the four types of support considered. In this figure, mixed systems appear in more than one category, as they offer several types of support. For example, 50% of the systems surveyed provide information to businesses. Next, 41% of the systems offer

¹ This comparison mainly includes support systems for internationalization (and therefore not exclusively for export) aimed at SMEs, although some are also aimed at all types of companies.

financial support. Finally, systems offering individualized support or promoting networks represent 35.8% and 27.4%, respectively.

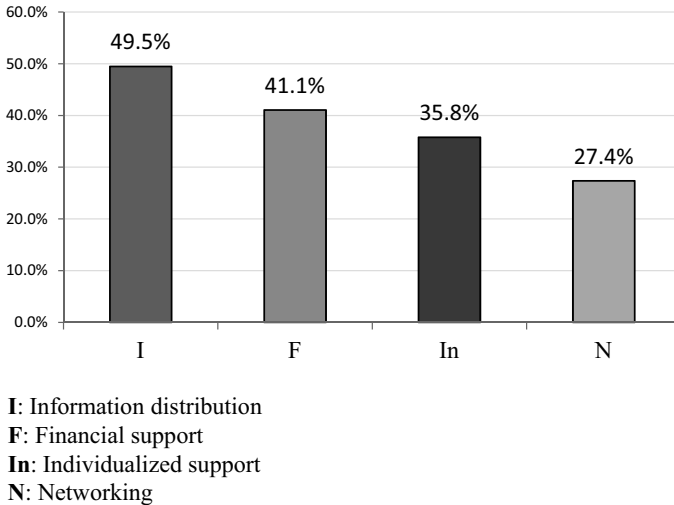


Figure 1.2. *Distribution of systems according to the four types of support (Enjolras et al. 2015)*

In view of these results, it appears that the support systems for internationalization are mainly oriented towards the dissemination of information and financial support. This result is interesting because it highlights the strategic points on which the support organizations act as a priority. Thus, it is a question of rather punctual support, aiming either at sensitizing the SME to the problems of the international markets or at proposing financial assistance to them, allowing them to increase their available resources in the short term. This is in line with the conclusions of Seringhaus and Rosson (1990), who consider the measures proposed by export support organizations to be mainly incentive-based. In addition, most of the support systems are specialized in a particular type of support. This specialization potentially multiplies the number of actors involved in business support and can make access to the systems more complicated.

As regards the inclusion of innovation in export support systems, the majority of these systems appear to be compartmentalized. Of the hundred or so systems identified, only 11% include an innovation dimension. The tendency to combine export and innovation support systems identified in the

literature is, therefore, still not widespread at the global level, from an operational point of view.

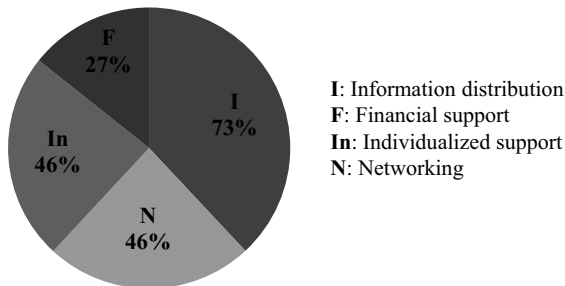


Figure 1.3. *Distribution of joint innovation–export support systems by the four types of support (Enjolras et al. 2015)*

According to Figure 1.3, within the joint innovation–export support systems, information distribution (I) again seems to be the most important type of support (73%). However, network promotion (N) becomes much more important (46%). It is possible to explain this increase, as the ability to network is a very important impact factor both for innovation performance (Chesbrough 2003; Nieto and Santamaría 2010; Zeng *et al.* 2010) and internationally (St-Pierre *et al.* 2011; Child and Hsieh 2014; Hohenthal *et al.* 2014), and especially for SMEs. It, therefore, seems relevant to propose support acting on this dimension in particular. On the other hand, financial support (F) loses much of its importance (27%) in joint innovation–export support systems. Personalized support, on the other hand, increases in relation to the values reached by purely export-oriented systems. Finally, the study highlights the systems, including an innovation dimension, that tend to combine several types of support; they are mostly mixed (see Figure 1.4).

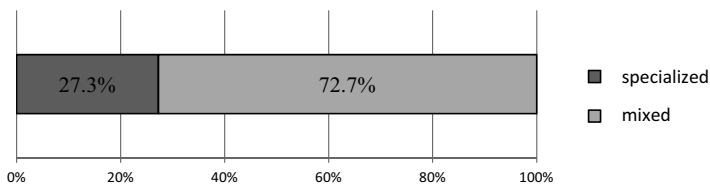


Figure 1.4. *Distribution of joint innovation–export support systems by specialization or not (Enjolras et al. 2015)*

The profile of joint innovation–export support systems is, therefore, different from that of “traditional” support systems. The latter are oriented towards incentive and rather short-term support, whereas joint systems seem to favor networking and individualized support. They tend to offer several different types of support and seem to provide SMEs with diversified and longer-term contributions through the acquisition of sustainable resources and skills.

However, it is important to specify that “traditional” support systems, which are more short-term-oriented, are not less suitable for supporting SMEs than “joint” systems, which are oriented towards the acquisition of long-term skills. A study by Francis and Collins-Dodd (2004) highlights the fact that the impact of support systems is not the same depending on the degree of international involvement of SMEs. The reason is simple: the needs are not the same. Indeed, depending on their degree of internationalization (Kotabe *et al.* 2002), SMEs mobilize different resources, skills and strategies, and the obstacles they encounter are not the same. The role of support systems must, therefore, vary according to this degree of internationalization (Catanzaro *et al.* 2013). Thus, the first stage of international commitment requires that SMEs be made aware of the benefits of and approach to internationalization in order to consider their launch on foreign markets. The “traditional” support systems, and therefore incentives, are perfectly appropriate for a degree of a low level of commitment. On the other hand, the more SMEs increase their level of commitment to internationalization, the more they need to acquire resources and strategic skills. The joint innovation–export support systems, therefore, seem more appropriate in this case, but in view of the low level of commitment, they are not as appropriate. This common vision represents a way of encouraging the development of a new type of business model. This joint vision is indeed an interesting way of managing the complexity of companies and takes on its full importance in the particular context of SMEs, for which the available resources are limited (Szczepanski 2016).

1.1.2. *In the academic world: a causalist vision questioned*

1.1.2.1. *Self-selection or learning-by-exporting?*

The innovation–export relationship is a very important area of research in the current scientific literature. The dominant paradigm under which this relationship is studied can be described as causal, as it emphasizes a causal

relationship between innovation and exporting (Love and Roper 2015). Innovation would have a positive effect on exporting and, similarly, exporting would impact innovation. Traditionally, two theories coexist: “self-selection” and “learning-by-exporting”, and each promotes an opposite direction of causality. Is it innovation that impacts export or export that impacts innovation?

The self-selection theory is based on an assumption that innovation makes it easier for companies to reach the international market (Roper and Love 2002; Monreal-Pérez *et al.* 2012; Boso *et al.* 2013; Dai *et al.* 2019; Ribau *et al.* 2019). This is the majority accepted theory in the scientific community. It is therefore supported by a large number of publications. Thus, according to this theory, innovation confers a competitive advantage to the company, which allows it to acquire a higher general performance and to improve the optimization of its resources. Innovation thus allows companies to be more competitive in foreign markets and facilitates their internationalization. Innovation thus appears to be a necessary condition for exporting (see Figure 1.5).

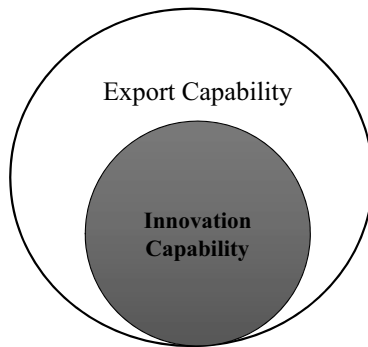


Figure 1.5. Graphical representation of the self-selection theory

Several empirical studies have been carried out to test this theory with panels of companies of various sizes, sectors of activity and geographical areas. For example, Pla-Barber and Alegre (2007) validate self-selection through a study of 120 French companies of all sizes from the biotechnology sector. Similarly, Roper and Love (2002) also studied the impact of innovation on the international performance of German and British companies. The main conclusion is that the nature of the impact of innovation on exports depends on the context of the company (country of origin, size and sector of activity).

These findings are confirmed by Altomonte *et al.* (2013). It is important to note, however, that in both of these studies, innovation is considered only from the perspective of product innovation.

Thus, in addition to the context in which the company operates, the type of innovation considered also seems to have an impact on the nature of the innovation–export link. Indeed, van Beveren and Vandebussche (2010) emphasize the importance of the correlation between product innovation and process² innovation. Introducing a new product or process separately does not significantly encourage exporting, but introducing both simultaneously has a stronger positive impact (Becker and Egger 2013). Thus, companies prepare for entry into foreign markets by reducing costs (process innovation) and increasing product quality (product innovation). Caldera (2010), however, puts forward somewhat different results, indicating that, in general, innovation promotes exporting in companies, but that process innovations have a smaller impact than product innovations. This result can be explained by the fact that product innovation allows for strong differentiation from competitors in foreign markets as well as better product quality, which provides a greater competitive advantage than process innovation, whose objective is rather to reduce costs.

Concerning SMEs in particular, the innovation–export link is also validated by various articles (Cassiman *et al.* 2010; Cassiman and Golovko 2011; Higón and Driffield 2011) in the context of product innovation. Le Roy and Torrès (2001) propose an additional element by proving that the positive impact of product innovation on the international activities of SMEs does not depend on the geographical area of the target market. The hypothesis that the context impacts the innovation–export relationship is thus qualified by these results.

In general, while self-selection is a theory that is widely accepted in the literature, it is also regularly discussed. Bellone and Guillou (2013) analyze the innovation–productivity–export link. The main result is that innovation is not the only cause of productivity and export gains. Other factors must be taken into account. On the other hand, Deng *et al.* (2014) consider that the link between

²“Process innovation” means the implementation of a new or significantly improved production or delivery method (including significant changes in techniques, equipment and/or software). By extension, process innovation also refers to new improvements in the way products are delivered to customers.

innovation and export can be negative and that it is necessary to take into account the heterogeneity between companies. They show that, for Chinese industrial companies, innovation has a positive impact on export intensity, but its impact is not necessarily positive for survival in foreign markets. Finally, Oura *et al.* (2015) also test the impact of innovativeness on the export performance of Brazilian SMEs. They argue, however, that innovativeness is mainly considered a key factor in improving companies' performance in foreign markets, but little attention is paid to inter-country experience as an equally important factor as innovativeness. They prove that international experience has a greater impact on export performance than innovative capability.

Thus, self-selection appears to be a widely accepted theory considering innovation as a necessary condition for SMEs to export. However, many studies highlight the fact that it is above all a necessary condition, but not sufficient, to ensure the sustainability of the international activities of SMEs. This is highly dependent on factors linked to the type of innovation considered, the context in which companies evolve and their heterogeneity. Moreover, this theory is counterbalanced by another theory emphasizing the importance of international experience: learning-by-exporting.

The theory of learning-by-exporting is based on the assumption that exports lead to improved innovation within a company, as well as its performance more generally (Kafouros *et al.* 2008; Golovko and Valentini 2014; Fassio 2018; Di Cintio *et al.* 2019). The discovery of a foreign market allows the company to acquire a large amount of information and knowledge. This acquired knowledge pushes the company to adapt and therefore innovate to maximize its success both in this new market and in its domestic market. It is, therefore, a contributing factor to an organization's innovation capability (see Figure 1.6).

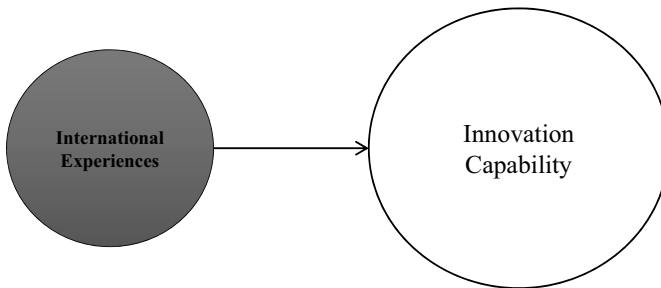


Figure 1.6. Graphical representation of learning-by-exporting

Lileeva and Trefler (2010) take this view. Their findings indicate that in Canadian industrial companies, access to foreign markets favors innovation and, in particular, product innovation. The learning-by-exporting theory also seems to depend on the type of innovation considered. Thus, international experience could have a greater or lesser impact on the company's innovation capability, depending on the type of innovation undertaken.

Thus, the effects of learning-by-exporting would only be visible under certain conditions. Kafouros *et al.* (2008) give the main implications of exporting for innovation capability and appropriation of innovation. The notion of threshold is discussed: exporting only positively influences innovation (and more particularly the return on investment of innovation) if the company's international activities reach a certain threshold, called the "degree of internationalization".

Learning-by-exporting, as a mirror theory of self-selection, is also discussed by many authors and appears not as a necessary condition for innovation but as a catalyst whose effects are multiplied 10-fold under certain conditions. While the question of the type of innovation always seems crucial, the notion of context is only very rarely addressed as a differentiating factor. These two theories, therefore, coexist in the literature, both reflecting a certain vision of the innovation–export relationship, based on causal thinking in terms of impact.

1.1.2.2. *A two-way relationship: towards a virtuous circle*

While the majority of studies of the innovation–export nexus focus on a definite direction of causality (self-selection or learning-by-exporting), several authors have tested the hypothesis that causality between innovation and export can be bidirectional. This means that self-selection and learning-by-exporting theories could coexist as a virtuous circle (Cassiman and Golovko 2011; Halilem *et al.* 2014; Zehir *et al.* 2015; Ayllon and Radicic 2019).

However, these investigations show results that are sometimes surprising. For example, Damijan *et al.* (2010) propose an empirical test of the two-way innovation–export relationship in Slovenia. The results confirm that exporting encourages process innovation, but the other hypotheses are not significant enough to be verified. The results seem to hold only for medium and large companies. It is interesting to note that the results of this study are rather contrary to the elements put forward by other authors

studying one or the other of these two theories: product innovation does not seem particularly significant, and the SME context does not seem to be conducive to a bidirectional relationship. Similarly, Monreal-Pérez *et al.* (2012) study the bidirectional link between innovation and exporting in Spanish industrial companies. They test both hypotheses simultaneously: self-selection and learning-by-exporting. Their results show that exporters develop more innovation activities and invest more in R&D. They develop and accumulate more knowledge and skills than exporters. They develop and accumulate more product innovations. According to them, innovation has a positive impact on exports. However, the learning-by-exporting hypothesis is not validated in their study. One explanation: geographical and cultural distance, which favors learning-by-exporting, does not play a major role in this study, as Spain largely exports to culturally close European Union countries. This reinforces the place of the degree of internationalization as a trigger for the “international experience” catalyst. Exporting to culturally close countries reflects a low degree of engagement in international markets and thus minimizes the effects of learning-by-exporting. Thus, these results do not call into question the bidirectional link between innovation and exporting but rather characterize it conditionally.

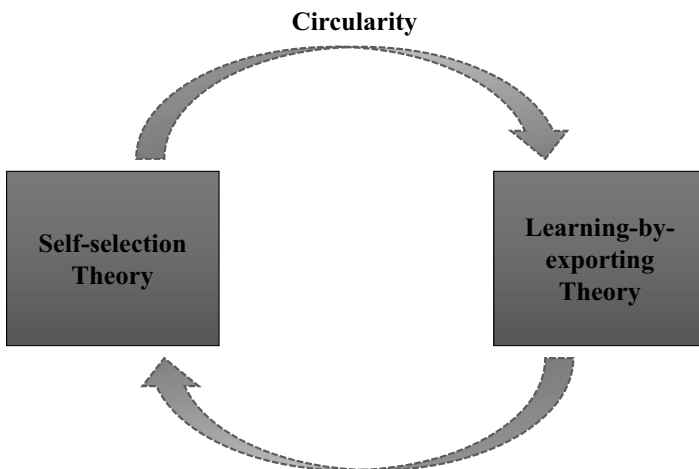


Figure 1.7. Graphical representation of the bidirectional innovation–export relationship

Some authors shed additional light on this potentially bidirectional relationship. Halilem *et al.* (2014) propose a study of Canadian industrial

SMEs and empirically validate the bidirectional link between innovation and internationalization. This study considers product and process innovation, as well as import and export. It, therefore, adopts a broader scope than learning-by-exporting. Following this logic, Damijan and Kostevc (2010) propose another study in which they investigate the theory of learning-by-trade in Spanish companies (also including importing and exporting, not just exporting). This study led to the proposal of a sequence: import/innovation/export/innovation (1) or export/innovation/import/innovation (2). Sequence (1) was chosen because the empirical results seem more significant. Importing encourages companies to innovate (product and process innovation, but especially product innovation) and to start exporting. Finally, exporting is introduced by innovation and ultimately leads companies to launch new products, but not necessarily new processes. This is also true for small companies.

Thus, innovation seems to have a positive impact on export performance (especially product innovation), and exports also seem to improve the innovative capacity of SMEs with a specific temporality. They point out that self-selection and learning-by-trade can coexist as a temporal sequence. Finally, Filipescu *et al.* (2013) propose a study that concerns the reciprocity between exporting and innovating in the Spanish context. Exporting is measured in two categories: the extent of exporting activity and its intensity. Innovation is represented by product and process innovation and by R&D intensity. The main conclusion is that the impact of innovation on export is not an exact mirror of the impact of export on innovation. There is a mutual reinforcement of export and innovation (Filatotchev and Piesse 2009), but this reinforcement takes a different form depending on the direction considered. This study provides an interesting perspective on the impact of one activity on the other. It highlights that the link between innovation and exporting does not seem to be limited to a simple mirror effect.

Thus, the bidirectional causal relationship between innovation and export seems to exist under certain conditions (temporality, degree of commitment to international business) and according to differentiating factors (company size, type of innovation, context). These observations and the complex thought they suggest concerning the nature of the link between innovation and export pave the way to other hypotheses that allow us to go beyond the cause-and-effect relationship and move towards an alternative vision.

1.1.2.3. *Complementarity: an alternative way out of the causalist paradigm?*

Some studies concerning the innovation–export link propose to go further in the reflections carried out by adopting a different vision of the links between these two activities. These authors try to show that in the case of SMEs, innovation and exporting are complementary: if a commitment is made to one of these activities, it facilitates the commitment to the other via synergy effects.

The results of Golovko and Valentini (2011) show that Spanish manufacturing SMEs that invest in both innovation and exporting enjoy better growth than those that invest in either innovation, exporting, or neither. The return on investment in one activity increases with the level of performance of the other activity. However, Ayllon and Radicic (2019) found that while complementarity between innovation and exporting exists, it subsists only in contemporaneous effects. Their results suggest no evidence of a link between past product and process innovations and current export activity. Thus, temporality again appears to be a key factor to consider.

The academic view of the innovation–export relationship paves the way for many hypotheses, both in terms of determining factors and in terms of the vision to be adopted. It is, therefore, difficult to identify a real consensus concerning the link between innovation and export. While the majority of studies consider this link in causal and directional terms, certain forms of alternative relationships are also envisaged, putting forward the notions of a virtuous circle (bidirectional relationship) or complementarities. Generally speaking, and whatever the vision adopted, this relationship seems to be more or less strong depending on the context in which the company evolves, its size, its degree of commitment to international business and the type of innovation considered. For SMEs, it would seem that product innovations are very largely discriminating. They appear before they enter the foreign market (self-selection), as well as later and in a more important way (learning-by-exporting). Thus, the notion of temporality, or even of temporal sequence, also seems essential. This review of the literature thus highlights that, in the context of SMEs, innovation cannot be considered as a simple condition for exporting. Similarly, exporting cannot be limited to a prerequisite for innovation. The relationship between these two activities is

much more complex than that and deserves an in-depth analysis that goes beyond a simple cause-and-effect relationship.

1.2. Towards a paradigm shift

SMEs, like all forms of organization, are confronted with complex problems, that is, problems with numerous interactions, in which different frames of reference/systems of thought coexist, and for which the interweaving of interpersonal relations, techniques and managerial practices is indispensable. Innovation and exporting are examples among many others. Moreover, it has been shown previously (see section 1.1.2.3) that these two activities have strong links, which seem to go further than a simple cause-and-effect relationship. However, the study of this link largely remains confined to an academic issue, adopting a dominant causalist thinking and giving rise to numerous hypotheses that have not yet found a consensus. In practice, therefore, the link between innovation and export remains rare and difficult to operationalize in the support offered to SMEs.

The objective of this section is, therefore, to propose a new paradigm adapted to the operational context of SMEs and offer an alternative to the analytical vision of treating innovation and export separately within companies. The aim is to promote a systemic vision, taking into account the interactions and complementarities between these two entities. To do this, it is necessary to rely on the theoretical foundations of the systemic and complex approach and then to apply the main precepts to the management of innovation and export in the context of SMEs.

1.2.1. *Moving from analytical thinking to complex thinking*

1.2.1.1. *The strength of systems theory*

The development of Western thought and science is based on a rationalist and analytical tradition. It is considered a universal reference. However, this superiority of the rationalist tradition is largely questioned by the systemic approach. This approach is based on the notion of system, which, according to Joël de Rosnay (1975), can be defined as “a set of elements in dynamic interrelation, organized according to a goal”. It is a conceptual tool capable of helping to solve a complex problem (Yatchinovsky 2012).

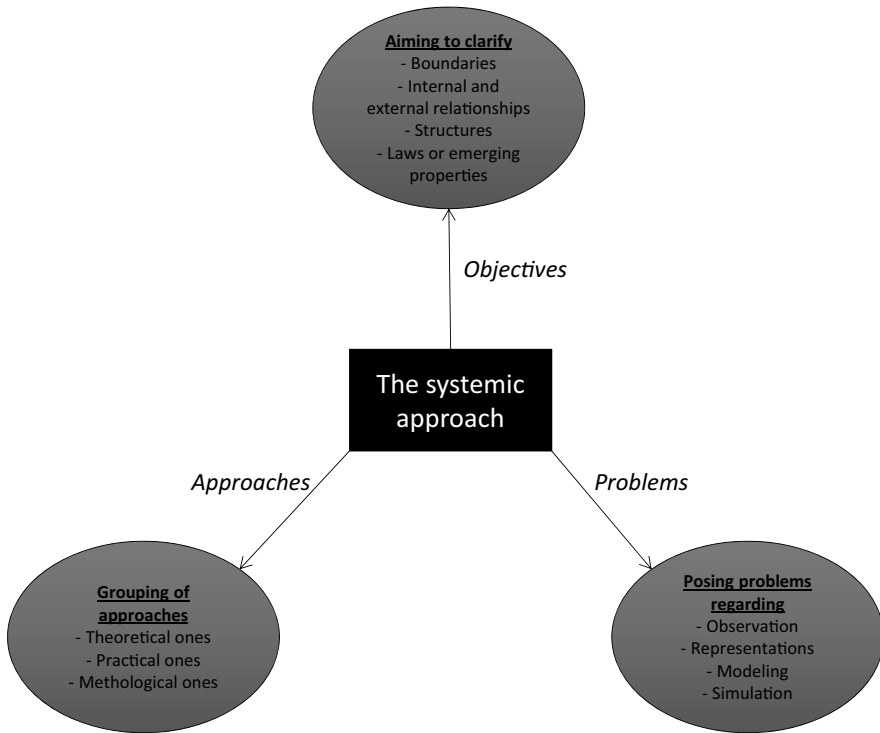


Figure 1.8. Definition of the systemic approach, inspired by (Durand 2006)

The systemic approach emerged from three precursor scientific movements (Durand 2006):

– structuralism, introducing the notion of structure as a basis for reflection. This movement is used in particular in the human sciences (linguistics, anthropology, psychology, etc.);

– cybernetics, coming from the Greek *kubernesis*, reflecting the action of directing, of governing. Cybernetics, or the “science of governance”, represents a crossroad that has seen the emergence of numerous discoveries from various scientific fields. It has contributed, along with structuralism, to the emergence of the concept of organization and has fostered the exchange of ideas between specialists from various disciplines;

– information theory, which developed at the same time as cybernetics, and which was even considered as a part of the latter before seeing its field of research widen considerably.

Thus, in 1985, the French college of systemics gave a definition of it schematized by Figure 1.8.

1.2.1.2. *A systemic rationalism opposition*

The systemic approach is opposed to the rationalism expressed in Descartes's *Discourse on Method* (1637). It is based on four fundamental precepts:

The first was never to accept anything as true unless I knew it to be true, that is to say, to carefully avoid haste and prevention [...]. The second was to divide each of the difficulties that I would examine into as many parts as I could and would be required to better resolve them. The third was to conduct my thoughts in order, beginning with the simplest and easiest to understand objects, and then to ascend little by little, as if by degrees, to the knowledge of the most complex [...]. And the last one to make everywhere such complete enumerations and such general reviews that I would be sure not to omit anything.

Rationalist precepts	Systemic precepts
Evidence	Relevance (in relation to the researcher's findings)
Reductionism (analysis)	Globalism (taking the system's environment into account)
Causalism (linear reasoning)	Teleology (system's behavior research)
Exhaustiveness	Aggregativity (for a simplifying representation)

Table 1.1. *Comparison of rationalist and systemic precepts (source: Le Moigne (1994))*

In his book, Le Moigne (1994) contrasts Descartes's four precepts with the precepts of the systemic approach (see Table 1.1):

– relevance (as opposed to evidence) consists of considering something as true in relation to explicable purposes. The perception of an object changes according to the intentions of the modeler;

– globalism (as opposed to reductionism) challenges the supremacy of analysis. It is about considering an object as a part included and active in a larger whole, an environment. It is about putting forward the notion of emergence by considering that the whole is more (or less) than the sum of its parts, according to Aristotle’s maxim;

– teleologism (in opposition to causalism) consists of questioning the causalist thinking according to which the world is endowed with a structure, an order, and this structure incorporates invariant laws of cause and effect. Causalist thinking proposes reasoning in terms of necessary and sufficient conditions and in terms of linearity. The teleological precept, on the contrary, proposes a reflection on the behavior and the finalities of the object as well as on the resources that it mobilizes. It is a question of considering that the relation between two elements is not a simple causal action of A on B; it comprises a double action of A on B and of B on A;

– aggregation (as opposed to exhaustiveness) challenges the principle of exhaustiveness, which is difficult to achieve in reality. This precept proposes to accept the differences and variability of situations, not by “omitting” elements but by voluntarily and explicitly aggregating them.

These four precepts, therefore, call into question the rationalist and analytical approach in favor of a systemic and complex vision. It is, therefore, on these four precepts that we will base the proposal of a new paradigm for the understanding and joint management of innovation and export within SMEs.

1.2.1.3. *A key concept: complexity*

In addition to the four precepts presented above, systems thinking is based on four fundamental concepts (Durand 2006):

– interaction (the relationship between two elements is not limited to a simple causal action);

– globality (the whole is more than the sum of its parts);

– organization (arrangement of relationships between components that produces a new unit with qualities that its components do not have);

– complexity, which we will explore further in this section.

The concept of complexity is actually a paradigm in itself. It should not be confused with complication. Complexity is a set of heterogeneous

constituents inseparably associated and organized as well as the uncertainties, indeterminations and random phenomena associated with them. The complication, as for it, represents a system composed of many elements more or less in disorder but whose principle of composition is simple.

Thus, complex thought consists of substituting the paradigm of simplification, including principles of disjunction (separating what is linked) and/or reduction (unifying what is diverse), with a paradigm including principles of conjunction that allow us to distinguish without disjoining and to associate without reducing (Morin 1994).

Edgar Morin describes three principles for thinking about complexity:

– The dialogical principle: considers that two elements are not simply juxtaposed but necessary to each other. They can even be perceived as complementary and antagonistic at the same time (order and disorder, for example). A dialogical relation is a “fundamentally complex relation, that is, at the same time complementary, competing, antagonistic and uncertain” between two notions (Morin 1977). However, the notion of dialogic is not necessarily limited to the relation between two notions. In the third volume of *La Méthode*, Morin (1986) defines the dialogical principle as “the complex association (complementary/competing/antagonistic) of instances [not of ‘two instances’] necessary together for the existence, the functioning and the development of an organized phenomenon”.

– The principle of organizational recursivity, or the whirlpool process: each moment of the whirlpool is both the product and producer. A recursive process is one in which the products and effects are both the causes and producers of what produces them. This principle is an idea that breaks with the principle of cause and effect. What is produced returns on what produces it in a cycle that is itself self-constituting. We can speak of a virtuous circle.

– The hologram principle: amounts to considering that the part is in the whole but that the whole is in the part. Pascal (1976) illustrates this principle in the following way: “I cannot conceive the whole without conceiving the parts, and I cannot conceive the parts without conceiving the whole.” This principle is part of recursive logic (what we acquire as knowledge of the parts returns to the whole and vice versa), which is itself related to dialogical logic in a sense.

Thus, to be open to complex thought is to seek to connect in order to construct meaning rather than to give in to the ease of fragmentary analyses (Le Moigne 2007). It is necessary to “join in order to understand”, whereas, on the contrary, the simplification exercise requires “separating to understand”, which implies a reduction and/or a disjunction of reality. Thus, complex thinking, and all that it implies, represents a fundamental notion for thinking about the innovation–export relationship in terms of complementarities and synergies. This is a considerable contribution compared to disjunctive thinking because it highlights unifying and common elements without merging the whole. It is a matter of joining without confusing and distinguishing without disjoining.

1.2.2. Theoretical framework: articulation of mobilized theories

In order to support a complex vision of the relationship between innovation and export in SMEs, it is necessary to build a relevant theoretical framework articulating different scientific theories on which to base our reflection. This theoretical framework is mainly based on the theory of industrial organization and its SCP (structure, conduct, performance) model. From this basis of reflection, several scientific theories will be presented in order to complete the SCP model and to adapt it to the particular case of innovative and exporting SMEs.

1.2.2.1. The theory of industrial organization: the SCP model

This theory is based on the SCP paradigm. Between 1960 and 1970, the authors behind this paradigm (Mason 1959; Bain 1968) considered that the structure of the market influences company conduct, which determines their performance. Market structure refers to environmental factors: supply, demand, competitive intensity, the existence of barriers to entry, standards and regulations, etc. Business conduct describes what companies do and how they do it (positioning, pricing, R&D, distribution strategies, etc.). Finally, performance refers to the results of industrial sectors and companies (profitability, growth, efficiency, technical progress, etc.). This first school of thought is traditionally called the “Harvard School”. From the 1970s onwards, however, the SCP model was called into question, particularly the causal and linear relationship between structure, conduct and performance on which it was based (Tirole 1988). A new school of thought, therefore, appeared: the new industrial organization. The main contribution of this school of thought is to consider that the company can modify its

environment through strategic decisions (Uzunidis 2016). Various feedback effects are then added to the Harvard School model (see Figure 1.9), making the SCP paradigm more dynamic and integrating a more complex vision of the interactions presented.

This theory provides an interesting basis for our research. By modifying its conduct, a company can, on the one hand, modify the structure of its own market, and, on the other hand, improve its performance in this same market. The modifications of its conduct are then based on strategic decisions influencing its internal organization. However, this SCP model needs to be further developed to adapt it to the specific context of our research work. We therefore propose to examine the different S, C and P dimensions in the light of different scientific theories in order to propose a complete and relevant theoretical framework (see Figure 1.9).

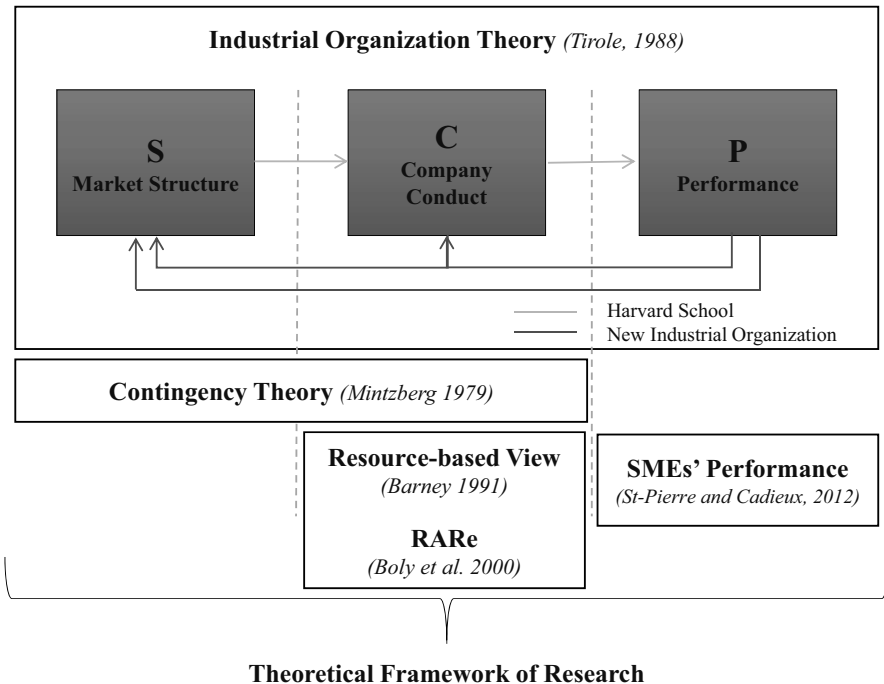


Figure 1.9. Construction of the theoretical framework of the research. For a color version of the figure, see www.iste.co.uk/enjolras/innovation.zip

1.2.2.2. *The relationship between the structure and conduct: contingency theory*

In the context of our research, the contingency theory appears as a complement to the theory of industrial organization presented in section 1.2.2.1, particularly when we are interested in the relationship between the structure of the market (or the environment) and the conduct of the company (or organization). This school of thought considers that there is no such thing as a good organization *per se*. Henry Mintzberg, the main representative of the contingency school, states that the structure of an organization depends on both its own characteristics and the nature of its environment (Mintzberg 1979). There is, therefore, no universal structure that adapts to all situations. A “good” structure must be adapted to its environment, and an environment shapes the organizations that compose it.

Based on the scientific literature, different factors of contingency can be identified, reflecting contextual elements that can push companies to adopt certain behaviors.

Contingency factors	Description	Sources
Environment/geographical area	Public policies, regulatory context, political/economic stability	Mintzberg (1979), Choi and Lim (2017), van den Heiligenberg <i>et al.</i> (2017) and Urbinati <i>et al.</i> (2018)
Centralization/decentralization	Power relations, decision-making process	Mintzberg (1979) and Liu <i>et al.</i> (2018)
Structure of the organization	Size, age	Mintzberg (1979), Forés and Camisón (2016), Akinwale <i>et al.</i> (2018) and Belas <i>et al.</i> (2018)
Market orientation	Competitiveness, internationalization, industry, technological intensity	Mintzberg (1979), Thornhill (2006), Love and Roper (2015), Korab and Koudelkova (2016), Tidd and Thuriaux-Alemán (2016) and Crowley and Jordan (2017)

Table 1.2. *Contingency factors from the literature*

Thus, contingency theory sheds light on the S–C part of the SCP model proposed by the new industrial organization. The conduct of a company evolves to respond to the constraints of its specific market. Its internal

regulatory systems must therefore be as varied as the environment with which it must deal. To overcome the constraints of its environment, the company must adjust its conduct by making strategic decisions that allow it to set up a coherent and specific internal functioning that will enable it to improve its performance and, finally, to impact the structuring of its own market.

1.2.2.3. *Acting on the conduct of SMEs: a vision in terms of resources and activities*

After having examined the relationship between structure and conduct, we propose to focus on the conduct of companies and more particularly that of SMEs. To do so, we propose to introduce a theory that is particularly well suited to the study of small structures: the resource-based view (Brulhart *et al.* 2010).

Resource-based view is a model from strategic management (Collis and Montgomery 1995). It first appeared in the work of Penrose (1959) and focuses on the way in which competitive advantage is generated through a combination of resources present within the company (Dhanaraj and Beamish 2003).

Strategic management is based on a theoretical framework according to which a company creates a competitive advantage by implementing a strategy that exploits its own strengths while responding to opportunities in its environment. This strategy avoids external threats and neutralizes internal weaknesses (Barney 1991). Two models exist (see Figure 1.10):

- environmental models of competitive advantage: an external analysis of the opportunities and threats facing the company;
- the resource-based model: an internal analysis of the company's strengths and weaknesses.

Strategic management thus seems to be in line with the contingency theory presented in section 1.2.2: a company adapts to the characteristics of its environment. However, strategic management has an important limitation for our study. Environmental models of competitive advantage assume that resources and strategies are broadly the same across companies in the same group (e.g. by industry) (Porter 1998). Heterogeneity is not taken into account.

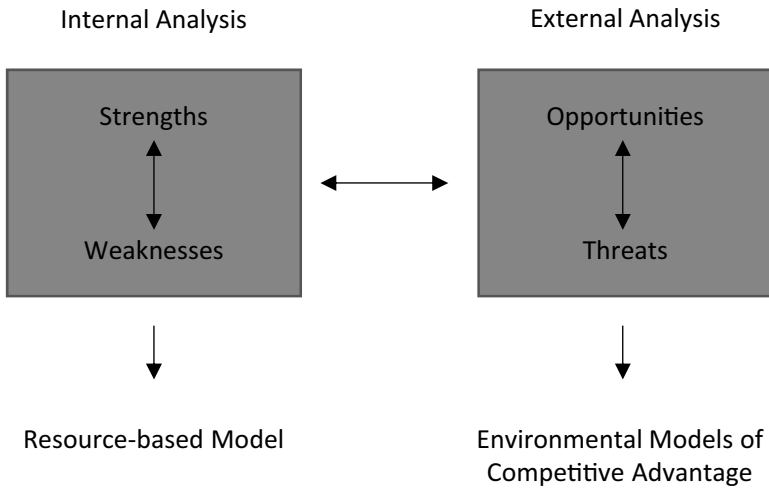


Figure 1.10. *The two models of strategic management (Barney 1991)*

The resource-based model, on the other hand, takes into account the heterogeneity and disparity of resources and strategies across companies. It, therefore, eliminates the limitation identified in the environmental models of competitive advantage. For this reason, we propose to study the conduct of companies from the perspective of resources alone to take into account the heterogeneity of companies.

According to the resource-based view, companies can be considered as a set of resources and these resources are heterogeneously distributed within companies (Teece *et al.* 1997). A company's resources are its tangible and intangible assets, and competencies are related to the ability to combine these resources (Julien 2005). Some of these resources, known as "strategic", are considered to be the foundations of competitive advantage in the domestic and international market (Barney 1991). According to Barney, a strategic resource must be valuable, scarce, not easily transferable or imitable and not substitutable. A resource is valuable when it allows the company to design and introduce strategies that improve its performance while satisfying the needs of consumers. A strategic resource must be scarce for the company's current and potential competitors. If a resource is valuable but possessed by a large number of companies, it will be exploited in the

same way by each of them, which will prevent the creation of any competitive advantage. Similarly, a strategic resource must be inimitable. Valuable and scarce resources can still be imitated by competitors if they need them. The non-replicability of a strategic resource is, therefore, a key point in creating competitive advantage. Finally, a strategic resource must not have a substitute. No resource should be strategically equivalent, as this would allow competitors to develop a similar strategy and break the competitive advantage created by the strategic resource in question (López Rodríguez and García Rodríguez 2005). Thus, a company must promote the acquisition and mobilization of strategic resources in order to adapt to the threats of its environment or to seize certain opportunities. The resource-based view thus represents a complementary theoretical basis to the SCP model, and it seems particularly adapted to the context of SMEs that encounter difficulties related to their overall lack of resources.

To go further, we propose to consider the link between resources and activities. For SMEs, the mobilization of strategic resources requires, on the one hand, identifying them, and, on the other hand, being able to exploit them through the implementation of specific activities that allow the desired result to be achieved. These strategic activities represent proof of a company's ability to use the resources it has at its disposal. Having the resources is not enough; we must be able to exploit them. Thus, we propose to complete the resource-based view by introducing the RARe models.

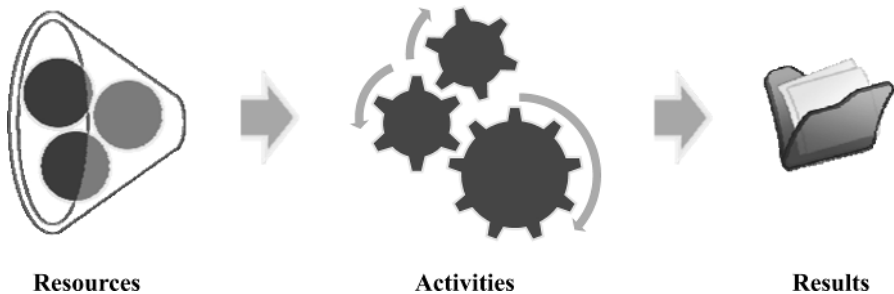


Figure 1.11. *The RARe model (Ben Rejeb 2008)*

RARe is the abbreviation for resource–activity–results. These models are based on a systemic approach that consists of analyzing, for a particular

actor, the resources used to carry out activities and the result produced (Boly 2008). The RARe makes it possible to link the resources to be mobilized, the way they are used (activities) and the envisaged objective (results) (see Figure 1.11).

We, therefore, propose to apply the RARe model to SMEs' innovation and export capabilities. To improve their innovation and export capabilities, SMEs must modify their behavior and, therefore, the activities they implement to better identify and exploit their strategic resources in order to achieve a tangible result. For example, a company wishing to export to a new market must know its competitors in that market. According to the RARe model, the tangible result it wishes to achieve would be a list of potential competitors in the market in question. To do this, the company must, for example, set up a competitive intelligence activity. It must therefore mobilize resources such as a network of business leaders, IT tools, support systems, etc.

The RARe model emphasizes the importance of a global vision in the form of a triptych of resources, activities and results. These three elements are interrelated and make it possible to affirm that, in order to achieve an objective that it has set for itself, a company must not only have access to resources but also know how to mobilize them and use them correctly. It must therefore modify its own routines in order to adapt its behavior and gain in performance while adapting to the environment in which it evolves. Through this RARe vision, we, therefore, choose to follow in the tradition of Schumpeter (1934) via the capability approach, which describes what the company can do and how it seeks to carry out innovation and international activities to ensure continuity over time. From this perspective, the entrepreneur is an actor of change, and the company achieves an outcome via the mobilization of multiple resources responsible for the implementation of practices/routines reflecting the adoption of a specific behavior (Zawislak *et al.* 2014).

1.2.2.4. *The notion of performance for innovative and exporting SMEs*

In order to propose a complete theoretical framework, we need to consider the third element of the SCP model: the notion of performance.

Traditionally, corporate performance is measured in terms of financial indicators. However, this approach has been questioned for many years (Kaplan and Norton 1996). The performance of companies is, in fact,

multi-criteria. In particular, performance indicators must be linked to the objectives and strategies of companies in order to be relevant and representative (St-Pierre and Cadieux 2012). According to Berrah (2013), the expression of performance is a step in an improvement process, in accordance with the precepts of the Deming wheel. This expression of performance can take different forms: a measurement or an evaluation. Performance measurement is an expression of the achievement of an objective by comparison with an observed measure. It is expressed, for example, through steering or monitoring indicators. Performance evaluation is an expression that also results from a measurement compared to the objective but related to a specific interval (between 0 and 1, for example). It incorporates a form of satisfaction on the part of the decision-maker in the light of the measures achieved, and gives an interpretation in relation to a global vision or reference framework. It is expressed this time through strategic, global and structural indicators. Performance evaluation can be used in the context of a diagnosis, in which case it can be used to explain the performance achieved in terms of effectiveness (whether or not objectives were achieved) and efficiency (use of the resources allocated). In the context of an optimization process, it makes it possible to visualize how to improve the achievement of objectives.

Our research work is based on the context of innovative and exporting SMEs. Numerous performance indicators and evaluation methods have been identified for both innovation (number of patents, investment in R&D, etc.) and export (export sales, etc.) (Muller *et al.* 2005; Boutary *et al.* 2013). However, the performance indicators used are mainly quantitative and oriented towards economic performance. However, in the specific case of SMEs, the multiplicity of performance indicators is even greater. St-Pierre and Cadieux (2012) identified four types of objectives in terms of performance through the study of more than 300 Quebec SMEs:

- personal performance (recognition, quality of life, assets, etc.);
- economic performance (growth, profit, international, etc.);
- sustainable performance (meeting customer needs, maintaining jobs, financial health, etc.);
- social performance (quality of life of employees, reputation of the company, etc.).

The notion of performance in SMEs, therefore, seems very complex, and the interest of adopting a multi-criteria vision seems undeniable.

In view of this particular context, we therefore propose to adapt the SCP model by integrating into the notion of performance its multi-criteria character, which is particularly characteristic of the case of SMEs. Moreover, a key notion of this research work is that of the improvement of the performance of SMEs and thus of the evaluation of their performance. According to Berrah's work, the evaluation is either part of a diagnosis or part of an optimization process. In this research work, we have chosen to reconcile the two by proposing a support tool dedicated to SMEs, in the form of a diagnosis to assess their innovation and export capabilities and then to optimize it through the identification of ways to improve. On the other hand, the stronger an SME's innovation and export capability, the better it will perform, according to our research. We do not seek to quantify the performance of SMEs in terms of results (patents, sales, etc.); we evaluate the potential of companies through the evaluation of their internal routines (their behavior) (Galvez 2015).

1.2.2.5. The articulation of different theories: the SCP model revisited

The different theories presented in this section lead to a theoretical framework on which our research is based. First, the industrial organization theory highlights the links between the structure of the market, the behavior of the SME and its performance. By performance, we mean here the innovation and export capabilities. Then, according to the contingency theory, to improve its performance, a company must respond to the constraints imposed by its market by making adjustments to its behavior or its internal structure. These adjustments involve the identification and acquisition of strategic resources (resource-based view), which must then be exploited through activities (in the sense of Schumpeter) that lead to a tangible result (RARE model).

The articulation of these four theories allows us to come up with a revisited SCP model (see Figure 1.12) so that it is suitable for the specific context of SMEs, on the one hand, and for the study of their innovation and export capabilities, on the other hand.

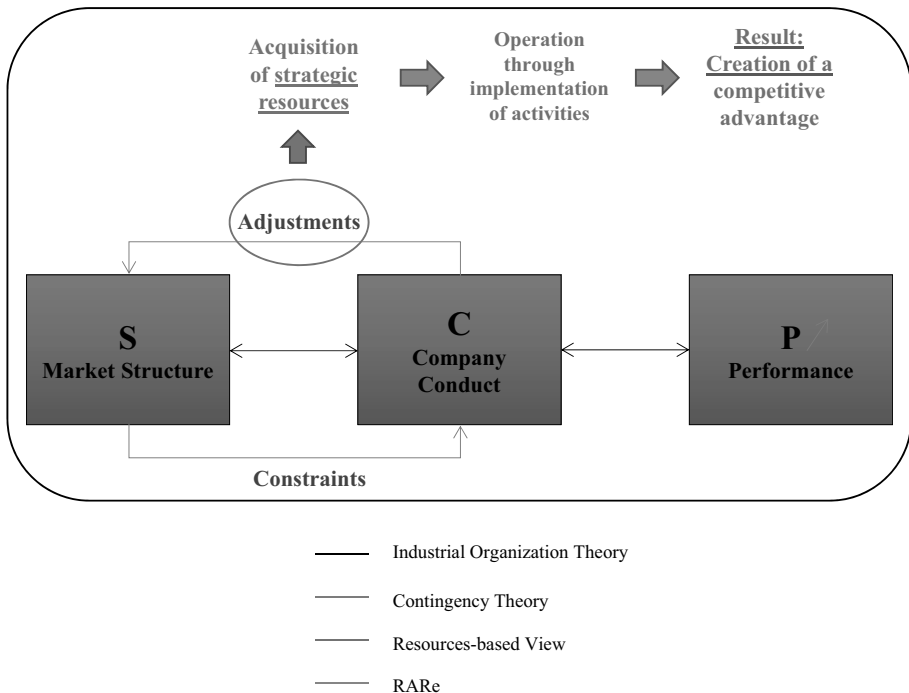


Figure 1.12. *The SCP model revisited: theoretical framework. For a color version of the figure, see www.iste.co.uk/enjolras/innovation.zip*

1.2.3. The application of the complexity paradigm to SME innovation and export activities

The previous sections of this chapter (see sections 1.2.1 and 1.2.2) have made it possible to put forward the fundamental theories and notions that serve as a basis for creating a new paradigm for thinking about the innovation–export relationship. Thus, it was possible to propose a new point of view on this relationship based on complementarity and complex thought. Based on a paradigm shift initiated in the literature on the innovation–export relationship, this paper proposes an alternative to the analytical vision that consists of treating innovation and exporting separately within companies by favoring instead a systemic vision that considers the existing synergies between these two activities. The contribution of this work lies in the systemic vision chosen to analyze this relationship within SMEs and in the mobilization of an appropriate theoretical framework to support and model this complex vision based on the SCP model.

1.2.3.1. *Towards the creation of a common innovation–export space*

As demonstrated earlier (see section 1.1), the innovation–export relationship is generally thought of as disjointed in the literature. Innovation and export are considered two separate activities, although they have a mutual impact on each other. On the contrary, in this section, we propose considering innovation and export as two complementary activities that create synergies. This new paradigm thus aims to replace the commonly accepted analytical view with a complex view of this relationship.

Analytical thinking isolates what it separates and obscures what connects and differs. Complex thought, on the other hand, makes it possible to join while distinguishing.

In his book *Introduction à la pensée complexe*, Morin (1994) said:

Join the cause and the effect, the effect will come back to the cause, by feedback, the product will also be productive. You will distinguish these notions and you will join them at the same time.

Based on this quote, we propose to apply the principles of dialogism and recursivity to the innovation–export relationship. Thus, the proposed paradigm considers innovation and export as the two poles of the same dialogical and recursive duality. That is, these two poles form a virtuous circle (recursivity) within which they are united without the duality being lost in this unity (dialogism).

The meeting of these two complementary poles creates a common space conducive to the emergence of synergies. Thus, through this paradigm, innovation is not only a prerequisite or a necessary condition for exporting and vice versa. We propose to consider innovation and export as two complementary activities.

The notion of complementarities can take different forms (Morin 1977):

- interactions;
- links establishing a common area;
- associations and combinations of complementary activities;
- informational communications.

The studies cited above (see section 1.1) have highlighted the interactions and exchanges of information between innovation and export. These are indeed interactions in the form of reciprocal actions that innovation and export exert on each other (Durand 2006). These reciprocal actions include exchanges of information, and this is particularly true in the case of learning-by-exporting, where information from international markets impacts the innovation process. The complementarity between innovation and exporting thus seems to be proven in terms of interactions and informational communication.

However, the vision we support proposes to go further in the complementarity by integrating into the innovation–export relationship a common space that can be considered as an interface between these two activities. This common space represents the activities that an SME must carry out as a priority to simultaneously create a value in terms of innovation and export (see Figure 1.13).

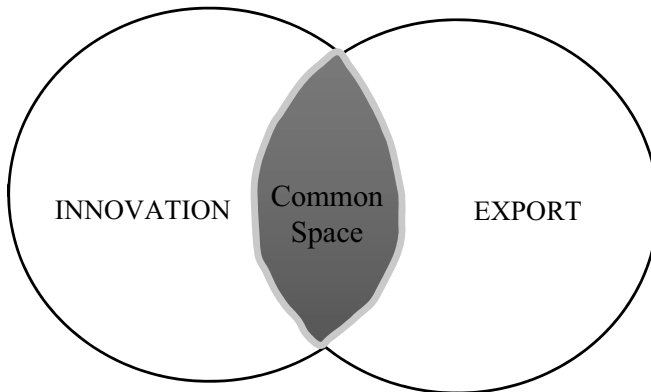


Figure 1.13. *Theoretical positioning*

We, therefore, hypothesize an enhanced complementarity in the form of a linkage that establishes a common part. In the particular context of SMEs, for which the lack of resources is a particularly important problem (Szczepanski 2016), this vision seems particularly relevant, as it is based on the assumption that it is possible to exploit an innovation–export synergy in order to reduce the effort needed to reach a defined goal. By acting in this common space, companies potentially trigger a single lever that has a

simultaneous impact on their innovation and export activities and produces a synergistic result that requires less effort than two separate actions. This common space is therefore composed of the activities/routines that an SME must implement to create a value simultaneously in terms of innovation and export. It, therefore, reflects a behavior based on a dialogical and recursive logic for which the development of specific activities/routines allows the mobilization of joint resources, skills and knowledge that are at the origin of synergies between innovation and export. This is how the notion of emergence appears. From the innovation–export coupling, more than a simple addition of activities or resources specific to one or the other is born.

Thus, this paradigm is mainly based on a basic notion of the systemic approach: complexity. It applies two fundamental principles: dialogism and recursion. Finally, it is based on a vision in terms of complementarities, leading to the emergence of a common space whose main property is to reduce the effort required to increase the performance of an SME simultaneously in terms of export and innovation.

1.2.3.2. *What does this paradigm contribute to SMEs?*

Most of the problems SMEs have to deal with are complex. Innovation and export are among them because they are “disorganizing” and directly affect the value creation process. They call into question the company’s strategy in relation to its environment. We can speak of denaturation in the sense of Torrès and Julien (2005). Denaturation, for the study of SMEs, considers that “small size” does not necessarily mean “small structure”. Thus, a company with a small workforce can nevertheless adopt formalized management methods, a decentralized management, define an anticipatory strategy and expand its market internationally. It then becomes more like a “miniature large company” by adopting practices that are generally characteristic of large companies. Innovation and exporting are activities that encourage this denaturation of SMEs. By opening their market to the international market or by piloting innovation projects, they modify their organization and their management methods by turning to a formalization and structuring of their internal processes.

At first glance, SMEs may find it more difficult to solve complex problems such as innovation and exporting, among others, due to the constraints imposed by their size. But this is not necessarily the case.

They do not necessarily face more difficulties than other types of organizations (Blackstone and Cox 1985) because their flexibility and their proximity to their employees are powerful assets. However, other difficulties specific to SMEs in dealing with complex problems can be identified (Schmitt *et al.* 2002; Okręglicka *et al.* 2015; Moeuf *et al.* 2018). For example, the omnipresence of the leader and the centralization of management can be penalizing. Problems are generally addressed by a single person who is the leader, and this forces him or her to perpetually evolve in complexity. On the other hand, the short-term vision and the lack of formalization of the company's strategy are also sources of uncertainty. According to Morin (1994), complexity calls for strategy. An SME manager must have a long-term vision while managing the day-to-day running of the company. However, in general, the short-term vision is privileged in SMEs because of the need to manage urgent problems. Thus, the lack of formalization of the strategy, as well as the centralized management within the SME, hinders the management of complex situations. Problems are generally considered separately, and rarely in relation to the organization's interactions.

In the particular case of innovation and export, a lack of a clear, long-term strategic vision can lead to a compartmentalized management of these two activities. In the same way, centralized management and decision-making can make it difficult to take into account the existing interactions between innovation and export. However, a complex vision of innovation and export management that emphasizes a common space can be a real advantage for SMEs. Indeed, the coupling innovation–export allows us, on the one hand, to reinforce the coherence and the homogeneity of the company strategy. This opens the way to the initiation of a global vision by “decompartmentalizing” these two activities and by taking into account the inter-relationships that characterize them. Within SMEs, this opening up is made possible and can be facilitated by their flexibility and their proximity to the staff. This seems to be particularly adapted to their context. On the other hand, the emergence of a common space highlights the existence of common activities, skills and resources for innovation and export. By encouraging companies to act on these common elements as a priority, an emergence effect appears. The notion of emergence is defined by the appearance of properties of a system that are new compared to the properties of its components considered separately (Morin 1977). In this particular case, we do not consider that the whole is more than the sum of its parts; we

consider that the whole is less than the sum of its parts in terms of the efforts associated with the rise in performance. In fact, acting on the activities, resources and skills common to innovation and export enables us to activate a single lever (a common element), which has repercussions on two activities (innovation and export). The effort required to improve performance is, therefore, lower than if the company had used two levers (one for innovation and one for export). This is an optimization of available resources and, therefore, a response to the main difficulty encountered by SMEs, both in developing innovation and in sustaining their international activities.

