

MARKETING FOR *the photonics industry*

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You create a start-up, diversify the business of your SME, expand your product range; every new activity, every new business, starts with a concept. You, your partners, your team, have an idea for a product. Your dream product will be better and cheaper or it might not even exist yet, but it will meet market requirements. You are going to make this concept a reality.

It is a long process, practically an adventure. Because, though you own the idea and though you can shape your concepts to match your wishes, the reality we are talking about is not yours. It is that of your customers; their needs and their expectations. In the photonics industry, reality is also constrained by the limits of physics and technology. A physical component or product is always a compromise. It can perform some functions, but not all. It can achieve a certain level of performance, up to a certain limit. Its cost must be justified by the added value perceived by the customer.

In other words, the concept is in your head, but business reality means that all stakeholders in the value chain are involved: partners, subcontractors and, above all, customers. Even in high-tech fields such as photonics, a successful product is the coming together of a dream and this business reality. Marketing is about bringing these two things together; it is listening to market requirements and using them to define future products. It is also about creating a message for future customers to discover the value of your products and be convinced to buy them. But we will provide a detailed definition of marketing later.

Like any high-tech business, the photonics industry is first and foremost about trade!

Photonics produces hardware, *i.e.* manufactured components and systems. It is a high-tech business and has very close ties to research. Several entrepreneurs started their careers as researchers. However, like any business sector, the mission of the photonics industry is trade – the exchange of goods and services for money. Statement of the obvious, no? Everyone must judge this for themselves and those around them.

This is not the only feature shared by all high-tech industries. There is another one that is equally important: users never buy technology. They buy a function performed using technology built into equipment. What matters to them is the features of the product, what it can do, under what conditions it can be used, its limits, its sturdiness and, above all, whether it meets their needs. These features will have a particular influence on the marketing used in photonics.

We are humbled by this observation. So much effort to master technology! To use it in equipment! To make sure the product works! And you are competing for your prospect with outdated technology, which is more limited but has been used for 20 years!

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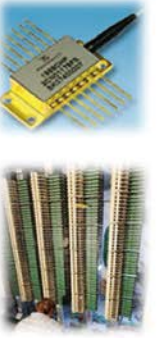




Types of Photonic Systems	Sensing & imaging systems	Communication systems	Screens, displays, projectors, ...	LED, OLED, lamp systems	Photo-voltaic systems	Laser & production systems
Photonic Functions	Acquiring information	Transmitting information	Delivering information	Light providing	Energy providing	Manufacturing
Examples						

Figure 1. All the functions that can be performed using photons.

Special features of the photonics industry

Beyond these general features, photonics also has some special features that must be taken into account in marketing. The first is its versatility. Indeed, we should bear in mind that the European Commission has identified it as a key enabling technology. *Figure 1* shows all the functions that can be performed using photons.

Consequently, we will use lasers for communicating as well as for lighting, measuring, cutting, etc. Or the same microspectrometer will be built into an allergy analyser and a river pollution monitoring system. At Tematys, we often approach a new technology developed by a researcher as a 'solution seeking a problem'. And a 'good' problem, from a business perspective, is one that customers are prepared to pay a sufficient amount to resolve.

Another special feature is that photonics is a slow-growth market. It takes ten years on average for a photonics start-up to really take off. There are several reasons for this. As for any hardware industry, developing a product requires more initial capital and

investment than a software business. Firstly, photonics engineers, but also electronics engineers, software developers, precision engineers and, of course, experts in the field of the target application (medical, environment, industry, etc.) must be brought together. Ensuring effective communication between all these professionals is not always easy, especially since physics and materials do not go together easily. The development and 'debugging' phase of an industrial prototype is never simple.

The second reason for the slow growth is related to the versatile nature of photonics. The sector is not a market in and of itself, like the automotive market. It is geared to areas of application. But doctors, chemists, materials engineers, telecom engineers, even the general public, still need to be convinced of the performance and added value of photonics.

And even when they discover the benefits of photonics, they are not always prepared to invest astronomical sums to test new techniques and see how they can be used. Especially since the competition is fierce. How many technologies use photovoltaics? Wind power, fossil fuels, hydroelectric power, nuclear

power, geothermal energy, tidal power, biogas energy and many others.

Photonics engineers face a difficult issue. Photonics has a lot of potential for its target markets, but who is prepared to pay to test it until the market becomes large enough to sustain itself? Lots of photonics product development strategies stem from this problem such as, for example, the use of CMOS to take advantage of production lines that are already profitable for electronics or the removal of 1.5 μm components, the development of which has already been funded by the telecom companies.

Depending on other sectors to make progress is clearly a powerful brake.

Demystifying marketing

Photonics, with its special features, is therefore a market full of opportunities, but also sprinkled with uncertainty and pitfalls to avoid. The role of marketing is to suggest and, above all, to underpin a route conducive to the growth and prosperity of the business. The mission of marketing is to understand current and future market requirements and to give managers the means to choose

a strategy, based on information that is as logical and reliable as possible.

Once the strategy has been chosen and products developed in conjunction with future users, the marketing team expresses the added value of the product in a sales strategy and prepares marketing materials. Here is a summary of the 4 tasks of marketing.

1. **Study markets and trends.** This is often what is meant by 'market research'. This task includes:
 - studying and quantifying demand (existing or potential);
 - forecasting future developments;
 - analysing the competition.
2. **Define and specify future products and associated business models.** Market research is a 'snapshot'. But it is only a descriptive and forward-looking document. The second task of marketing is to use it to define future products and associated business models. As we will see, this stage is crucial, complex and full of trial and error. This is where concept meets business reality. We will also see that there are ways to go faster and underpin this period of uncertainty.
3. **Prepare market access strategies and promote products.** Having a 'well-positioned' product, *i.e.* one

that meets the requirements of users, is not enough! How many entrepreneur engineers have asked themselves the question: *"I have better products than the competition, but my sales are not taking off! Why?"* Because the market already works without your product, because customers do not know you, because your business is very small, which does not reassure big companies – there are many possible explanations. And it is the role of marketing to prepare 'market access strategies', *i.e.* action plans and marketing materials to 'reach' customers, whatever the obstacles, barriers, habits and prejudices. Market access strategies are most often missing from business plans.

4. **Prepare growth strategies.** The last task of marketing is focused more on the long term. It involves developing a growth strategy for a business or activity. Knowledge of the market and the competition is essential for achieving this because a growth plan depends not only on internal R&D, but also external acquisition opportunities. This is especially true in photonics, which is made up of a myriad of specialist SMEs.

Useful definitions




Market research: studying and quantifying the business demand for a product, analysing associated uses, forecasting future developments, analysing the competition.

Positioning study: studying the definition of the best commercial product imaginable using a given technology in a given sector of application. A positioning study prepares one or more product-market pairs and analyses and compares their respective market potential. Designing a product/market pair involves describing a feature and an added value (the offer), a target market, an associated business model and a position in a value chain. The criteria for comparing product-market pairs depends on the target sector, the target customer and also the company handling the product and its investment capacity.

Market access strategy: action plans and marketing materials to 'reach' customers, whatever the obstacles, barriers, habits and prejudices. Market access strategies are most often missing from business plans. Market access strategies meet the requirements of the sales process:

- how to make people recognise a need and identify our product as a potential solution;
- how to let customers assess the product and the associated offer;
- how to remove or reduce obstacles to buying the new product;
- how to organise the sale itself;
- how to provide the product and related services;
- how to ensure efficient after-sales service.





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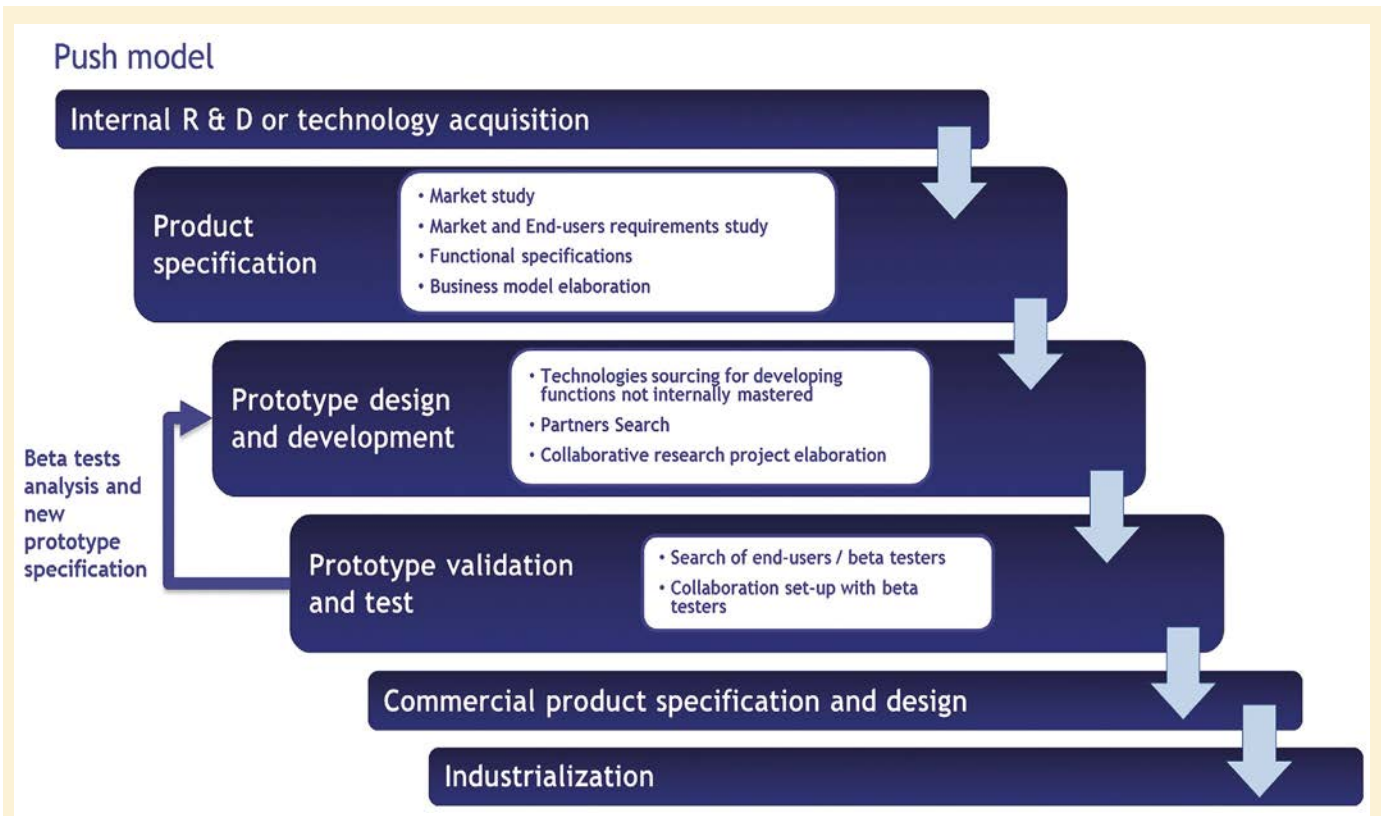


Figure 2. Marketing is an integral part of the development process for photonics products. *Push* model: the product is developed based on an established technology (source: TEMATYS).

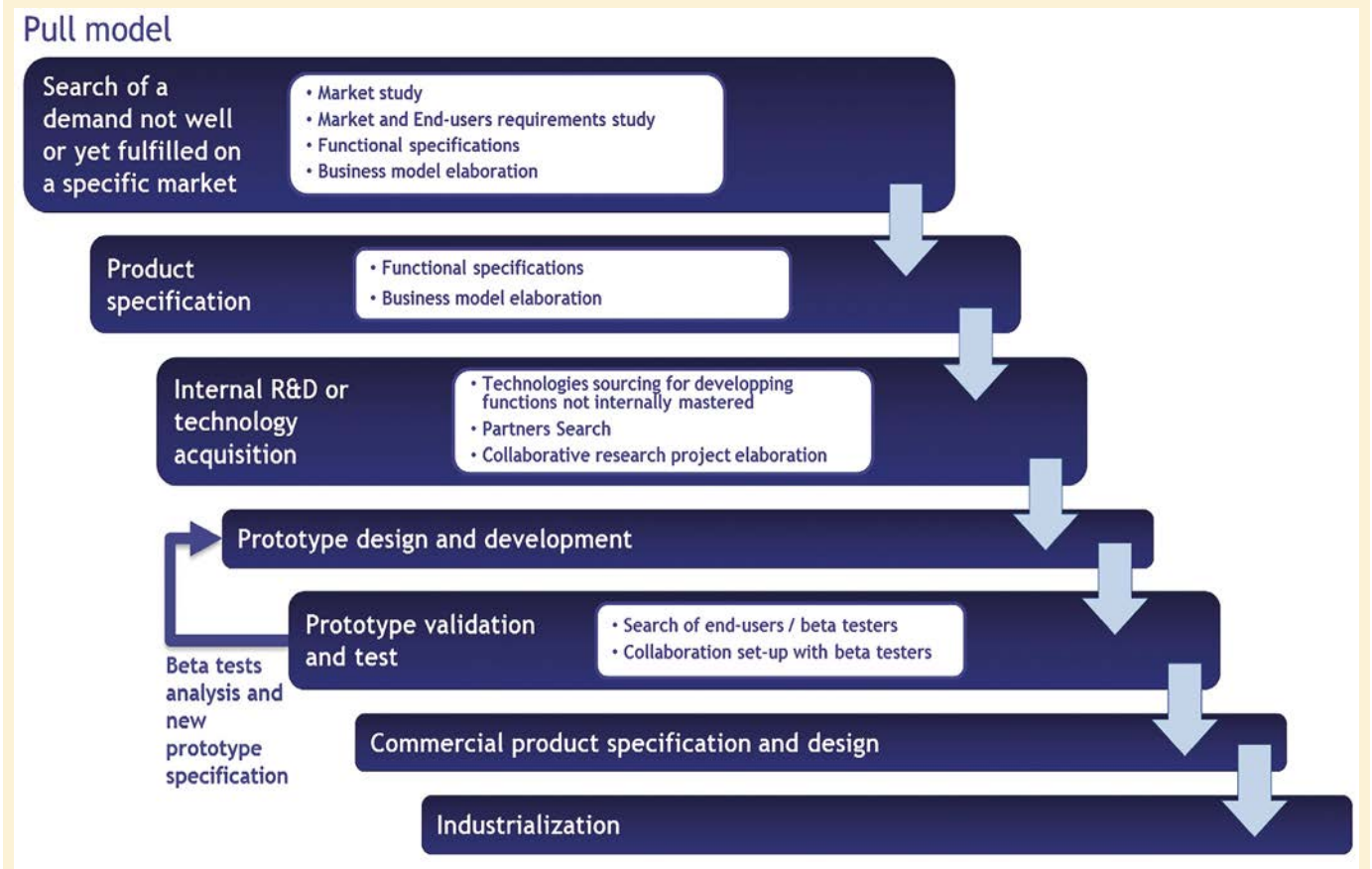
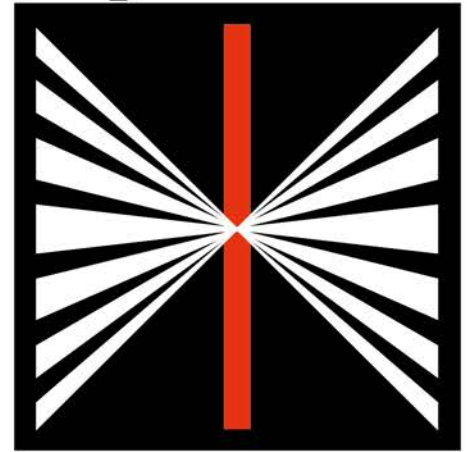


Figure 3. Marketing is an integral part of the development process for photonics products. *Pull* model: the product concept is defined with customers first and then developed based on a technology harnessed internally or 'sourced' externally (source: TEMATYS).



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What can we expect from marketing in the photonics industry? In this sector, we have seen that technologies can often serve and target several applications, only some of which will be good markets able to sustain business growth. In the case of start-ups, the choice of target applications should be even more drastic because they do not have the means to pursue several ambitions at once.

A structured marketing campaign allows you to streamline your choices by listening to customers before even developing the product and to base your decisions on an analysis of the facts and definition of risks. There is no certainty in marketing, since its aim is to understand the future expectations of customers and these can rarely be clearly defined. However, a good market study will systematically identify and assess potential applications and help focusing investments on areas with the highest chances of success. In other words, it underpins a growth strategy.

Let's look at a deliberately hypothetical example. A French start-up has developed a sensor that can be used on naval ships, on agricultural machinery for papaya cultivation and in light vehicle. The most attractive market – the jackpot – is the automotive industry, with their very high volumes and a strong domestic industry to serve as a springboard. But everyone knows how difficult it is to penetrate this market, since you need to provide guarantees on the reliability of the product, financial sustainability, production costs as well as industrial production infrastructure and just-in-time logistics. For papaya, we may question the investment opportunities in this agricultural sector, especially in France. Finally, the shipping market does not offer very high volumes, but the added value of the product is regarded well enough to convince early adopters. Going down this route will allow the start-up to generate revenue quickly, better manage the industrialisation of its sensor and reduce the time required to build good partnerships to penetrate the automotive market at a later date.

Marketing at the core of the product development process

We have looked at marketing tasks and their usefulness in developing activities tailored to market demand. Talking to customers to develop products that will suit them best, understanding and monitoring the competition, developing access strategies and materials to promote products: all of these tasks are common sense.

However, in high-tech industries, the word 'marketing' is still seen as strange, if not taboo. Furthermore, some public and semi-public innovation support organisations find it normal to spend over a million euros to support a technological development while requiring nothing more than vague market research costing ten thousand euros.

Yet marketing is an integral part of the product development process. In fact, it is its *raison d'être*, since its goal is to create a product that will sell as well as possible and increase sales.

Figures 2 and 3 explain when marketing plays a role in the product development process (white boxes). The product definition phase is naturally based on an understanding of the market and demand driven by dialogue with future customers. But the validation phases also benefit from marketing work. Indeed, the first users of the prototype(s) are among the first people contacted during the product definition phase.

Figure 2 shows a typical development process for a technological product. It is called the *push* model because the product is initially based on a technological development about which we ask ourselves the question: "what could this be used for?"

Figure 3 describes another approach, more steeped in business logic. This is the *pull* model, where, even before worrying about technical developments, we seek to invent a product concept based on an in-depth analysis of the market and customer requirements. This phase is therefore almost entirely marketing-based. This model

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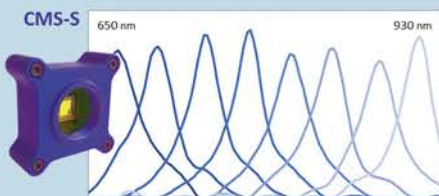
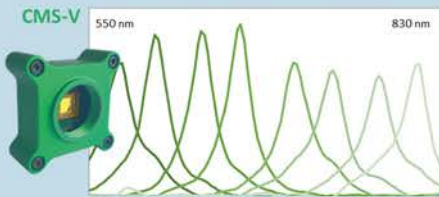
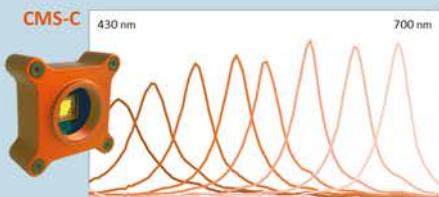
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is at the heart of the approach recommended by entrepreneurs such as Steve Blank, who taught entrepreneurship at Berkeley, Stanford, Columbia, NYU and UCSF [1]. And it is just as suited to hardware development activities as it is to digital business.

Developing your positioning and strategy takes time

Whichever approach is chosen, *push* or *pull*, developing product positioning and an access strategy takes time. Marketing seeks to build a future. It is necessarily uncertain. It is rare to find the right formula the first time. Paul Millier of EM-Lyon talks about the state of transition [2] during which the product is remodelled through trial and error – we ‘learn’ the market and break down the barriers and obstacles to putting the product on the market.

Similarly, Steve Blank recommends a gradual and repetitive approach focused entirely on interactions with future users and customers who validate the product definition at each stage of its design.

Each stage (Fig. 5) is a cycle where we ask users and customers about their needs and whether the design being considered meets their expectations. We repeat this several times before moving on to the next cycle, once we are satisfied with the current stage. The first

two cycles of this process (*customer discovery* and *customer validation*) are based solely on paper and simple proofs of concept. Development of the first prototype does not occur until the 3rd cycle (*customer creation*). In other words, the start of the product definition process is comprised entirely of marketing. This is probably a bit radical for a very technological industry such as photonics, but it has the advantage of reminding us that the aim of entrepreneurship is customer satisfaction.

In any case, these product development processes involve a great deal of contact with users and future customers. Organising all these meetings, carrying them out, interpreting them, analysing the lessons learned from them and turning them into operational specifications obviously takes a long time. This is especially true for the photonics industry, since it is diverse and versatile. In conclusion, taking time to design the product is normal, but taking time to design it without leaving your office or workshop or waiting until the product is finished before seeing customers is a risky move.

Photonics marketing: a skilled profession

How can you make your product definition study a success? Marketing is not an exact science and although CAD allows us to simulate a product and its

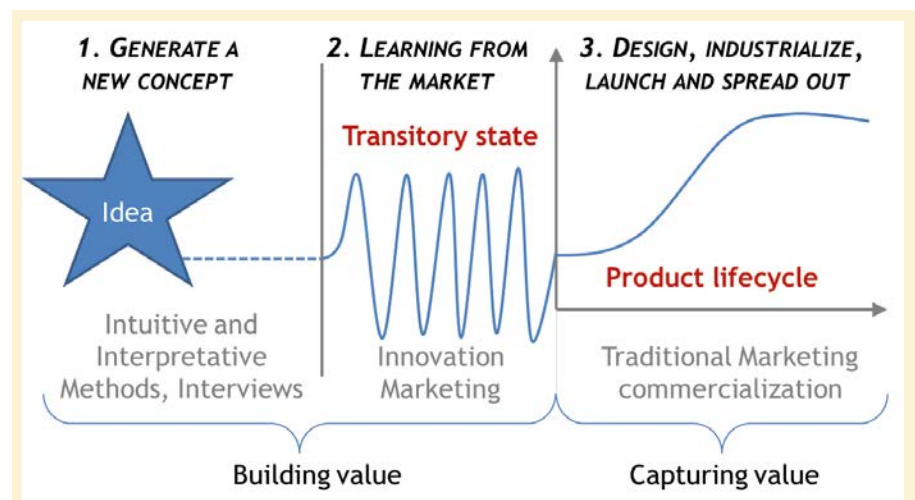
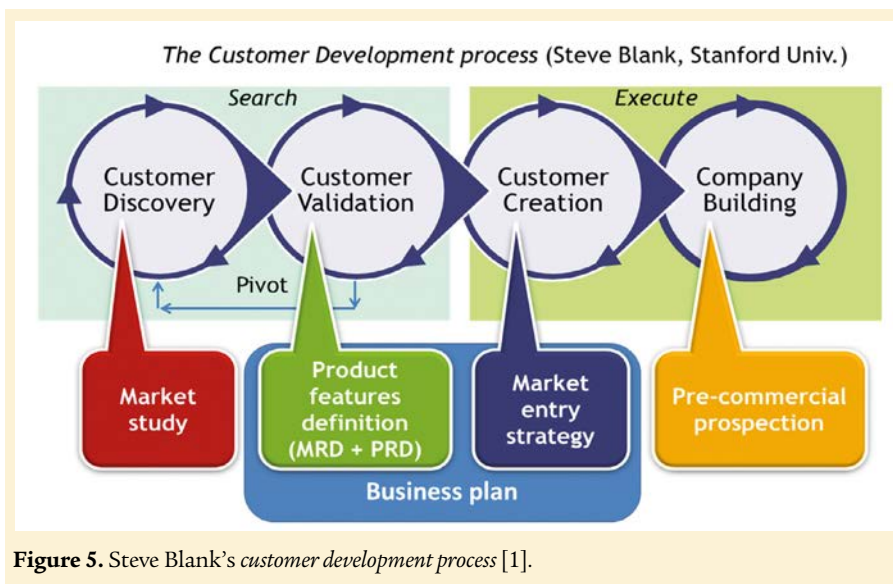


Figure 4. According to Paul Millier, technological product development goes through a transitional state involving uncertainty and testing during which the product is remodelled through trial and error; we ‘learn’ the market and break down the barriers and obstacles to putting the product on the market [2].

behaviour, no software can predict its commercial future. What makes marketing technological products complex is working in a highly uncertain environment. However, choices must be made in order to define a product! So, how do we make decisions? How do we underpin this process?

Some methods, such as those of Steve Blank and Paul Millier, already allow us to ask the right questions at the right time and focus on the goal, *i.e.* designing a product that will sell. But beyond these methods, marketing technologies is, above all, a skilled profession, a form of craftsmanship. This savoir-faire is especially crucial for:

- **Building a trusting relationship with the contact.** You will often question specialists and experts who are potential buyers of the product. When you meet them, you will have only a few seconds to convince them that talking to you is worth it and not a waste of their time. You should prepare meticulously and methodically for interviews.
- **Help the contact to look to the future and assess a product that does not yet exist.** Once you have the interview, you then need to create conditions in which the contact can give you useful feedback. But there is nothing more difficult than getting people to talk about a product that does not exist.



- **Interpret qualitative, incomplete and uncertain information.** Designing a new product is a gamble and is often based on a hunch. Even when you put a lot of effort into establishing contacts and interviews, you will have to make judgements based on qualitative, incomplete and uncertain information. Product definition is like investigative journalism; you have to collect information, continuously assess the reliability of the information you are being given, identify trends from weak signals, be able to generalise based on individual opinions, etc. Another pitfall to avoid is only

listening to one customer, especially a major one. Because of their prestige, you might be tempted to incorporate all of their requests for adaptations related to their specific needs. But be careful not to become a subcontractor, prevented from producing a generic product that can be sold to a larger market.

- **Accept that the expectations of your future customers are different from what you thought – and find solutions to meet them.** Product design is a process of trial and error, as previously mentioned. You will definitely be surprised by your contacts' assessments of your prototypes and

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Networking is a Worthwhile Investment



Networking is one of the main reasons to attend industry events like exhibitions, conferences, and meetings. Of course the presented material will be instructional and informative, but the opportunity to meet new people and interact with peers is also extremely valuable. Networking time is sometimes underrated by organizers and attendees. Some events schedule coffee breaks that are too few and too short. Or, they use the break as a time buffer to recuperate time from presenters who exceeded their allotted speaking time. At EPIC events, networking is a key ingredient to the success of all our initiatives. This is why at our meetings, presentations are short, time is imposed and respected, and there are numerous and long breaks for attendees. During EPIC meetings, we make it *a priority* to personally introduce attendees to each other, and we share a participants list that includes every attendee's picture, biography, and company description. At EPIC, we take you to the handshake, the rest is up to you! EPIC organizes 20-30 events per year, mainly technology workshops, but also purely networking events. If you would like to be part of an active international network of photonics experts and leaders, you are invited to become member of EPIC! ■

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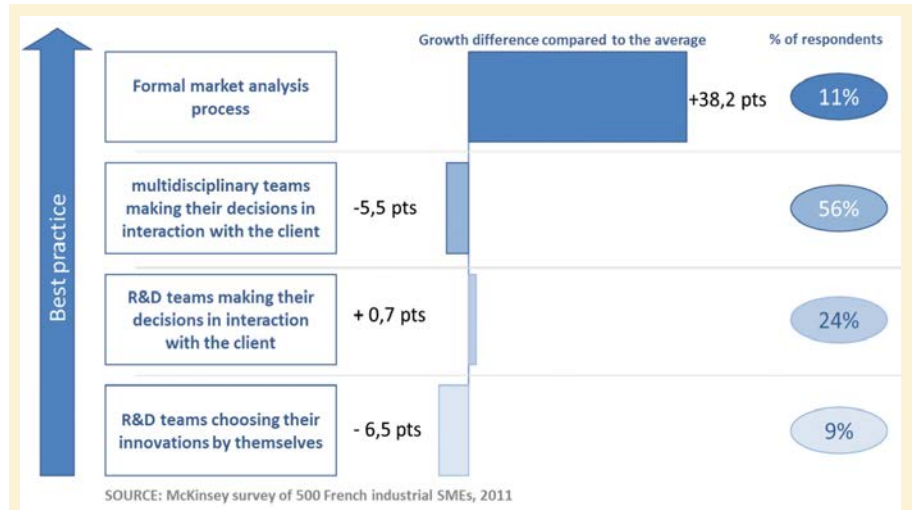


Figure 6. Comparison of the growth differential in relation to the average of 500 French industrial SMEs (study carried out in 2011, all sectors [3]).

designs. You will also need to prepare to rethink your ideas which, remember, are only hunches, since they have not faced business reality.

The marketing approach is even more complex in a high-tech environment as the skills necessary for successful marketing run counter to what engineers have been taught. However, it is similar to the scientific research approach, where we submit a hypothesis that we then seek to validate through experiments.

Hiring a marketing firm for success

Since most photonics companies are small or very small businesses, they rarely have an internal marketing department. They have to call on the services of specialist firms. But in the context of an artisanal industry that aims to perform an activity engineers find counter-intuitive, it is difficult to know whether the marketing firm in question will be up to the task and provide sufficient, reliable information that will allow a decision to be taken with confidence.

So how do you choose and work with a marketing firm? Here are some practical tips to start the process:

- **Make your request as clear as possible.** The clearer the request, the clearer the response. Convey your

expectations, your goals and your questions. Try to describe what, for you, would be a successful assignment. For their part, the marketing firm will specify what they can provide and the limits of their involvement. Do not be afraid to spend time interacting with the marketing firm at this stage.

- **Assess their skills via their relationship with you.** Can they reassure you and build a trusting relationship with you? Do they listen to your expectations? Do they give a clear description of their methodology? If they can reassure you, they will also be able to reassure the contacts they interview.
- **Tell the marketing firm what actions you have already taken before the start of the assignment.** In most cases, you will not have waited for a marketing firm to start the process and establish contacts. Tell the marketing firm so they do not retrace your steps and provide you with confirmation of what you already know, whilst irritating your contacts whose time will have been wasted.
- **Accept uncertainty and the unexpected.** We have discussed at length the extent to which marketing deals with the future, *i.e.* an uncertain topic. Accept the feedback of the contacts interviewed even when it is negative. They are the ones who will take your product forward.

• **Respond to requests from experts and future users, even if they surprise you.** Not all feedback is negative; on the contrary, when your concept meets an expectation, those interviewed often want to go further. They ask when the product will be available and want to know whether it will suit their specific application and whether it will work in their technological environment. But often the use they envisage is very different to what you have in mind. If this type of request is made, that is great news — it means your product has perceived value. So you must answer the questions, even the most absurd — the success of your product may depend on this unexpected use.

But in any case, remember two key points:

- A marketing assignment for tens of thousands of euros seems expensive to provide 'a few slides'. But this is only a fraction of the cost for technical development of your product, which will cost you at least several hundred thousand euros, taking into account wages and investments.
- If the conclusions of the market research are negative and the marketing firm recommends (using practical and sensible arguments) making significant changes to your concept or, worse, not launching it because the feedback on the ground is negative, listen to them, even if it is not very pleasant. That just tells you that your dream does not pass the business reality test. Taking this external advice into account will probably save you hundreds of thousands of euros in unnecessary development costs.

Whether you do it internally or entrust it to a marketing firm, market research is always profitable because

it brings you closer to customer expectations and allows you to make logical decisions with confidence.

Marketing: an ongoing activity

In 2011, the marketing firm McKinsey proved that marketing is an investment for industrial SMEs and not a burden. 500 French industrial SMEs from all sectors were surveyed. The results were clear: Those that had a structured analytical and market-based approach experienced growth much higher than the average (Fig. 6).

In contrast, those that had only an informal process of listening to customers (often a single customer, the most prestigious) are at a disadvantage. They are close to their customers, but they do not take back lessons learned and useful information to create growth strategies. They are 'consumed' by the day-to-day and urgency. They have their 'noses to the grindstone'.

In conclusion, French photonics SMEs often have significant expertise in their field, but do not manage to grow, often for lack of an ambitious growth strategy that can convince investors. However, French photonics SMEs also have the creativity and excellence of French research, which is just waiting to be used.

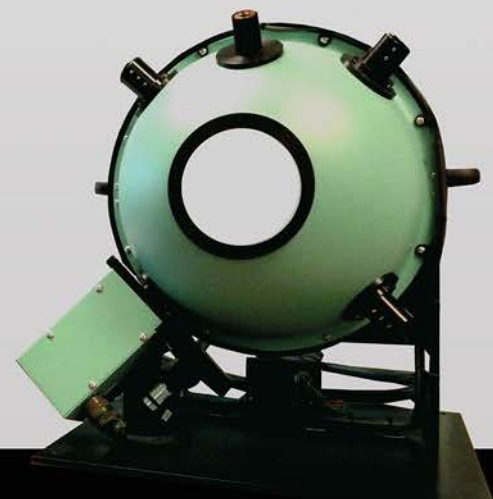
In our opinion, this sector is a gem that is not yet aware of its potential and capacity to create tomorrow's large industrial companies. The reluctance to leave the comfortable cocoon of technical vision to address business logic based on a structured and meticulous approach to marketing is one of the main reasons for this limitation. ■



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FURTHER READING

- [1] Steve Blank and Bob Dorf, *The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company Hardcover* (March 1, 2012) <https://steveblank.com>
- [2] Paul Millier, *Stratégie et marketing de l'innovation technologique* [Strategy and marketing of technological innovation], 3rd edn. (Dunod, Paris, 2011)
- [3] *Industrie 2.0, Jouer la rupture pour une renaissance de l'industrie française* [Industry 2.0: Changing direction for a revival of French industry] (Mc Kinsey France, 2013)