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INNOVATION

WHITE PAPER

Technology enabled sustainability in the chemical industry

The chemical industry plays an extremely important role in the global economy. According to the International Council of Chemical Associations (ICCA), the industry contributes $5.7 US trillion to Global GDP and supports 120 million jobs both directly and indirectly. It accounts for 7% of global GDP and is the fifth largest manufacturing industry in the world.

Sagentia Innovation has been helping many of its clients in the industry to define their sustainability strategy and explore opportunities for developing greener products and reducing the negative environmental impact.

Like other major industries, environmental sustainability is high on the agenda of the chemical industry right now. In particular, climate change is leading to increasing policy and regulatory pressure for all industries to reduce the environmental impact resulting from their operations. On the social front, consumers are increasingly demanding “greener” products. And while the chemical industry provides solutions to some of the world’s greatest sustainability challenges, it is energy intensive and heavily reliant on hydrocarbon feedstock for both the base raw material and the primary energy source.

Survey Company Profiles (no. employees)

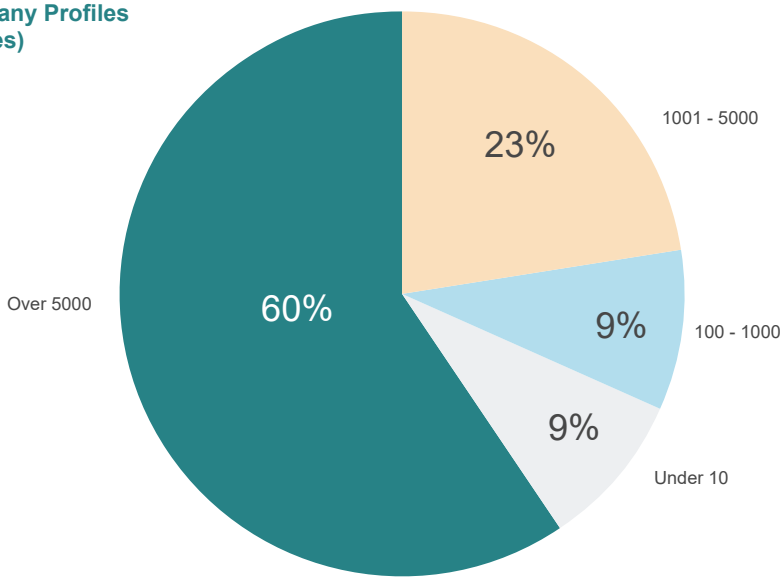
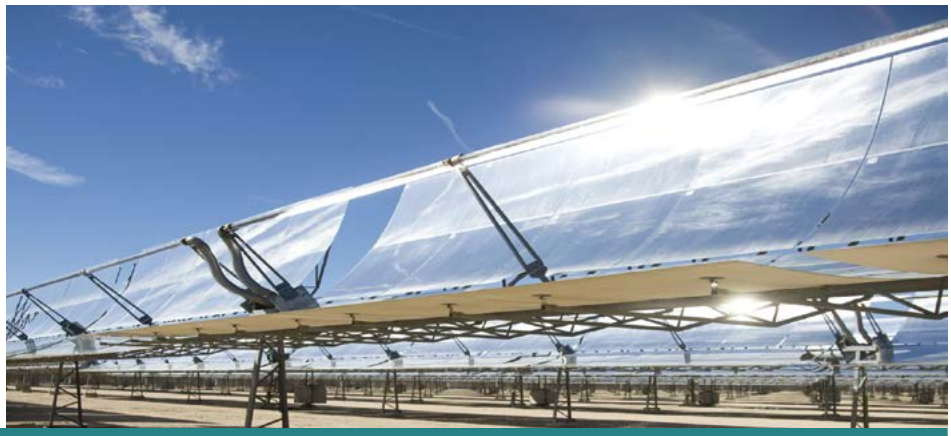


Figure 1 Survey company size

We recently surveyed 35 senior executives from a mixture of large corporations and small chemical companies across Europe, North America and Asia.

New technology plays a pivotal role in order to propel the chemical industry into a more sustainable future and it’s not hard to notice a flurry of sustainability technology initiatives from many in the industry over recent years. Sagentia Innovation has been helping many of its clients in the industry to define their sustainability strategy and explore opportunities for developing greener products and reducing the negative environmental impact of their operations.



While this is a fast-evolving space, the transformation of the industry will not happen overnight. To help capture the industry's current thinking on how to define, plan and act on sustainability, and how to monitor, develop and implement sustainable technologies across the whole business, we recently surveyed 35 senior executives from a mixture of large corporations and small chemical companies across Europe, North America and Asia.

The respondents come from a variety of backgrounds, from business management, business development, innovation, R&D, and strategy and growth.

This report will share some of the insights we gained from the survey as well as our view on what's important for the industry in order to achieve its long term sustainability objectives.

Respondent profiles

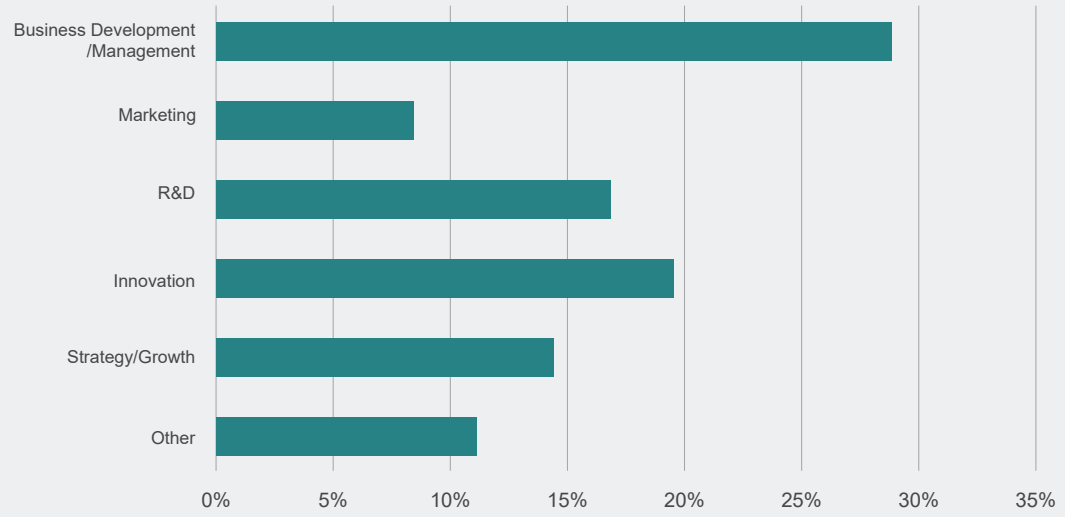


Figure 2 Background of Respondents

How do chemical companies define environmental sustainability?

"... meeting the needs of the present generation without compromising the ability of future generations..."

"...the ability to shape the Company's activities and decisions on the 3Ps: People, Planet and Profit."

Some companies define sustainability within the context of broad environmental, economic, financial, and social factors, for example using the UN's sustainable development goals or and the 3Ps.

Other companies have more business specific definition with some focusing on reducing the environmental impact of their own operations and others on developing solutions to help their customers to be more environmentally sustainable.

	Operation focus	Product/customer focus
Part of overall business strategy	"The effective management of economic, environmental and social risks and opportunities for long-term value creation." "…the capacity to drive financial, environmental and societal targets of the company over time." "The lowest environmental impact, the lowest safety risk for the users, the highest efficiency at work."	"Profitable solutions that benefit Society and reduce the impact on the environment." " We define sustainability as ensuring a consistent supply of feedstock, and ensuring that we minimize our impact on the planet …"
Explicitly environmental	"...to protect and/or improve environment." "We aim for a business that has no damaging impact in our environment or communities we operate in."	"Reducing the environmental footprint of our customers" "… working on solutions to address global challenges as e.g. defined by the UN SDG's"

Example of survey responses

Sustainability is both important and urgent

Sustainability is no longer just an issue of corporate image management as it once was. Now – and for many companies – it's about whether a company can retain the societal licence to operate.

In our survey all but one respondent stated that sustainability is either important or extremely important to their business: 80% of the respondents say that their organisations either have a formal (71%) or informal (9%) sustainability strategy in place, while 89% of the respondents stated that sustainability is urgent or extremely urgent for their organisation.

There is no doubt that sustainability is a long game and changes will come in as a gradual shift. And whilst there is low-hanging fruit to be picked, considerable investment and technological advancement are needed to fundamentally transform the chemical industry. This reflects on the timeframe companies plan their sustainability strategy. Almost 30% of the respondents state that their organisations plan on a 10-year + time frame, and 36% planning on a 6- to 10-year time frame.

Does your company have a sustainbility strategy?

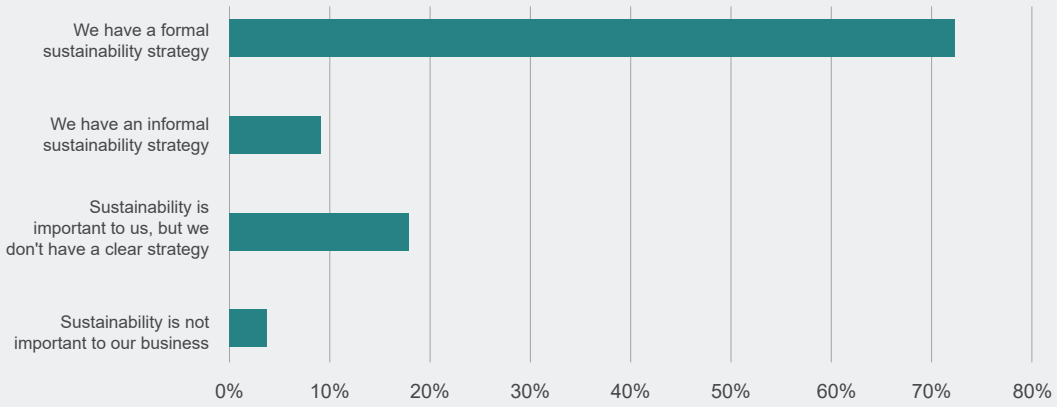


Figure 3 Importance of sustainability strategy

Urgency of sustainability

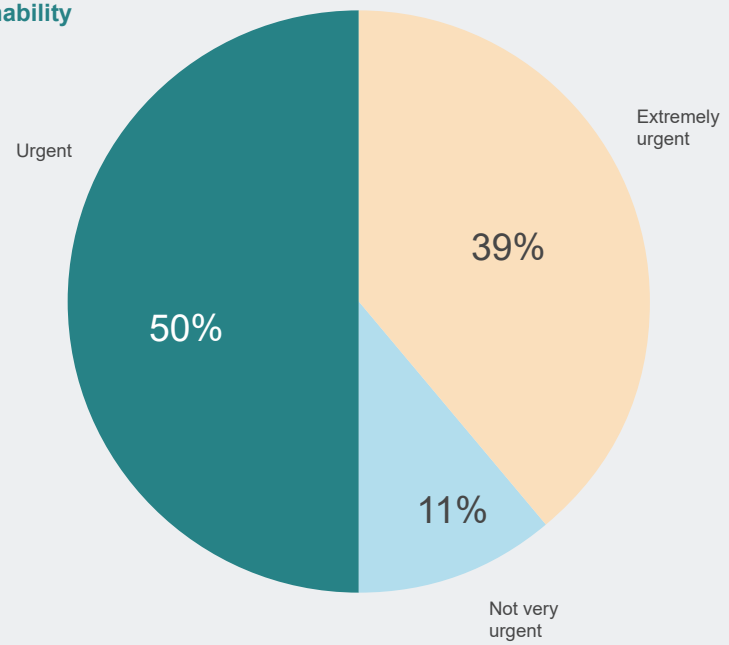


Figure 4 Urgency of sustainability

Timeframe of sustainability strategy planning

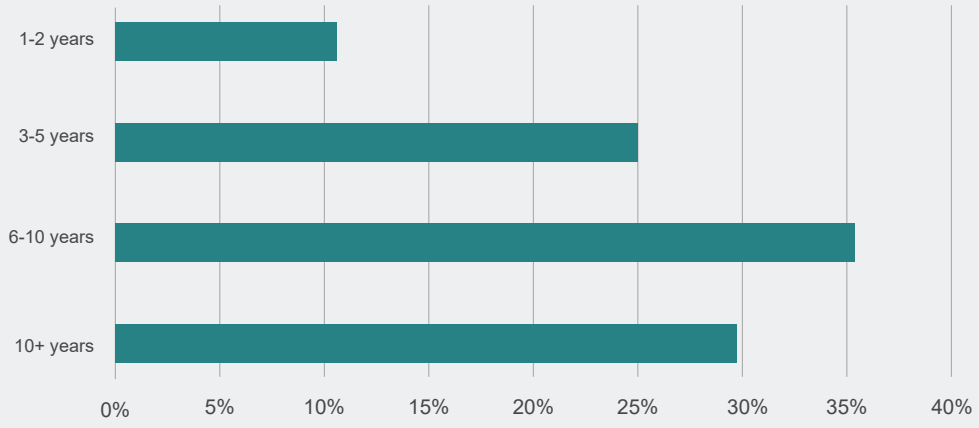


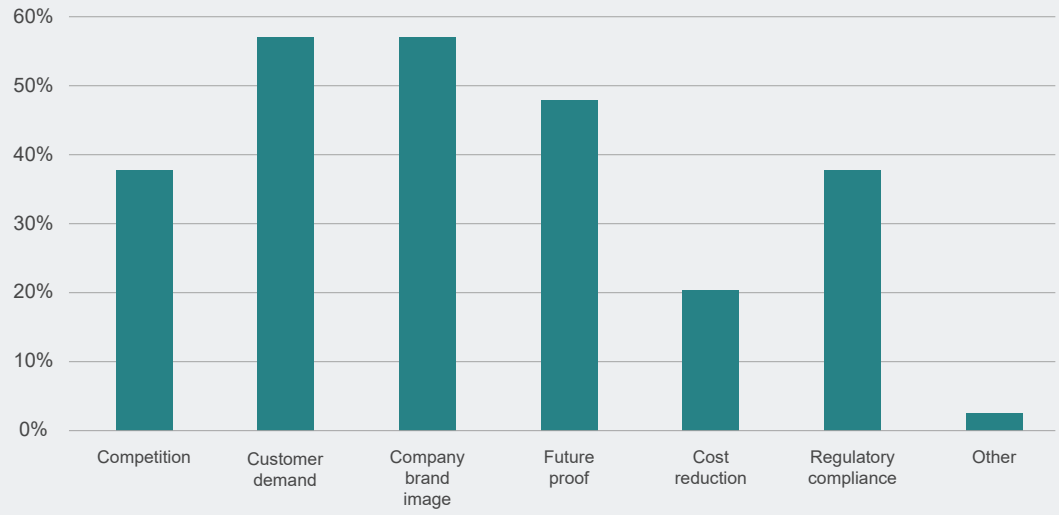
Figure 5 Timeframe of sustainability strategy planning

Business drivers for sustainability

Major business drivers to sustainability include customer demands and concerns over company image, as well as the need to future-proof business.

The last decade has seen increasing consumer awareness of climate change and sustainability with millennials especially, shunning brands that are perceived to be environmentally irresponsible. A major concern is waste generated from consumer packaging. Sagentia Innovation has been working with major brand owners in their efforts to find more sustainable packaging solutions and it now seems that the pressure has cascaded down the value chain with the chemical/material industry needing to be part of the solution. We have seen the number of "vertically integrated" sustainability initiatives increase in the last couple of years: one such example is Alliance to End Plastic Waste (https://endplasticwaste.org), whose members include companies at all stages of the value chain from petrochemical companies, intermediate manufacturers, polymer resin manufacturers, and packaging makers, to brand owners such as P&G and Henkel.

Businss drivers for sustainability



Almost 50% of respondents also see sustainability as a way to future-proof its business. Regulation will inevitably become more stringent and improving the sustainability of both products and operations will help secure a company's license to operate in the future.

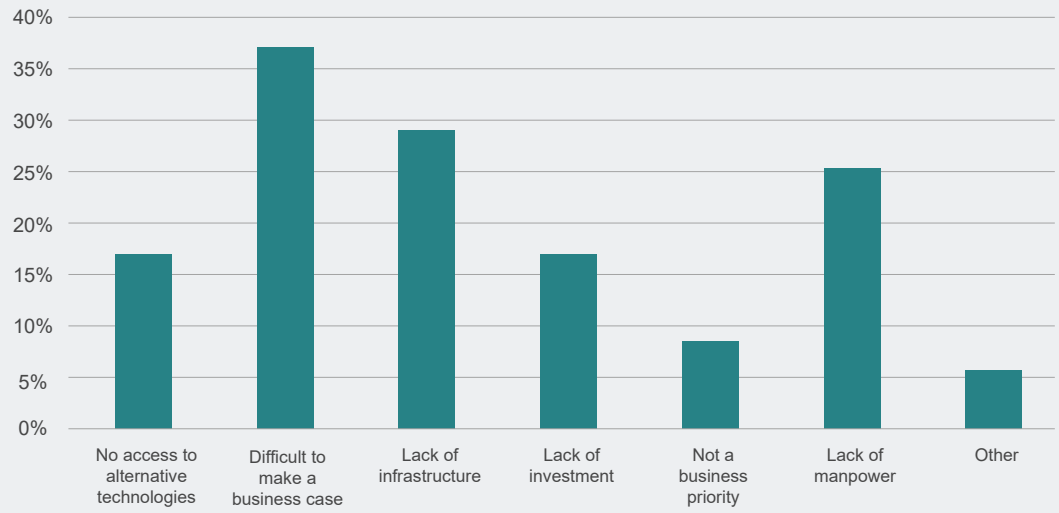
Sustainability is not all about social responsibility and brand image as companies see such initiatives as an opportunity to gain commercial advantage and create differentiation. 20% of respondents stated that their companies see sustainability as a way to achieve cost reduction especially as a significant part of chemical manufacturing cost is energy consumption and improving energy efficiency during chemical conversion separation, purification, and transportation, offers scope for cost reduction. Alternative feedstocks such as biomass and plastic waste (through chemical recycling) also offer the possible cost savings in the long run although the short-term business case is not always easy to establish.

Challenges in implementing sustainability strategy

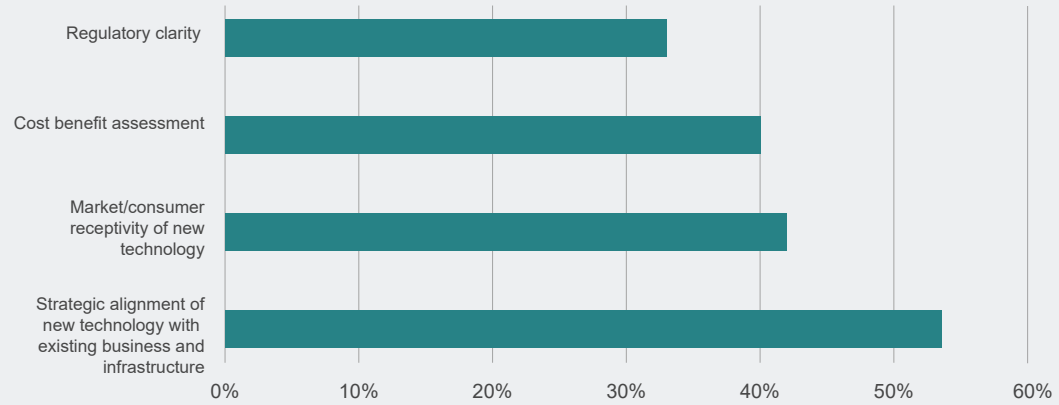
One of the biggest challenges identified in implementing a company sustainability strategy is in building a credible business case. Technologies that have the most potential to transform the industry, such as electrification, chemical recycling, and bio feedstocks, are still under development and require substantial long-term investment. And until costs reach parity, chemical companies will always face the challenge of persuading their customers to pay more for sustainable products.

Lack of infrastructure, for example, to collect, transport, and clean up plastic waste is another major challenge as it simply does not exist in many parts of the world: it's a major stumbling block cited by most companies in the material sector.

Challenges companies facing in in implementing sustainability strategy



Challenges to make coherent strategic decisions sustainable technology



And it is probably unsurprising that sustainability initiatives have to compete with other business priorities for resources, both in terms of investment and manpower.

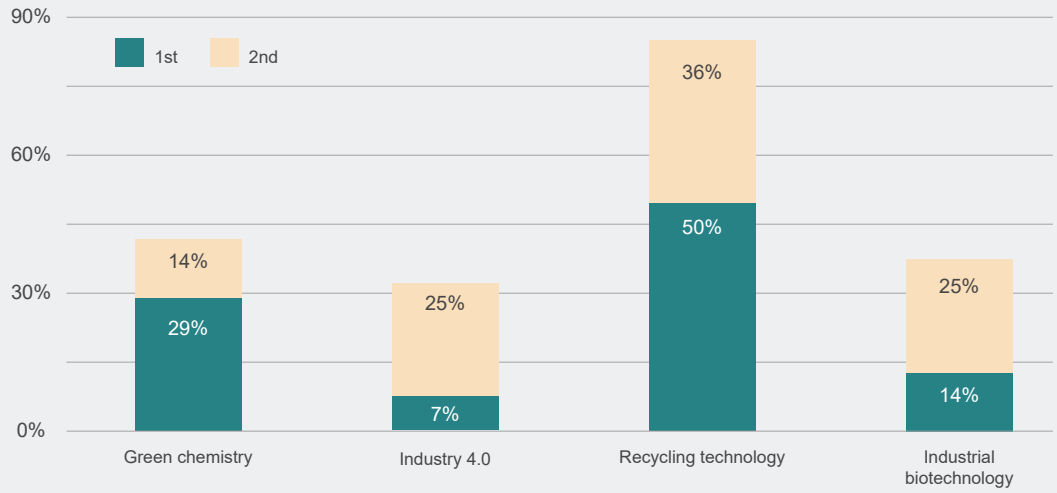
Whilst access to new technologies itself is not viewed as a major challenge by most respondents, it is harder to decide which new technologies to invest in to ensure strategic alignment to a company's existing business and infrastructure.

Technologies to achieve sustainability

We asked respondents to rank the relative importance of green chemistry, industry 4.0, recycling technology and industrial biology and the graph below shows the accumulated figures for the top two choices. 86% of respondents think recycling technology ranks either 1st or 2nd whilst 32% think the same for industry 4.0. This is consistent with Sagentia Innovation's observation that plastic waste management is the overall primary sustainability priority for many companies in the chemical industry.

Conventional mechanical recycling has its intrinsic limitations. Contamination means often recycled plastics can only be used in low value applications. Thermal degradation of polymers also means that materials such as PET can only be recycled a finite number of times before thermal degradation renders it practically unrecyclable. The industry has shifted its attention to chemical recycling (also known as molecular recycling or feedstock recycling) in the last few years; this breaks down polymer molecules back into monomers which can then be used as feedstock to make new resins.

What technology has the greatest potential to transform sustainaiblity for the chemical industry in the next decade?



If successfully scaled up, chemical recycling has the potential to truly close the polymer carbon loop. However, it should be noted that chemical recycling is still at a relatively early development stage and facing significant technical barriers especially for mixed plastic waste. We will monitor this space very attentively.

The reason why carbon capture hasn't been a key focus for the chemical industry is complex:

The recycling issue is very visible hence more urgent.

There is plenty of scope to reduce carbon emission through other means (e.g. electrification, energy efficiency improvement and process optimisation).

The economic case for carbon capture is still difficult.

Business model innovation (e.g. chemical leasing) is another route to incentivise companies to operate more responsibly.

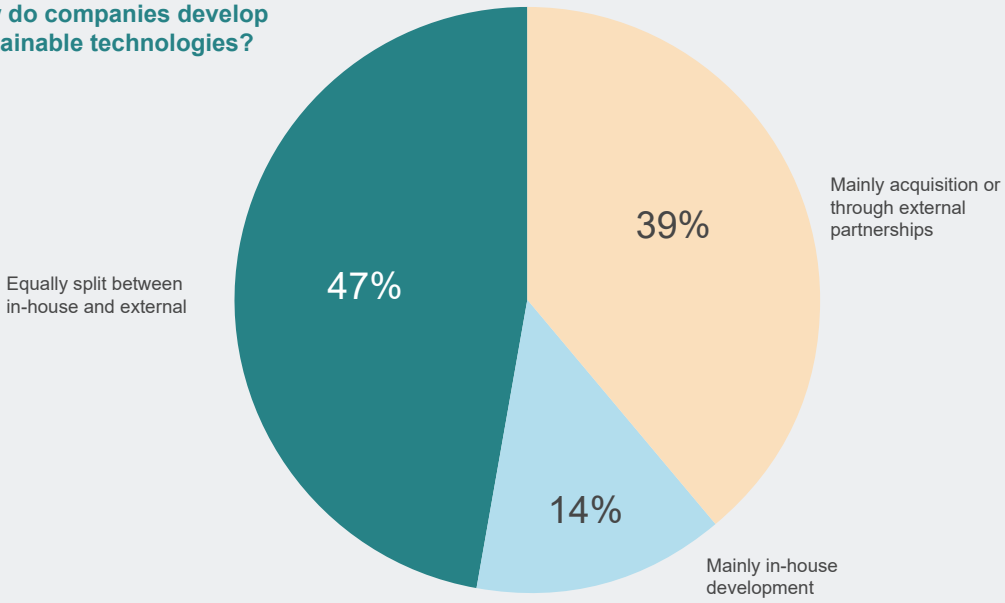
Technology access

With any new technology development, companies can choose either to develop in-house or acquire externally.

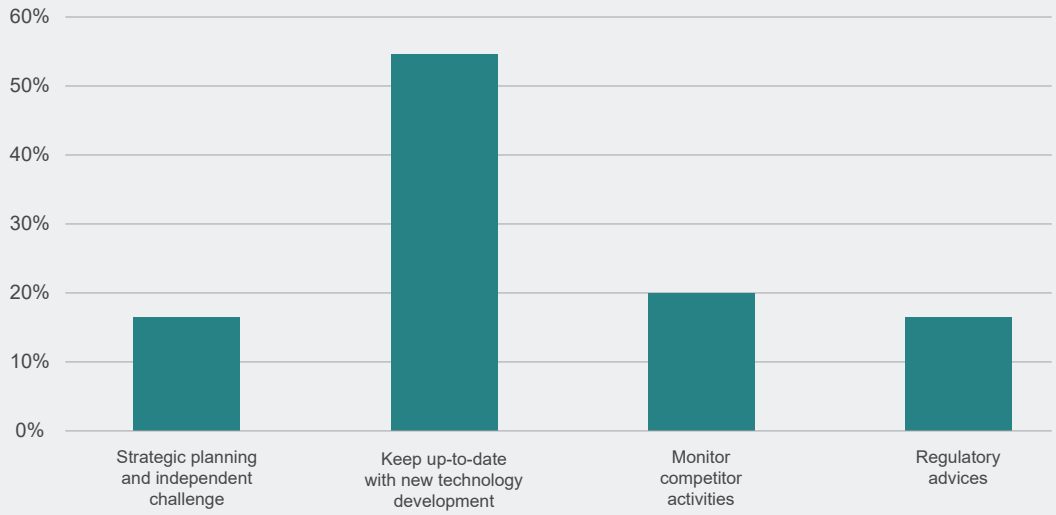
Our survey shows that almost half the companies use a hybrid model with more than 60% of the companies forming some kind of external partnership in order to access technologies and speed up development. While this does show that companies attach high importance to sustainable technology development, it also demonstrate that even the big companies do not have all the competences in-house.

In addition to joining networks and attending conferences, many companies also use specialist companies such as Sagentia Innovation to help their strategic planning as well as to keep abreast of new technology development.

How do companies develop sustainable technologies?



How to use specialist innovation service providers



Over the next decade, the chemical industry will be transformed as new technologies mature and regulation and social attitudes force a shift in the entire economy. Sagentia Innovation looks forward to being part of this transformation.

Sustainability is set to transform the chemical industry in the coming years. This is driven by the increasing realisation of climate impact, and customer demands for more environmentally responsible products, together with anticipated change of regulations in most major economies.

Chemical companies have responded to these changes by gearing up their effort in optimising their own operations, as well developing more environmentally sustainable products for their customers. Most companies that Sagentia Innovation surveyed consider sustainability both important and urgent and have set a clear sustainability strategy, however there are still significant challenges facing the industry.

Despite the consensus over the long-term strategic importance of environmental sustainability, the short-term individual business cases are not always easy to establish. Key technology platforms are still at a relatively early stage and require significant long-term investment which is often in competition with other business priorities.

Companies, even industry leaders, do not have all the technical competences in-house to go it alone, and need to work with others (e.g. start-ups, research institutes, companies in other parts of the value chain, or even competitors) to make a true breakthrough.

About Sagentia Innovation

Sagentia Innovation provides independent advisory and leading-edge product development services focused on science and technology initiatives. Working across industrial, chemical, energy, food and beverage, and consumer markets, Sagentia Innovation works with start-up disruptors through to world leading brands to extract maximum value from R&D and innovation investments.

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