



Innovating chemicals and petroleum

Revenue and efficiency in a volatile age

IBM Institute for Business Value

Executive Report

IBM Chemicals and Petroleum

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Innovation: The key to growth

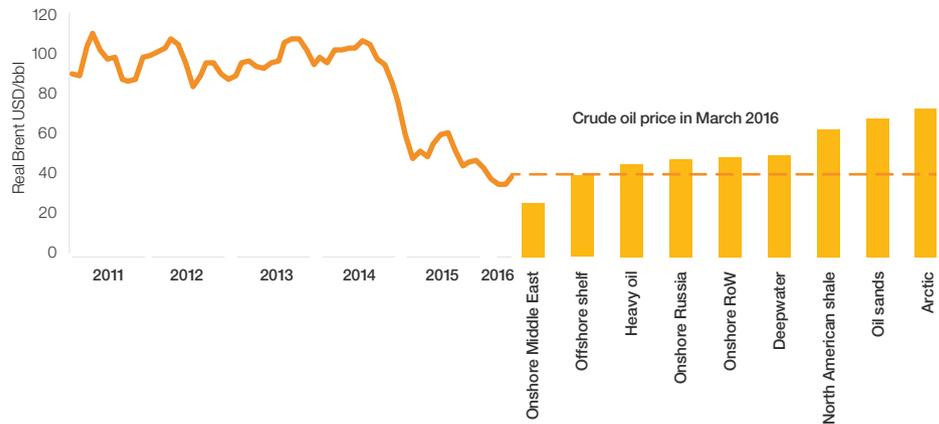
The global chemicals and petroleum (C&P) industry is facing unprecedented challenges. Falling crude prices, volatile socioeconomic and political environments, new forms of competition, and ever-increasing demands for sustainability and safety are disrupting the industry.¹ As C&P organizations navigate these challenges, they can learn valuable lessons from leading global innovators. C&P companies can apply these learnings to create new structures, functions and cultural environments conducive to innovation, and to establish more efficient processes for converting ideas into outcomes. By embracing these successful innovation strategies, C&P organizations can position themselves not only to overcome current challenges, but also to grow revenue, capture efficiencies and join the ranks of the outperformers.

Executive overview

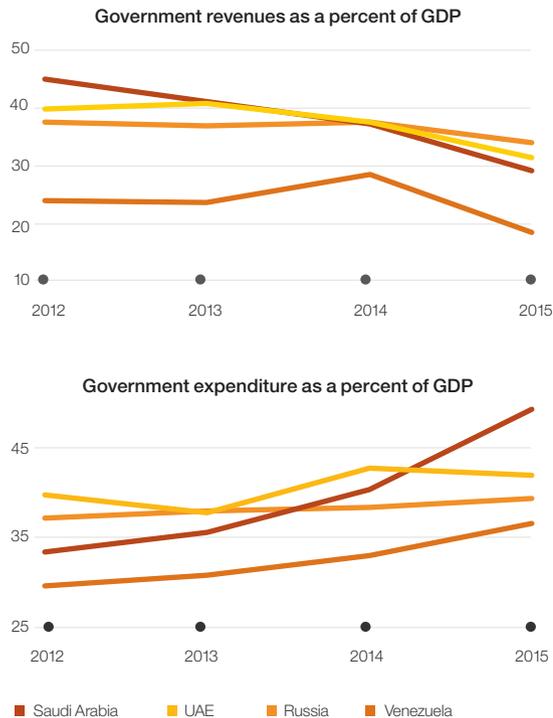
The global C&P industry has rarely experienced its current level of volatility. Challenges for the industry abound. Primary among them is a combination of reduced demand and increased supply that has lowered oil prices to levels not seen for more than a decade.² At prevailing low prices, oil production in many areas of the world is becoming uneconomic. Industry implications are manifest, with declining investment and growing pressure for major players to rethink strategies and cut costs (see Figure 1).³

Figure 1

Low oil prices are changing industry economics



Source: "Crude oil prices - 70 year historical chart." Macrotrends website; "Oil and the U.S. Economy." Pine Brook Partners report. April 10, 2015.

Figure 2*Public finances are also in the crosshairs*

Source: "World economic outlook database by countries." IMF website. October 2015.

Many industry players are experiencing the negative consequences of high rates of leverage – the ratio of total debt to total assets – over recent years. For example, debt loads of exploration and production companies in the oil and gas industry have almost doubled since the beginning of the decade in North America, while net cash flows have fallen precipitously over the same period.⁴

The debt-to-revenue crunch is also impacting many oil-producing nations, risking the need for severe budget corrections with consequent political instability. Public sector revenues have been falling, while government spending has either remained static or increased unsustainably (see Figure 2).⁵

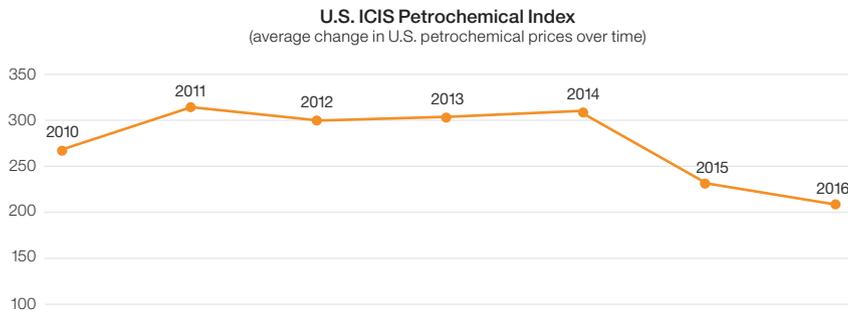
Substantial correction is inevitable, as current public spending levels for many countries are based on the unlikely assumption that oil prices will return to previous levels soon. As of 2015, USD 81 per barrel was the break-even budget assumption for the United Arab Emirates, USD 104 per barrel in the case of Saudi Arabia, USD 105 per barrel for Russia and USD 118 per barrel for Venezuela.⁶

At the same time, government policies to promote sustainability and increase use of renewables are reinforcing lower demand for oil long term.⁷ Continuing investments in clean energy sources, rapidly evolving fuel efficiency standards and improvements in battery technology are among the energy initiatives that place downward pressure on demand for oil.⁸

A global slowdown is impacting the chemicals industry and, coupled with increased production in China, is affecting both prices and margins (see Figure 3).⁹

Figure 3

The chemicals industry is under pressure as well



Source: "U.S. ICIS Petrochemical Index – IPEX." ICIS.



55% of C&P executives surveyed say industries are converging and being reshaped



55% of C&P executives plan to pursue strategies exploiting synergies with other organizations



51% of C&P executives tell us traditional business models are not sustainable

Shock of the new

C&P executives recognize that current disruptions extend beyond simple changes in supply and demand. According to a recent survey by the IBM Institute for Business Value, 42 percent of C&P executives anticipate competition from new and unexpected sources, while 55 percent indicate industries are converging and being reshaped.¹⁰ Additionally, 51 percent report that their traditional business models are not sustainable in the medium-to-long term. Fifty-four percent say that partnering is essential to building new capabilities and 55 percent are actively planning to pursue strategies that exploit synergies they have with other organizations.

Amid this intense disruption, C&P organizations must find innovative ways to improve and enhance exploration and production, promote refining and manufacturing efficiency, and optimize operations and safety. Innovation can help them forge a path to new opportunities. In fact, innovation is strongly correlated with outperformance, both across industries and within the C&P industry itself.¹¹ When market performance of the chemicals companies listed in the Thomson Reuters Top 100 Global Innovators list for 2015 was compared to the overall Dow Jones Chemicals Titan 30 Index, leading innovators consistently outperformed, even when weathering an unstable economic environment (see Figure 4).¹²

Figure 4*Innovation delivers a performance premium*

**Thomson Reuters
Top 100 Global Innovators, 2015**
List of innovative chemical companies

Dow Chemical
BASF
Solvay
Mitsui Chemicals
DuPont
Arkema
Air Products
Nitto Denko
Shin-Etsu Chemical
Toray



Source: "2015 Top 100 Global Innovators." Thomson Reuters. November 2015; Dow Jones Chemicals Titan 30 Index.

Figure 5*Revenue and efficiency comprise outperformance*

Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

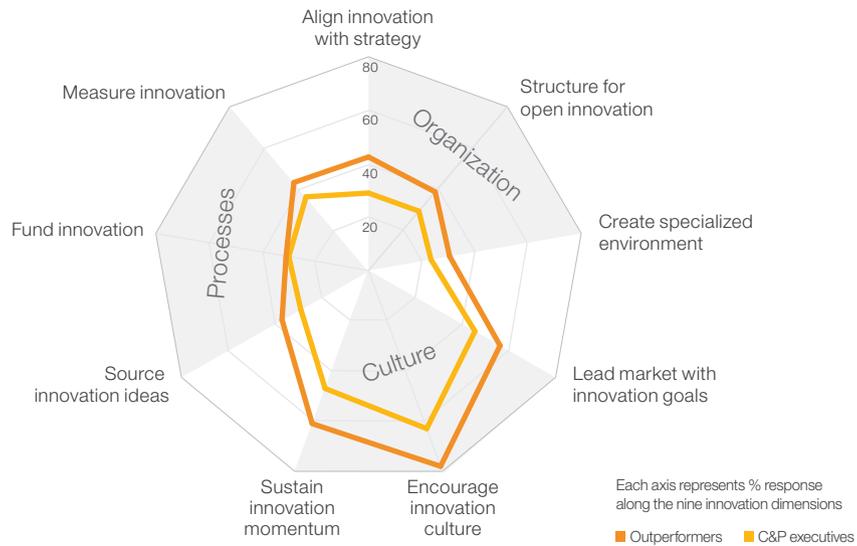
Success is more than magic

C&P businesses need to embrace innovation both holistically and systematically to maximize benefits. In a recent IBM Institute for Business Value global innovation survey, only 6 percent of the organizations surveyed outperformed their peers in both revenue growth and operating efficiency or profitability (see Figure 5).

Outperformers treat innovation differently than others. They:

- Build an organization that encourages innovation
- Create a culture that fosters innovation
- Design processes that enable innovation.

Almost across the board, C&P businesses struggle with innovation. In large part this can be explained by their former positions of strength. High prices drove success, and innovation simply was not imperative. However, this has now changed. If low prices continue, innovation will likely be the key differentiator between those businesses that thrive and those that merely survive – or perhaps even fail. Innovation needs to become a key priority – including establishing a clear innovation vision supported by robust implementation across the organization, culture and processes (see Figure 6).

Figure 6*Innovation aspiration must include a clear vision***Responses of outperformers and C&P executives across nine innovation dimensions***Source: IBM Institute for Business Value Global Innovation Survey, published 2015.*

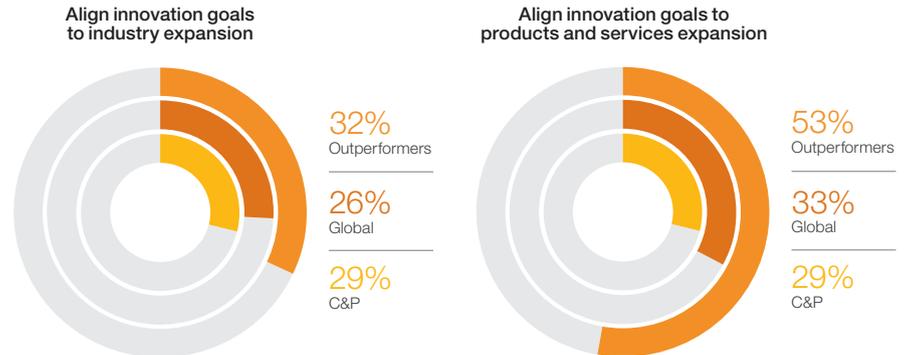
Build an organization that encourages innovation

The most successful companies create innovation structures and functions that support and align with underlying business objectives.

1. *Align innovation with business goals* – Outperforming organizations promote innovation targets that support and reinforce their business objectives. For example, outperformers align innovation goals with products and services and with their growth objectives. C&P industry executives, however, fall behind across both measures, particularly in aligning innovation with products and services, at a rate of 45 percent less than outperformers (see Figure 7).

Figure 7

Outperformers align innovation with their businesses



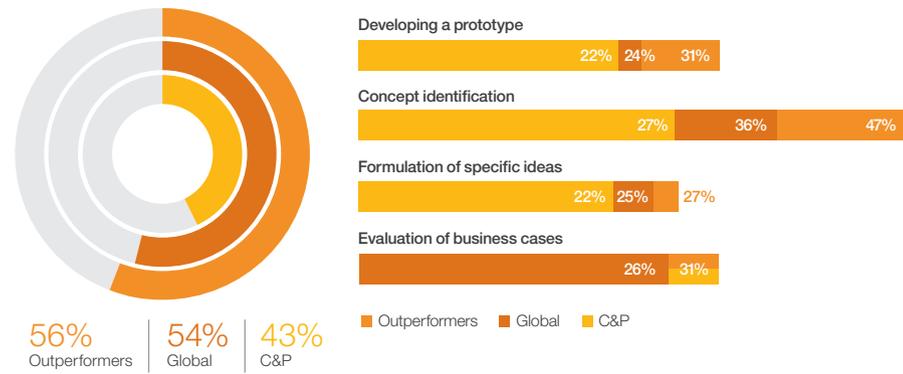
Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

Dow embeds innovation for sustainability¹³

U.S.-based global chemicals giant Dow has established a robust set of 2025 sustainability goals aimed at reducing its environmental footprint, while continuing to drive business growth and expansion. Innovation is at the core of Dow’s sustainability strategy. A key objective for products is to offset three times more carbon dioxide than they emit and save three times more energy than they use throughout their life cycles.

2. *Structure open forms of innovation* – Outperforming organizations build structures that promote open innovation behaviors, such as soliciting new ideas externally and internally, and crowdsourcing. With the notable exception of evaluating business cases for new innovations, C&P organizations lag far behind in openness (see Figure 8).

Figure 8
C&P organizations lag behind in innovation openness



Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

Reliance Industries creates an innovation center of excellence¹⁴

Reliance Industries, the Fortune 500 India-based energy conglomerate, has established a new division, the Reliance Innovation Council (RIC), to conceive and promote innovative new ideas across the company. The RIC has advanced multiple key initiatives to expand innovation across Reliance. Initiatives include the Mission Kurukshetra platform, through which employees can submit ideas and track progress right up to implementation; the Beyonders program, which links innovation opportunities with innovation training; the D4 program, aimed at creating a more vibrant innovation culture; and the Leading Expert Access Program, designed to link employees with global thought and innovation leaders within specific interactive sessions.

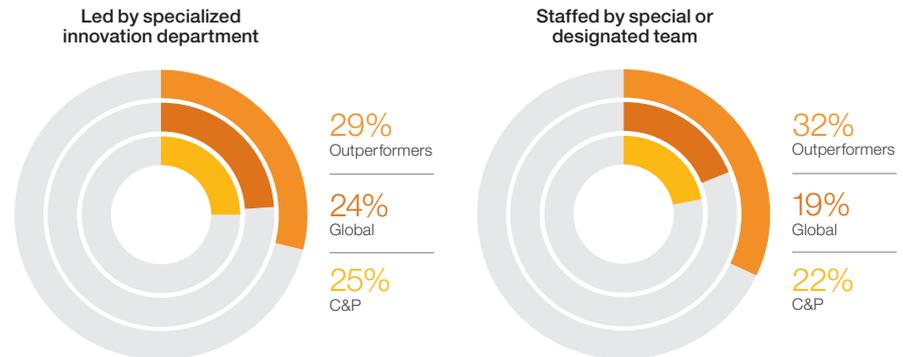
3. *Create specialized teams* – Outperforming organizations are more likely to establish and maintain dedicated innovation teams, and those teams are more likely to be part of a specialized innovation department. While C&P businesses are as likely as the most successful innovators to maintain a dedicated innovation department, they are significantly less inclined to maintain dedicated innovation teams (see Figure 9).

Build an organizational culture conducive to innovation

The most successful companies globally create working environments and cultures in which innovation can thrive.

Figure 9

C&P organizations are less likely to maintain dedicated innovation teams

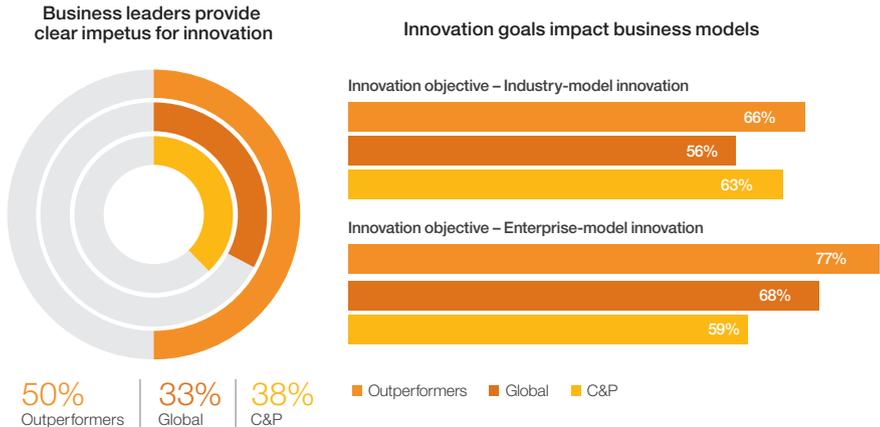


Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

1. *Lead with an innovation focus* – Outperforming organizations explicitly promote the centrality of innovation to their businesses. And they are more likely to provide clear direction and impetus for innovation. They are more open to industry- and enterprise-model innovation, and are more likely to link innovation efforts with financial performance.

C&P organizations rate below leaders in providing innovation direction and impetus, and in directing innovation toward improvement of their enterprises. However, C&P executives are nearly on par with global leaders in their embrace of industry-model innovation. This finding suggests a commitment by C&P executives to innovating the industry as a whole, but less inclination toward embracing innovation aggressively within their own organizations (see Figure 10).

Figure 10
C&P leaders show commitment to innovating the industry

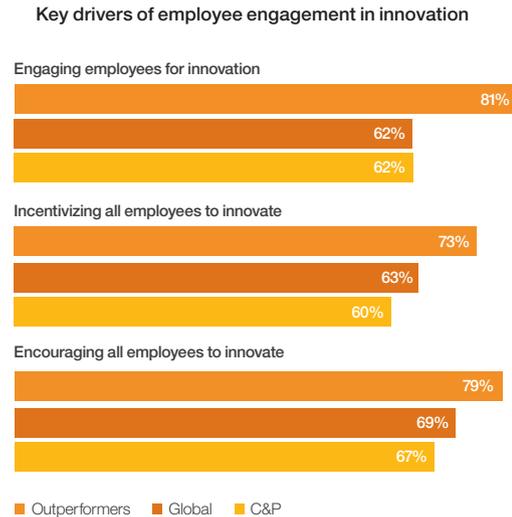


Mitsui Chemicals builds innovation ecosystems¹⁵

Mitsui Chemicals, a leading business within the Japanese conglomerate Mitsui, was ranked among the 100 most innovative firms of 2015 by Thomson Reuters.¹⁶ Mitsui Chemicals actively builds collaboration among small- and medium-sized enterprises that possess unique technologies through its Monozukuri Craftsmanship Campaign. In identifying potential campaign participants, Mitsui Chemicals seeks to establish mutually beneficial partnerships around exciting new innovations, offering a combination of outstanding development capabilities, global presence and marketing infrastructure.

Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

Figure 11
Outperforming organizations engage in key innovation behaviors

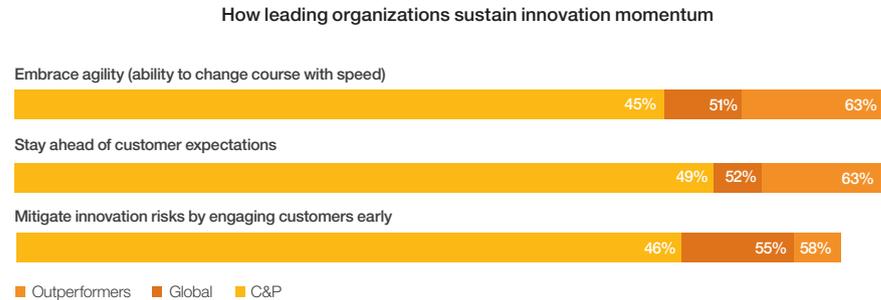


Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

2. *Encourage innovative behaviors* – Outperforming organizations are more likely to actively encourage innovation among employees through specific incentives and rewards, are more likely to engage employees directly in innovation processes and have a greater tolerance for failure. C&P businesses rank lower on average across all three dimensions (see Figure 11).

3. *Sustain innovation momentum* – Outperforming organizations are better able to stay ahead of the market. They value agility, actively work to stay ahead of changing customer expectations and bring customers into innovation activities early, especially with a view toward mitigating risks. Again, C&P companies on average rank lower across all dimensions. They are 29 percent less likely to embrace agility, 22 percent less inclined to stay ahead of customer expectations and 21 percent less likely to engage with customers early to mitigate execution risks (see Figure 12).

Figure 12
C&P companies rank lower in innovation engagement and agility



Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

BASF collaborates with Adidas to produce a leading sports shoe¹⁷

A recognized innovation leader, global chemical company BASF actively collaborates with its customers to adapt new materials to a broader set of business uses. Working closely with Adidas sports scientists, BASF recently innovated production techniques to apply E-TPU, a new high-performance material for athletic shoes. Having successfully demonstrated the value of the new material with Adidas under its BOOST sports-shoe brand, BASF is now exploring other applications for E-TPU.

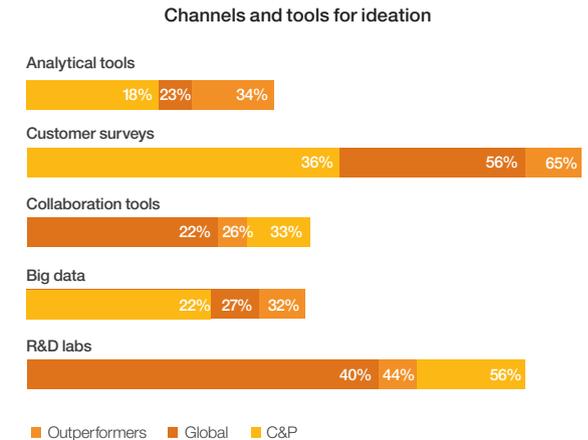
Build structures and processes that source, fund and measure innovation

The most successful organizations encourage innovation from a diverse range of sources. They directly fund new ideas and measure innovation effectiveness.

1. *Source new ideas broadly* – Outperforming organizations employ a broader range of channels and sources in ideation, and are more likely to use big data and analytics to reveal new opportunities for their businesses. Although C&P companies are less likely to employ big data and analytics than global innovation leaders, they rank higher in their use of collaboration tools and their employment of research and development (R&D) labs. However, like other research-intensive industries, such as life sciences and pharmaceuticals, the challenge now facing C&P companies is to extend the transformational power of innovation across the enterprise (see Figure 13).¹⁸

Figure 13

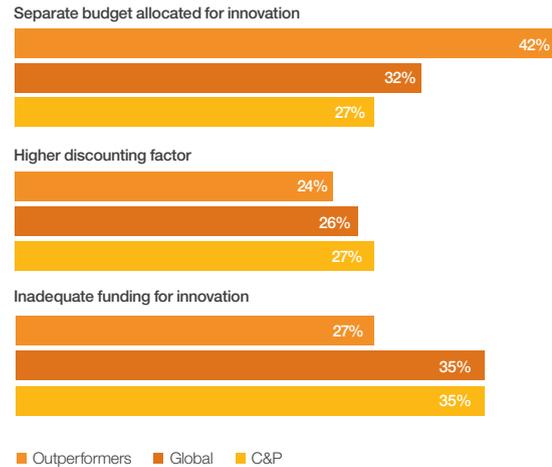
C&P companies use fewer channels to source new ideas



Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

Figure 14

C&P organizations are less focused on securing innovation resources



Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

ExxonMobil supports original research to expand possibilities from new ideas¹⁹

U.S.-headquartered ExxonMobil is ranked among the largest corporations globally. In a major new initiative, ExxonMobil invested USD 25 million over five years as a founding member of the MIT Energy Initiative. The initiative is designed to improve and expand renewable energy sources, explore new ideas and find more efficient ways to produce energy. Under an ExxonMobil fellowship program, 50 students will now be able to pursue research of their choosing in and around the energy field.

2. *Fund innovation* – Outperforming organizations are more likely to approach innovation with a financial discipline similar to that of any other business process. They are more likely to employ standard business case methodologies to make go/no-go decisions on specific innovations and are more likely to maintain consistent innovation funding. C&P businesses are not only less likely to allocate separate funds for innovation activities, they are 30 percent more likely to underfund innovation activities overall, despite high financial returns experienced over recent years (see Figure 14).

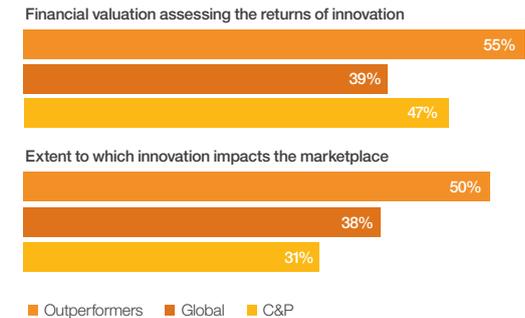
Eni separates valuable innovations from the rest²⁰

Eni, a globally integrated energy company headquartered in Italy, has developed a comprehensive approach to measuring the effectiveness of its innovation and R&D programs. Innovation benefits are measured by means of “what if” scenarios in which applications of best alternative technologies are tested against new innovations. Differences between the two are quantified, highlighting distinctions between incrementalism and higher-value innovation. The value created by Eni’s innovative technologies and products in 2014 amounted to more than EUR 700 million.

3. *Measure innovation outcomes* – Outperforming organizations hold innovation initiatives explicitly accountable to meeting clear financial objectives. They are more likely to measure innovation outcomes and to assess the impact of innovation on their markets. C&P companies rate lower across all three dimensions in assessing innovation’s financial returns and market impact (see Figure 15).

Figure 15

C&P organizations are less likely to measure innovation outcomes



Source: IBM Institute for Business Value Global Innovation Survey, published 2015.

Innovation lessons from the most successful organizations

Financial outperformers have created organizations, cultures and processes that enable innovation to thrive. C&P businesses can learn valuable innovation lessons from these high-flyers. To that end, they should focus on:

Organization

C&P businesses need to make innovation part of their organizational cores. Organizational design should be as much about innovation as it is about providing product to end consumers. Align innovation with business goals. Establish senior management support for innovation as a core mission of your organization. Orient operational models around open innovation, promoting conditions for the development of agile ecosystems. Form specialized innovation teams. And establish robust innovation governance and investment guidelines.

Culture

A culture that fosters innovation and organizational agility is a necessity. To build this culture, place customer-centric innovation at your organizational core. Encourage business-model innovation. Empower and reward employees for engaging in more open forms of collaboration and innovation. And communicate new priorities clearly and effectively across the organization, to partners and other key stakeholders.

Processes

Rethinking processes to facilitate innovation is a key step along the innovation journey. Focus on more effectively tapping into predictive analytics and big data. Extend innovation beyond R&D labs into collaborative ideation platforms to jumpstart thinking and conceive and validate new ideas. Establish clearly defined approval processes to evaluate and manage innovative initiatives. And secure dedicated innovation funding, measuring innovation outcomes according to financial metrics.

Can you become an innovation outperformer?

Ask yourself the following key questions:

Innovation organization

- How are you aligning your innovation strategy with your business strategy?
- How can you better organize innovation teams and responsibilities?
- How are you opening up your innovation processes?

Innovation culture

- How do you promote innovation as a core business activity?
- How are you encouraging your employees to innovate?
- How do you sustain the innovation momentum created?

Innovation processes

- How can you expand your sources for new ideas?
- How can you improve allocation of funds for innovation?
- How do you measure innovation performance?

For more information

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May 2016

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