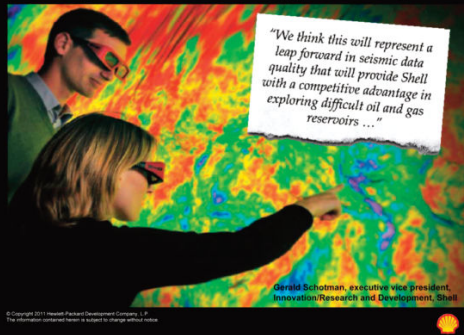


A FROST & SULLIVAN EXECUTIVE SUMMARY

Co-Innovation Supports “Big Wins”— An HP-Shell Case Study

Shell expands O&G technology leadership



HP MEMS Inertial Sensing Technology

- 1000x higher resolution: <1 micro-g to 10g
- Low mW power for battery operation



- Leverages existing HP 200mm inkjet fab

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Co-innovation is a powerful concept that enables companies to work together to leverage their resources to produce value while reducing or sharing risk. Co-innovation has been called the new open innovation. “Open innovation,” said Leo O’Connor (Frost & Sullivan Vice President, Global Research — Technical Insights), “as defined by the online community, is applied to projects where a clear need has been identified and a company is required to go outside to find ready, or nearly ready resources to fulfill that need.”

In recent research, Frost & Sullivan has found that while most companies do not have a formal open innovation department or staff, co-innovation is much more common, involving internal and external staff and departments working together in real time on breakthrough products, services, and technology.

The Collaboration Continuum

Companies have been collaborating around innovation forever, what’s new about co-innovation? It sits in a continuum of collaboration, ranging from:

Lead User Innovation: In which a company collaborates with a customer with acute and extreme needs and solves their problem. The new solution is then adopted by the mainstream that has the same problem but didn’t realize it.

Open Innovation: In which a clear need is specified and then advertised and filled by collaborating with people outside the company. Alternatively, an outsider may propose a clear technology or solution you can develop in collaboration.

Co-Innovation: In which two or more companies work together as equals to clarify a problem and invent a new solution. It can take the form of a transactional agreement, a strategic partnership, a joint venture, or a merger or acquisition.

What is new about co-innovation is two companies in a strategic partnership collaborating openly, as if they were a single team, to create a radical breakthrough in an industry.

Case Study: Shell and HP

Multinational oil company Shell Oil and multinational computer information technology corporation Hewlett-Packard recently announced a breakthrough in their jointly-developed inertial sensing technology to develop seismic data at extremely high-sensitivity and ultra-low frequencies.

The purpose of this co-innovative initiative was to create a clearer understanding of what occurs in the earth’s subsurface, by combining Shell’s and HP’s abilities to find new deposits of gas and oil.

“The collaboration with HP demonstrates Shell’s strategic approach to driving innovative technology solutions through active partnering,” said Dirk Smit, Chief Scientist for Geophysics and Vice President of Exploration Technology, in a press release that announced the testing.

The sentiment is echoed by Rich Duncombe, HP Strategist, Technology Development Organization, Printing & Personal Systems, Hewlett-Packard Company who said, “This new sensing milestone is on track to produce a leap forward in onshore seismic data quality to improve the exploration risk evaluation and decisions, illustrating the industry-wide benefits that can be achieved through cross-company innovation.”

Meanwhile, Wall Street Research has found Shell to be a leader in cash-flow generation as well as in technology. The company has spent more on R&D than its direct competitors each year for the past five years. This collaboration builds on the core strengths of each company to advance technology seismic technology.

Shell and HP’s Shared Vision of Co-Innovation

The seismic acquisition program at Shell and HP is focused on increasing the production of oil and gas. “It is one of the most exciting programs I’ve worked on in my career,” said Duncombe.

The program’s vision is to disrupt the seismic acquisition market from a 30-year, incremental-improvement cycle to a much steeper curve.

The model drives together a best-in-class approach to bring out the best in Shell and HP, said Duncombe.

Disrupting Seismic Technology

Current seismic systems are based on analog geophones. Geophone voice coils connect to cables and convert grounding movement sounds into voltages, which are recorded at a remote location. Large surveys can require tens of kilometers of cables between the geophones and various sensing units. “These systems are bulky; they’re heavy; and they require massive crews to operate these surveys,” said Duncombe.

To address the limitations of geophone technology, Shell and HP are building a system that will utilize up to one million, digital wireless sensor nodes. This game-changing innovation will increase the areal density of the subsurface image, while utilizing much smaller crews and lighter and more transportable systems, said Duncombe. The new technology adds flexibility, enabling geophysicists to create new survey topologies.

Rising to Meet Technological Challenges

The greatest challenge faced by Shell and HP is scaling up to meet the demands of the new seismic system technology. This challenge has required the two companies to create a number of co-innovation breakthroughs, including: operational efficiencies; system weight and transportability; and system resiliency.

The HP MEMS sensor is the heart of the system. This small micro-electro-mechanical chip is the world's most sensitive inertial sensor — if the sensor were placed in the center of Australia, it would be able to sense vibrations from wave action on the shores of the continent, said Duncombe.

This co-innovation project is all about disrupting the current market for seismic exploration. “But the journey actually started with a canceled research project — Atomic Resolution Storage,” said Duncombe. “After that project was cancelled, a researcher from HP Labs realized the micro-mover stage, which was used in the ARS project could be operated in reverse, to sense movement rather than to create movement.”

Another significant milestone in this journey was the publication of HP's vision in The Harvard Business Review. This vision was called the Central Nervous System for the Earth (CeNSE). CeNSE's focus was to place sensors throughout the earth to track seismic data and predict earthquakes.

From there, HP started to hone in its commercial strategies through a series of workshops and then launched the co-innovation program with Shell.

“We are not all the way to market yet, but this specific case highlights the key success factors for this project and other co-innovation projects,” said Duncombe.

HP's Co-Innovation Success Factors

Succeeding in the market through the process of co-innovation requires a commitment on the part of all companies involved. In order to ease this process, Duncombe shared HP's success factors for companies to follow when on the journey to co-innovation:

“ A compelling customer need and a great technology are necessary but not sufficient to change the world. Many innovation failures occur because teams don't take the time to formulate their projects and think through the real business issues. ”

Internal:

1. **Shelter the project from internal metrics and processes:** There is no formula or recipe to start a new business or product category. The only chance to be successful is to shape the organization to the needs of the project.
2. **Banish supplier/procurement thinking:** Partnerships for co-innovation do not fit into a supplier or procurement mindset and this approach will significantly reduced the power of co-innovation.

Partner:

3. **Have the tough conversations up front:** The key is to get the tough issues on the table rather than thinking that they will go away and work these issues face to face whenever possible.
4. **Negotiate based on principles:** A co-innovation project is a journey, not a transaction. There will be many issues that need to be negotiated from technical specs to funding to commercial strategies. The key is to develop a core competency in joint decision making and focus on project success.
5. **Never overestimate the knowledge of your partner:** These assumptions often go un-checked and will create numerous problems over time. A proven approach is to co-locate key team members to spot these communication gaps.

Value Creation:

6. **Every decision needs to improve risk-adjusted value:** Characterizing the market value of a disruptive solution is a difficult task and may consume the business analysts rather than characterizing the sources of risk. It is a good sign when everyone in a co-innovation program is focused on improving the risk adjusted value.
7. **Communicate your vision (prepare the market, build your brand):** Communicating the vision to the industry early can accelerate collaboration with other companies and create the right market conditions for a market disruption.

Market Disruption:

8. **Market disruptions are often driven by technology innovation:** Technology innovation is recognized as one of the most important factors required to meet the energy challenge over the coming decades.
9. **New businesses fail for commercial reasons:** The corollary is that the overwhelming cause of failure for new business launches is commercial issues. It is critical for co-innovation partners to jointly drive the commercial strategy to reduce risk and open market access.

10. **The more outrageous the vision, the more resilient the program:** Duncombe also notes a corporate paradox in executing co-innovation programs: “Failures are simply not OK. We didn’t get to where we are as major corporations by failing,” he said. “Failures may be tolerated but they are not celebrated which can create a constant ratcheting down of the vision to minimize risk. Yet, when a project falls into trouble, and it will, it is precisely the power of the vision that drives creativity and passion to solve the issue.”

The vision for the seismic acquisition program is to disrupt the seismic market from a 30-year, incremental-improvement trend to a much steeper curve. Above this project is HP’s vision for CeNSE. “This is a vision for decades to come to develop large sensing networks that will help people manage our resources, security, and infrastructure,” said Duncombe.

SmartOrg’s Best Practices for Co-Innovation

SmartOrg, a company that provides a unique combination of process consulting and decision support software, worked with HP on its co-innovation process. The business model, jointly developed by SmartOrg and HP, is based on experience over more than a decade working with companies in industries ranging from high tech to pharmaceuticals and other industries that depend on innovation for successful growth.

SmartOrg’s co-innovation model includes four phases or stages:

1. **Ideate:** Ideation is not about finding hundreds of ideas and sifting through them, but to first find “committed innovators” with actionable insights. It is then that ideas that contribute to his/her innovation vision will be of value.”
2. **Formulate:** Together with your partner develop and map out the most important technical, development, and commercial factors that drive value, with specific attention paid to the uncertainties that surround each factor. Agree and develop a “learning plan” to guide the project as it moves forward, including a set of “proof points” at critical junctures. Matheson cites a number of principles that underlie success:
 - A. Consider multiple paths to commercialization
 - B. Develop a set of strategic alternatives
 - C. Identify the impact of uncertainty on key factors
 - D. Develop a common value metric such as expected net present value (NPV)

3. **Incubation:** Incubation is about delivering on proof points at critical stages of the process. When proof points are met, decisions can be made about moving forward to the next proof point, adding resources as necessary. If proof points are not met, the project needs to be redirected or, in extreme cases, killed.
4. **Acceleration:** Once the incubation proof points have been explored and successfully met, the product or business is still adolescent and needs to be transitioned from proof-based metrics to profit and loss ones.

“ Adolescent businesses need adult challenges in a safe environment,” said Matheson. “These innovation and co-innovation businesses need profit and loss discipline without the crushing pressure to meet short-term goals. The new business needs to have the flexibility to adjust as management works out early issues and scales the business into full P&L accountability.”

ABOUT SMARTORG

Since 2000, SmartOrg software and services have helped companies discover their most profitable opportunities. SmartOrg provides solutions for the economic evaluation of opportunities, especially when the future is clouded with uncertainty. Companies like Boeing, Chevron, Dow AgroSciences, HP, SanDisk, and TEVA Pharmaceuticals use SmartOrg to build capability; drive innovation from ideas to commercialization; and select projects and improve returns on their portfolios. Learn more at www.SmartOrg.com

ABOUT HP

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