White Paper

Technology Strategies for Manufacturers:
Disrupt or Be Disrupted

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> "The Third Industrial Revolution—the digitization of products—will change the way goods are made."
>
> *The Economist*
> April 21, 2012

Introduction

Over the last decade, an explosion of new technologies has created new winners and losers in nearly every product space. New products for transport, communications, medical care, home, and business activities have given rise to swift and disruptive changes in the marketplace. Most companies have models to incorporate new technologies into future products. However, they continue to be surprised by rapidly emerging technologies that disrupt markets. Cisco's Internet Business Solutions Group (IBSG) has engaged with major manufacturers to develop a novel approach to managing new technologies.

This paper describes three key principles of a strategic approach to mapping and planning for new technologies:

1. **Identify, evaluate, and track emerging technologies** to make more effective decisions.
2. **Establish new processes to sense and evaluate emerging technologies.** Technologies are changing rapidly and new technologies will emerge that require frequent evaluation for strategic impact. These technologies can come from many sources, including universities, competitors, venture capitalists, and internal sources.
3. **Demonstrate agility in dealing with emerging technologies.** Create strategies for acquiring, licensing, partnering, and building capability in a way that optimizes market position and minimizes disruptive losses. Market leaders will also develop a platform of solutions, services, and partners to deliver market success.

As enterprise executives incorporate these three key principles into their product marketing and engineering strategies, they will improve their management of product development and reduce the risk of market disruptions that negatively impact their businesses.

Emerging Technologies Create New Winners and Losers

Industry leaders in many markets have changed in the last decade. This is not simply the result of new consumer buying patterns. Rather, we are seeing the rapid creation of winners and losers based upon technology choices. Winners are more effective at choosing,

developing, and marketing products and solutions with the right technologies. Winners also tend to evaluate broader market ecosystems to understand the dynamics of the market, identify leading technologies, and assess potential partners for joint development of products and services. Losers tend to rely more on internal efforts and information generally available in the market to create and launch products.

Technology in this context refers to any discovery involving materials, design, use, and cost of an end product or solution—for example, new adaptive manufacturing processes such as 3D printing. For the purposes of this paper, technology also includes the use of services from connected products. In the span of three or four years, new technologies have emerged in mobile device manufacturing, medical devices, materials for air transport, automotive vehicles, lighting, energy exploration, consumer products, and adaptive manufacturing, to name a few.

Some of these concepts originated from intensive lab efforts in large corporations or in a wide range of universities. But many had less conventional origins—in venture startups, or even from individuals working in garages anywhere in the world. In the past, companies internalized the development process. This approach no longer works because, in the explosion of new technologies, innovation can come from anywhere.

Disrupt Markets with New Technology—or Be Disrupted

In 2011, the top 200 global manufacturing companies spent in excess of $200 billion on research, design, and development of new products.[1] The manufacturing industry is an innovation leader in terms of patents, spending on research and development, and introduction of new products. Manufacturing accounts for 68 percent of R&D spending in the United States, according to a recent report by *The Economist*.[2] This focus on innovation has resulted in rapid growth of new industries and manufacturing capabilities. Consider, for example, the application of LED technology, composites for transport, machine-to-machine (M2M) communications, nanotechnology, synthetic visualization, fuel cells, and new lightweight materials. These are among the technologies that can disrupt product innovation in many industries.

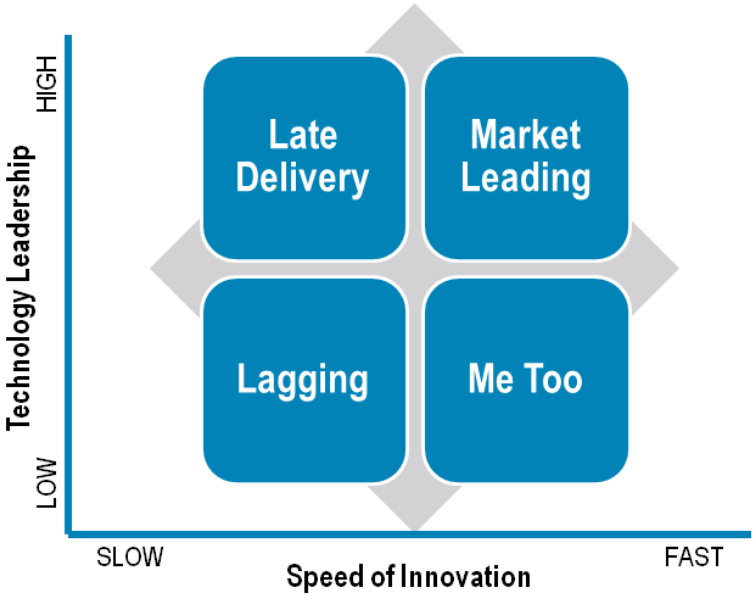
These new disruptive technologies can reshape entire markets and rapidly change the profit picture—or even end the life—of leading corporations. The world's major industrial countries are focusing on this paradigm. The United States recently announced a new $1 billion program to create an office to support the development of new manufacturing technologies. Germany, China, Japan, Korea, and many other countries have similar initiatives designed to encourage active interaction among manufacturers, universities, and institutions focused on technology innovation. Many of these leading industrial countries seem to be focusing on different areas of strength. Germany, for instance, is emphasizing cyber-physical systems, since German manufacturers lead in embedded systems, whereas the United States is concentrating on energy exploration and development.

Most companies have models to help them incorporate new technology into future products. However, many enterprises continue to be surprised by rapidly emerging technologies that leave them scrambling to adjust to disrupted markets. Companies that bring the right technology to market in a timely fashion tend to generate buzz and capture share in new markets—or disrupt existing markets. But being fast with a technology that does not address market requirements or include the support of key ecosystem partners may lead to "me-too"

products that are not winners. Companies that fail to include new technologies in their strategy will be laggards and eventually leave the market (see Figure 1).

Cisco IBSG is working with leading manufacturing companies on a novel way to manage new technologies. The objective is to create market-leading solutions based on a shared technology strategy. A new innovation model is emerging from this effort that will improve the management of technology development and reduce the risk of being left behind by market disruption.

Figure 1. Innovation Model Drives Market Success.



Source: Cisco IBSG, 2012

Companies Need a New Strategic Model for Product Innovation

Technology innovation is accelerating at a pace and range most executives have never experienced before. New products and services are announced daily. So, executives in manufacturing, consumer products, and other industries have shifted resources to look for new ideas from outside sources such as academia, venture organizations, and partners, as well as from internal incubation. However, the volume of new technologies has left a landscape of missed opportunities and failed product launches. As a winter 2011 global innovation report from Booz & Co. indicated, there is a significant mismatch between spending and successful innovation by many corporations.[3]

Most large manufacturing corporations spend between 3 and 10 percent of revenue on new product introduction. Much of that money is misspent, since technology disruptions can rapidly change customer values and the competitive landscape. Executives in marketing, strategy, and engineering need a systematic way to efficiently scan the external and internal horizons and validate emerging technologies that could disrupt a company's key markets and erode profits. The approach of the past is not sufficient to create winners in tomorrow's marketplace. Rather, companies need a more strategic approach.

Figure 2. Traditional Technology Strategy Versus Future Approach for New Product Innovation.

Past Approach	Future Approach
1. Use open innovation	1. Identify technology platform
2. Incubate selected ideas	2. Define future market eco-partners
3. Launch products	3. Build market acceptance
4. Hope for results	4. Manage product growth

Source: Cisco IBSG, 2012

Figure 2 illustrates the new approach required for innovation. In the distant past, corporations relied on internal development of critical technology to create new products and solutions. This was altered in the last decade by a spate of efforts to collect ideas from external sources via open innovation models. Generally, a company would elicit ideas via a website or in forums with industry leaders. While in some instances there were significant successes, this approach became a common practice and many companies found that their new products were not differentiated or market-leading.

The future approach is to scan the technology horizon, both internally and externally, to identify key technologies that will disrupt a market segment or create a new business model.

It cannot be a simple model of incubating a few ideas collected externally, launching a product, and hoping for the best. Instead, leading corporations will seek complementary partners in the market ecosystem—partners whose technologies enable differentiated solutions. This ecosystem of complementary partners will also work to define new profit pools and solutions that leverage a wider range of services and expand the market size.

One example is in the aviation industry, where several companies joined together to provide Wi-Fi Internet access in airline passenger cabins. This represents a new profit pool benefiting airlines, equipment makers, service providers, and technology companies. There are many other examples in other industries and markets.

Future product innovation processes will need to orchestrate a number of key capabilities, including a clear understanding of the following:

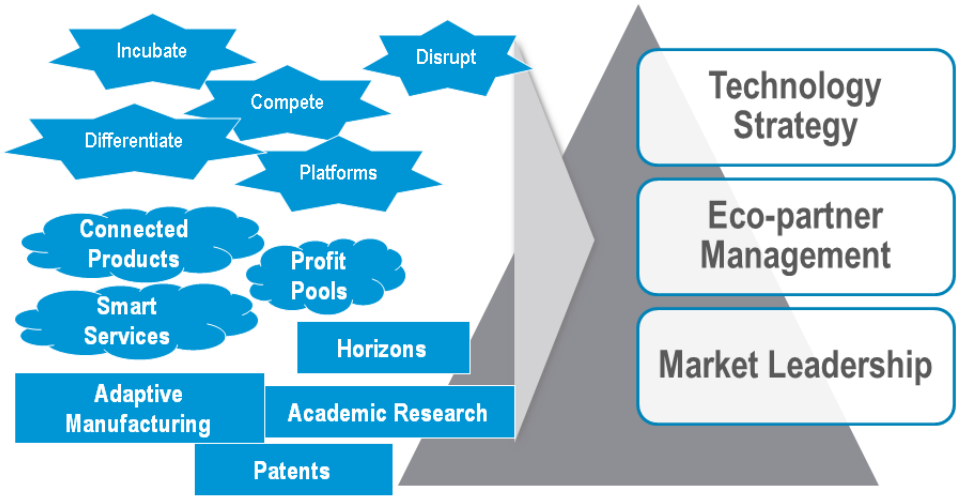
- **Technology Strategy:** Develop a technology strategy based on internal and external scans of rapidly emerging capabilities. These need to include an assessment of key characteristics such as ability to disrupt, stage of incubation, differentiating factors, competitive alternatives, and identification of platform choices. Developing a business and technology architecture is a critical step in this analysis.
- **Ecosystem Management:** Arrange and manage ecosystem partners by assessing the need for technologies to perform certain functions that extend beyond internal capabilities, such as the ability to connect to a broader environment. There is a need to understand existing and future profit pools to validate partner choices. Frequently, the

provisioning of smart services, such as analytics, is essential to the model and can be the source of long-term profitability. Providing smart services can extend a product's useful life by enabling product refresh. Smart services also create a differentiated barrier to new competitors for target customer groups, and can enable new offerings from ecosystem partners.

- **Market Interactions:** Prepare and execute detailed plans for managing market interactions, from initial introduction through full-scale market management. This includes ongoing analysis of customer reactions, portfolio management, media communications, and competitive analysis.

Understanding the strategic enablers and development processes prior to the effort is also critical. The new strategy must encompass all aspects of the value chain. This includes evaluating the potential for new adaptive manufacturing processes, innovative materials, the current state of intellectual property ownership, and external sources of technology.

Figure 3. Future Product Innovation Success: Managing Technology, Ecosystem Partners, and Market.



Source: Cisco IBSG, 2012

Focus on Technology Innovation To Avoid Missed Opportunities

The strategy will frequently need to be repositioned or pivoted as technology changes or market reactions take shape. As a result, it is not enough to set up a strategic framework, and then revert to business as usual. Scanning for new technologies, orchestrating ecosystem partners, or "eco-partners," and managing market-facing processes must be ongoing processes.

Understanding the effects of potential disruptions, particularly related to time horizons, eco-partners, market transitions, and financial outcomes, is critical to success. A rigorous analysis can drive allocation of resources to sustain innovation. Unfortunately, many companies want to "sweat the investment" in innovation by reducing efforts to add capability or create disruptive technologies. When a new market entrant emerges with a superior product or service, then company management must scramble to acquire competing technology and launch a costly effort to provide catch-up products and solutions. Because they have lost

their focus on innovation, the core skills or capability to develop the technology for the new solution may no longer be available to a company. This leads to rapid loss of share and financial disaster.

Turning Innovation Strategy into Market Leadership

To become a market leader, a company needs not only to identify and track key disruptive technologies—it must also harness those new technologies in its solution platforms. Additionally, leaders work with partners who have the capabilities to provide critical components for market expansion.

Figure 4. Technology Strategy Approach for End-to-End Market Leadership.

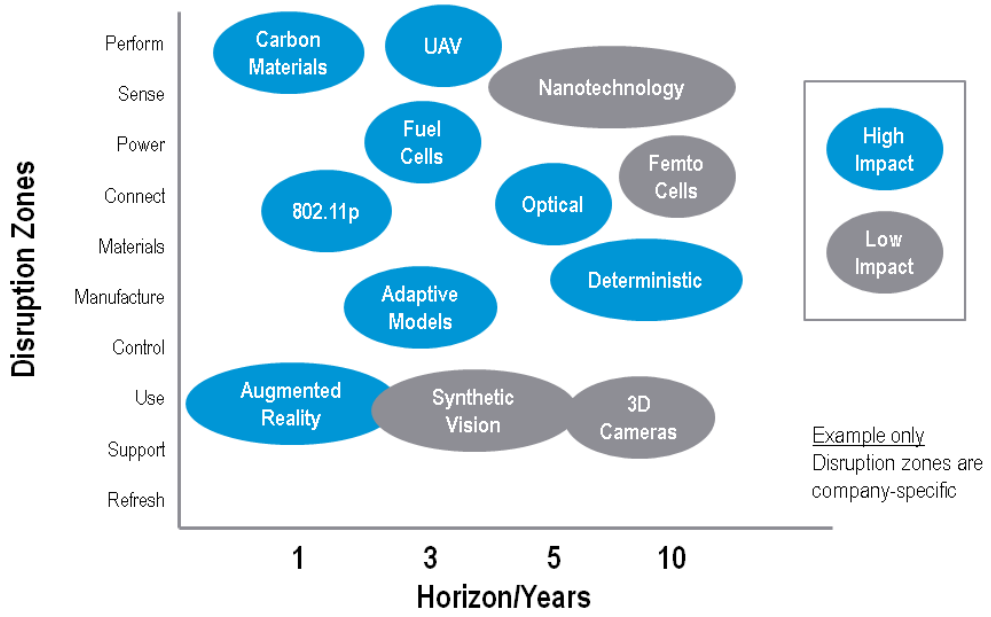
Source: Cisco IBSG, 2012

The technology scan requires the involvement of a diverse internal company team whose members combine business and technology innovation mind-sets. The team should not be limited to R&D or product engineering, but should also include, for example, sales, marketing, and even procurement. As they discover new capabilities in competitive environments, external research and development operations, or in the media, they need to provide simple but effective information to a scanning function that can assemble the content into an overall framework. The collated information should be presented as a dashboard or display in a form that executive management can quickly evaluate for strategic pivots.

The objective is not to develop strategies for each technology, but rather to understand the potential for disruption within the company's key platforms. In this case, "platforms" refers to solutions, services, and technologies that enable a new market offering. Platforms usually involve an ecosystem of partners who provide enabling technologies, market channels, and analytics, and who participate in the overall profit pool. A multidisciplinary team from the partner ecosystem is required to develop new product platforms that consider markets, profit pools, business architectures, and solution architectures enabled by the new

technologies. Also, it is a good idea to share technology scans with key partners on a periodic basis to validate information.

Figure 5. Technology Scan for High-Impact Disruptors.



Source: Cisco IBSG, 2012

Effective Technology Scans Consider Impact and Time Horizon

Technology scans look at the horizon for potential critical disruptions. These disruptions are identified based on information from credible company sources that review and evaluate a range of internal and external information. The scan dashboard is arranged to highlight the potential level of impact and zones or functions that can be affected within the company (see Figure 5). Some companies may choose to look at the impact based on key markets. It is important to understand the characteristics of the technology in terms of disruption potential and impact on time to market.

Most industries have time horizons for changes in business models. Some "long-cycle" industries can take seven to 15 years for a change in fundamental technology. Frequently, the key elements are incubated in labs or have limited use for years before widespread adoption and disruption occur. For example, Ethernet-based interactions with operating equipment have been used for many years. However, recently improved capabilities and new demand for connected products are enabling much wider adoption of embedded Ethernet technology in autos, airplanes, trains, and other devices. There are many other examples, including the rapidly expanding use of carbon fiber and nanoscale technologies.[1]

Technology scans should evaluate intelligence from a number of sources, including:

- Academic institutions
- Patent intelligence
- Standards bodies
- Venture groups and startups
- Competitive assessments
- Open source and professional communities

It is important to include employees or trusted partners in the scanning process who monitor these sources and can assess the importance and time horizons for new disruptive technologies.

Developing Platforms in the Context of the Larger Environment

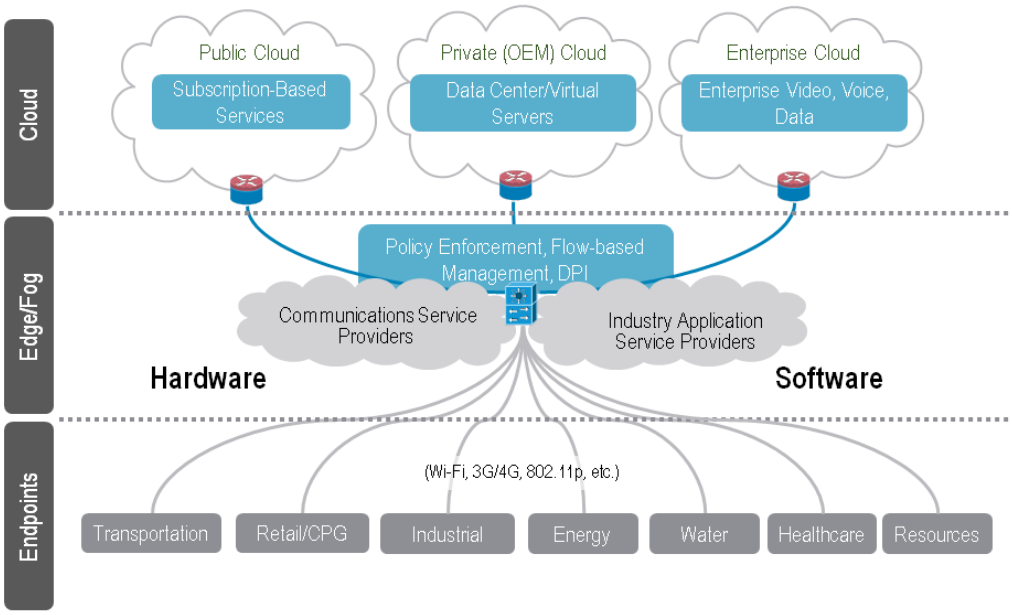
Developing solution platforms requires a keen understanding of the rapidly changing market environment and how it fits with key players and emerging technologies. Leading companies will be those that create a model of existing and future market segments based on a deep understanding of customer processes and value propositions.

For example, a platform for water management would include consumers, water utilities in local jurisdictions, suppliers of purification and distribution solutions, and a range of companies providing support services. In a world where global warming and population increases are rapidly altering market dynamics, a new water model would include more emphasis on connecting use with processing and supply. The future platform would consist of all parts of the ecosystem, with new entrants providing technology to connect and service water needs. The model would include new processes for desalination, use of energy to process water, and more efficient methods of controlling use. There would be a new business model and a supporting technology model. This approach would create new profit pools and market winners.

Changes such as this are happening rapidly in many industries, including healthcare, transportation, energy, retail/CPG, and manufacturing. New profit pools derived from services provided on-demand at a distance will create new platforms and businesses. Technology is essential to the future platform in each case. These platforms will likely be enabled by cloud-based models to provide efficiency and visibility.

Manufacturing companies have an opportunity to harness the technologies provided by complementary providers and lead in the development of new services. Forward-looking companies will focus on connecting industries via Internet- and cloud-based services to combine capabilities from a range of ecosystem partners. Connecting the industry components will be critical to effective orchestration and will lead to a better position in the target market.

Figure 6. Connected Industries: End-to-End Technology Platform.



Source: Cisco IBSG, 2012

Conclusion and Action

Successful companies are developing new models to identify and leverage technology as part of their business strategy. Past practices of incubating and launching individual products will give way to a model based on scanning for disruptive technologies, building a platform for the future, and identifying complementary eco-partners that can provide key capabilities and technologies. Companies that are successful with this strategy will define the new market space and take a lead in orchestrating market transformation.

Corporations that want to be market leaders need to assess their model for change. Key assessment steps include understanding the company's market position having the ability both to scan the relevant technology environment and manage culture change. A successful approach to innovation is based on scanning for disruptive technology, developing an eco-partner platform, and managing market interactions. Key elements of this strategy include:

- Proper identification and assessment of technologies that can disrupt the market
- Identification and orchestration of leading technology partners that are complementary in terms of business objectives and technical competence
- Development and management of the market ecosystem

Delivering on this model will establish winners in the new market. Winners and losers will be decided based on each organization's ability to capitalize on the rapid evolution of disruptive technologies.

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Endnotes

1. "The Third Industrial Revolution," *The Economist,* April 21-27, 2012.
2. Cisco IBSG, 2012.
3. "Strategy + Business," The Global Innovation 1000, Booz & Co., Winter 2011.

While not cited specifically in the text, the following sources contributed to some of the concepts described in this paper:

- "Innovation for the Risk Adverse," *Harvard Business Review,* May 2012.
- "How to Spot the Future," Thomas Goetz, Executive Editor, *Wired* Magazine, April 24, 2012.

More Information

Cisco IBSG (Internet Business Solutions Group) drives market value creation for our customers by delivering industry-shaping thought leadership, CXO-level consulting services, and innovative solution design and incubation. By connecting strategy, process, and technology, Cisco IBSG acts as a trusted adviser to help customers make transformative decisions that turn great ideas into value realized.

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