THE BUILD-OR-BUY DILEMMA IN AI

By Philipp Gerbert, Sylvain Duranton, Sebastian Steinhäuser, and Patrick Ruwolt

AS COMPANIES IN ALL industries explore the rising power of artificial intelligence (AI), they face a familiar dilemma: Should we build or buy? This is rarely an either-or choice. AI vendors have attracted most of the AI talent, so companies are compelled to work with them. At the same time, AI vendors rely heavily on data that only their customers can provide, so such vendors need to work more closely with clients than they may be accustomed to doing.

Consequently, companies have several challenges. They must decide how to select and work with AI vendors both efficiently and in ways that strengthen rather than sacrifice competitive advantage. And they should have a plan for building their internal AI capabilities in an era of short-term scarcity.

Why AI Is Different

Recent computing advances—fostered by Moore's law and its corollaries, as well as big data and algorithmic advances—have caused AI business applications to mushroom. Many of them also take advantage of recent advances in vision and language by machines. (See "Competing in the Age of Artificial Intelligence," BCG article, January 2017.) Machine vision, for example, is a core component of robots, drones, and self-driving vehicles, while speech recognition and natural language processing are integral to document processing, chatbots, and translation devices.

But until recently, AI was largely relegated to an academic niche. As a result, few seasoned professionals currently work in the field—and still fewer of them understand business processes, such as supply chains, or have experience interacting with business executives. This supply-and-demand imbalance will eventually self-correct as academic institutions around the world, including those in China and Eastern Europe, respond to market demand by churning out greater numbers of AI-trained graduates. Until that happens, the question remains how—not whether—to work with AI vendors.

首席AI观旗下有3大类40余小类3000多AI社群，现进一步邀请行业人士加入。

AI技术群	云计算与大数据	机器学习	自然语言处理（NLP）		语音识别
	计算机视觉（CV）	物联网技术	VR/AR	AI芯片	
AI应用	自动驾驶	安防	机器人	智能家居	智能音箱 物流
	新零售	金融	教育	影视游戏	医疗健康 通信服务
	智慧城市	智慧建筑			
城市群	北京 深圳 上海 武汉 广州 杭州 成都 南京 苏州 西安				

入群方法：

1、添加小助手微信（zhidxcom001）

2、回复"入群"，根据提示操作即可。

Vendors play a distinct role in an AI world. That's because AI learns inductively—through trial and error, best guesses, and feedback. Vendors, therefore, need to train their AI tools using data, which often includes sensitive information from their clients. As a result, vendors normally cannot sell plug-and-play applications; they need to work closely with their clients on AI training both during and after the run-time deployment. (See the sidebar.)

AI can bring both enormous benefits and disruption. With such high stakes, companies cannot afford to play a passive role. If they are careless, for example, they may share valuable intelligence that weakens their competitive position. And if they don't build internal capabilities, they risk becoming dependent on vendors.

When assessing AI's potential, executives should be familiar with the current capabilities, limitations, and potential of what we call the AI building blocks. These blocks, such as machine vision, are functioning units that contribute to creating an operational application. Every use of AI incorporates one or more of these building blocks, and each block relies on a collection of algorithms, application programming interfaces, and often pretrained data. (See "The Building Blocks of Artificial Intelligence," BCG article, September 2017.)
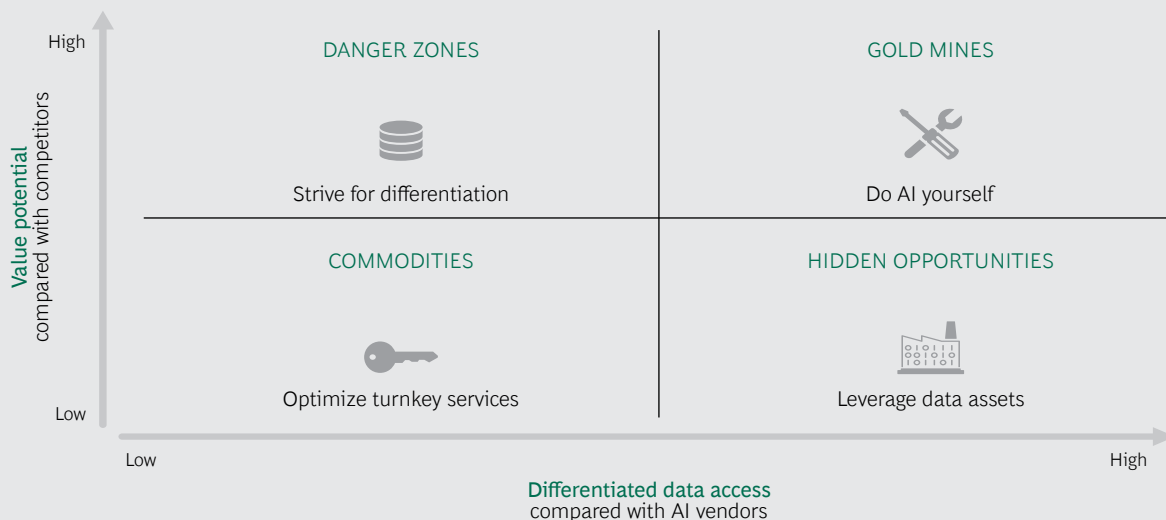
Dissecting the Build-or-Buy Dilemma

Companies can work with AI vendors in many ways, ranging from outsourcing an entire process to buying selected services, seeking help in building in-house solutions or training internal staff. Executives should view these options in light of two questions:

- How valuable is the process or offering to your future success?

- How strong is your ownership, control, or access to high-quality, unique data, relative to the AI vendor?

By analyzing the AI landscape in this way, companies will discover that their AI efforts land in one of four groups. While the boundaries may be fuzzy, and assessments may shift over time, each of these groups shares similar sets of challenges and opportunities. (See the exhibit.)

Commodities. This area is the closest to an off-the-shelf solution and a great entry portal into AI for companies. They can share data with vendors without fear of losing competitive differentiation. If they manage their relationship with vendors properly, they can lower costs and improve the performance of such processes as HR, finance, IT infrastructure, and maintenance. It is the proverbial low-hanging fruit of AI.

Four Ways to Approach the Build-or-Buy Choice

	DANGER ZONES	GOLD MINES
High	Strive for differentiation	Do AI yourself
Low	COMMODITIES Optimize turnkey services	HIDDEN OPPORTUNITIES Leverage data assets

Value potential compared with competitors

Differentiated data access compared with AI vendors (Low → High)

Source: BCG analysis.

Business process outsourcers are revising their business models to take advantage of these opportunities. Infosys, for example, recently required all employees to undergo intensive design-thinking training in order to spur them to come up with ways both to automate their current jobs and to offer clients creative AI-technology-enabled solutions.

Many smaller vendors offer turnkey AI services for specific subprocesses. For example, HireVue screens job candidates for Goldman Sachs on the basis of such characteristics as word choice and facial expression, which an AI engine analyzes. HireVue currently has a database of more than 20 million video interviews—a data trove that an individual user company would be challenged to duplicate.

Before entering into negotiations with a vendor, companies should do their homework to understand the value of these AI-enabled offerings and the vendor's distinctive contribution. A wind park operator, for example, conducted proof-of-concept work internally before negotiating with an AI turbine vendor on a predictive maintenance contract. By establishing a new baseline of what it could achieve without the help of the vendor in terms of greater uptime and lower maintenance of its turbines, the operator managed to strike a better deal.

Hidden Opportunities. Sometimes companies have access to data sources in areas that are not critical to competitive advantage. These data sources provide an opportunity for companies to tap into the technological expertise of AI suppliers and to generate quick wins and insights.

Woodside Energy, for example, worked with IBM Watson to make 30 years of expert knowledge gained from oil platform operations accessible to all employees in the company. The company relied on Watson's natural language processing technology to analyze and classify all data, including 38,000 written documents. Users can ask simple questions, such as "What is the maximum weight of a helicopter landing on the platform?" Although Woodside worked with IBM Watson on the project, it maintained proprietary control of the underlying data.

These approaches can pay dividends in several ways. Often companies can uncover a hidden treasure in massive collections of data and gain skill and experience in training AI algorithms. More ambitiously, companies could conceivably partner with a data-constrained AI vendor to sell application services, pretrained on the company's data, to other companies in related fields. These arrangements could be exclusive, or several companies could work on a data-sharing pool with a vendor.

Danger Zones. Danger zones pose both perils and opportunities. The perils arise because vendors have better access to data than the companies themselves in strategically critical areas. When companies are in a danger zone, they should take care to limit their dependency on the vendor and minimize the possible loss of competitive differentiation. But if companies can manage the relationship well and develop or acquire their own competitive sources of data, danger zones can morph into gold mines—areas of strong competitive importance and data differentiation.

For health care providers, machine diagnosis of radiological images is a danger zone. By working with hospitals, research organi-

zations, and others, a vendor could conceivably create a comprehensive, high-quality database of images that would trump the capability of any single provider. For instance, a company called Arterys is building an AI system in the cardiovascular field that protects patient privacy and is continually improving.

Arterys is a small company. But at scale, automated diagnostics can fundamentally alter industry dynamics and value creation for health care providers, medical technology companies, and insurers. All these companies need to develop strategies that take advantage of the transformative capabilities of AI.

A large metals producer recently took those steps when it recognized that competitors, suppliers, and other vendors within its industry could pool data and gain a powerful edge. The company began to acquire data on prices, suppliers, and materials from a wide variety of public, research, and industry sources. This database will allow the company to accelerate both its AI and R&D efforts and its success in the market. It can potentially open new business opportunities by providing complementary services to other industry participants.

Companies in a similar situation should have data-acquisition strategies that will support their AI activities. They need to find ways to acquire differentiated data, create a novel data mashup from multiple sources, or even acquire suppliers of data in areas critical to their competitive advantage. Without a distinct collection of data to feed into their AI engines, they will be stuck in a bad place.

Gold Mines. Companies need to do AI themselves when they have a gold mine. Vendors and experts can be brought in to accelerate development but only in supportive roles.

A global tire manufacturer followed this approach when it developed an AI platform to predict demand at individual stores for individual models of tires based on anticipated tire wear. The tool, whose develop-

ment BCG Gamma supported, relies on more than 1.6 billion public and private data points and helped to increase overall sales and reduce inventory levels at dealers.

Many of the most promising gold mines will necessarily involve managing complex "frenemy" relationships with suppliers. In the self-driving vehicle market, for example, all manufacturers deal with the leading AI vendors for various services. In such an environment, companies must have a sharp sense of what they should manage in-house, when they must look externally for data or expertise, and how to protect their competitive position. Ultimately the greatest value may emerge through cooperation. By partnering with other companies, vehicle manufacturers could conceivably create a global platform that facilitates self-driving vehicles more effectively than any of them could do on their own.

More so than for the other three groups, gold mines require strong in-house talent and the right mix of vendors providing expertise and project management. Robust negotiation and vendor management skills are critical, as are the transfer of knowledge and the training of in-house staff.

THE ANALYSIS OUTLINED here should help companies become more efficient and effective in structuring and sourcing AI applications and capabilities. Decisions such as whether to build or buy an AI product or service are too important to be approached haphazardly, but uncertainties should not stand in the way of progress. Companies should make decisions within the context of a coherent data strategy, the pursuit of competitive advantage, and a recognition that boundaries will continually shift over time. Areas of competitive differentiation will evolve, and data pools that are distinctive today may lose their value as data continues to proliferate. In this dynamic environment, acting systematically, intelligently, and decisively will itself help secure the future.

About the Authors

Philipp Gerbert is a senior partner and managing director in the Munich office of The Boston Consulting Group and a BCG fellow. He leads the firm's AI initiative and supports companies' efforts to take advantage of AI in business. You may contact him by email at gerbert.philipp@bcg.com.

Sylvain Duranton is a senior partner and managing director in the firm's Paris office and the leader of BCG Gamma, an advanced data analytics team. You may contact him by email at duranton.sylvain@bcg.com.

Sebastian Steinhäuser is a principal in BCG's Munich office and a member of the Industrial Goods and Strategy practices. He has extensive experience in digital strategy, analytics, and artificial intelligence. You may contact him by email at steinhaeuser.sebastian@bcg.com.

Patrick Ruwolt is a consultant in the firm's Munich office and an ambassador for the BCG Henderson Institute. He focuses on creating advantage through artificial intelligence. You may contact him by email at ruwolt.patrick@bcg.com.

The Boston Consulting Group (BCG) is a global management consulting firm and the world's leading advisor on business strategy. We partner with clients from the private, public, and not-for-profit sectors in all regions to identify their highest-value opportunities, address their most critical challenges, and transform their enterprises. Our customized approach combines deep insight into the dynamics of companies and markets with close collaboration at all levels of the client organization. This ensures that our clients achieve sustainable competitive advantage, build more capable organizations, and secure lasting results. Founded in 1963, BCG is a private company with offices in more than 90 cities in 50 countries. For more information, please visit bcg.com.