



Implementing AI: 4 Critical Steps for Success

by Steven Kursh and Arthur Schnure

The hype and reality of artificial intelligence (AI) bombards today's enterprises on an almost daily basis, but what does it take to actually implement it? Simply put, organizations need to address several issues across four critical steps in making AI work to their best advantage: (1) assess business needs, (2) seek skilled AI people and train staff, (3) identify AI machine learning (ML) input data, and (4) choose AI and ML tools. Plus, companies must reevaluate their AI initiatives and make continual investments. This *Executive Update* addresses each of the four steps and offers recommendations.

Step 1: Assess Business Needs

Nearly all software projects are premised on understanding user needs and requirements. In our experience with clients, we typically address this phase by working with prospective users to develop use cases. What are some common use cases? Well, it depends on the company, but we've seen use cases primarily fall into four categories for early-stage, toe-in-the-water AI compared to full-scale ML efforts:

1. Market and consumer intelligence
2. Sales and marketing
3. Pricing and optimization
4. Customer care

For example, one client — a publicly traded company that has pioneered AI and ML as a critical foundation in its business model — had a distinct business need to forecast sales for consumer product goods (e.g., small home appliances). The forecasting was critical because the products were primarily made offshore, had long supply chains, and were subject to changing raw materials costs. Like all retailers and wholesalers, the company didn't want excess inventory. It's all about having the right product, at the right time, for the right customers.

The company used AI and ML to model demand and orders. Additionally, they applied these advanced data technologies to monitor day-to-day online sales as well as to change critical drivers of sales (e.g., pricing and delivery times). After multiple iterations, the company now has a robust forecasting application in place as well as tools to leverage commerce data to grow revenue, increase margins, and provide better customer service.

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We recommend that your organization evaluate the best opportunities to leverage AI and ML, not so much from the perspective of ROI, but in terms of achieving small successes and for building your team. In other words, start on easier, quick-win projects, tackling more extensive initiatives further down the road to ease into the AI learning curve. For example, for an AI product sales projection use case, choose a product with years of historical data, including actual and predicted sales, where prior non-AI predictions have been inaccurate. Or, to improve organization efficiency, employ AI on an inefficient process or scenario containing extensive data, such as high call center costs to categorize call surges, so you can formulate ways to correct inefficiencies.

Step 2: Seek Skilled AI People & Train Staff

You may already have relevant expertise in-house, but it's likely you will need to hire new staff or pay consultants to obtain highly skilled AI expertise.

A full-scale AI effort requires the following roles: application/data architects, data integration experts, cloud platform engineers, data visualization experts, data scientists, business analysts, and business unit leaders. You may already have relevant expertise in-house, but it's likely you will need to hire new staff or pay consultants to obtain highly skilled AI expertise.

We suggest, too, that you train qualified internal people. Consider candidates with backgrounds in statistics, finance, research methods, and quantitative economics. Similarly, we've found in the past that recent college graduates in mathematics, life sciences, epidemiology, physics, and even philosophy can quickly become productive members of the team. Like with all hires, an important attribute is attitude, curiosity, and a willingness to learn about an exciting and rapidly growing field. Keep in mind that a key concern for many personnel is that management is prepared to invest, test, and upgrade as the company's AI efforts grow and improve — so be sure to foster that culture mindset. Management that sees AI as simply an ROI decision will likely not be able to attract and keep top-tier talent.

Step 3: Identify AI & ML Input Data

AI and ML input data — and lots of it — is all-important; without it, your app can't "learn" from various data sources. If AI input data is spotty or biased, the AI learning results will be skewed and unrealistic. For example, one of several data risks is a sampling bias that fails to draw representative information that fully represents the real world.

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We strongly recommend that your company identifies your primary data sources and costs up front. Many e-commerce vendors, such as Amazon Marketplace Web Services (MWS), provide APIs to internal and external users to access some portions of their sales data. We've also seen some companies use data from what may be considered unlikely sources (e.g., social media postings about products and services). Consider, too, sources for historic data (e.g., government agencies and trade associations), particularly in regard to test your AI application's results.

Extracting and loading input data to an AI platform is simpler than a third key data task: transforming the data to make it "AI useful." Though conceptually simple, special ETL (extract, transfer, and load) tools are needed to cleanse and augment AI data in an AI platform. Both unstructured source and structured source raw data often must be transformed to make it usable for AI, with the cleansed results saved in a structured database. Unstructured data is unorganized raw data (e.g., blog information), while structured data has all fields organized separately in a relational database or files, with fields such as first name, last name, and so forth. Once data is cleansed by ETL software, tags should be attached to data rows to help the ML software. For example, text data such as "While in a box store today, I bought a Samsung smartphone" could have a "Samsung, smartphone" tag assigned.

Step 4: Acquire AI and ML Tools

AI and ML tools have six main components:

1. ML software (i.e., the algorithms)
2. Natural language processing (NLP) software
3. Automation software
4. Third-party AI component tools
5. Cloud hardware/software infrastructure
6. AI “glue” programming source code, typically written in Python

ML Software

Unlike a human-written computer programmer, ML creates a model based on the desired result, which is used to “train” the model from its input data.

ML software is the central AI application for processing data so that AI can learn and improve its logic over time without being programmed on an ongoing basis by humans. Unlike a human-written computer programmer, ML creates a model based on the desired result, which is used to “train” the model from its input data. Multiple models can be created, each with its own characteristics.

Fortunately, you can get a head start drawing from one of many algorithms as tools for teaching your application. Many of these tools will likely be familiar to people who have worked in statistics, economics, finance, research methods, and the life sciences. For example, [linear regression analysis](#) is one such tool. Other well-known modeling tools include: [naive Bayes](#) for sentiment analysis, spam detection, and recommendations; [decision tree learning](#) for outcome predictions; [random forests](#) methods for merging multiple decision trees to improve predictions; [recommender systems](#) for predicting preferences, and [k-means clustering](#) for organizing data into groups like market segmentation or finding crime-prone areas. There are many other options, too.

NLP Software

NLP might come across as an invisible AI component, but its importance is critical to the functioning of AI. Working hand-in-hand with ML software, NLP software allows a computer to understand and learn from written words or audio materials. We've found that NLP software is particularly useful with unstructured data, using tools such as Google Translate, Amazon Comprehend, and IBM Watson.

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Automation Software

AI platforms require massive inputs of data and are invariably composed of many discrete processes before useful AI results emerge. Due to the magnitude of work and steps required, automation is absolutely critical to make AI accurate, productive, and cost-effective. One such automation product comes from Rainbird AI.

Third-Party AI Component Tools

Apart from the cloud vendors that have their own suites of AI tools, a robust third-party market helps enterprises construct an efficient AI platform. This can range from major components like [machine learning software](#) to discrete software tools that detect problems in AI input data. Many third-party components are open source software, made to be included within an AI platform (e.g., H2O AutoML, PyTorch, and NumPy) and accessible via the AI source code. Skilled programmers can ensure external open source products integrate well with other AI platform components.

Cloud Hardware/ Software Infrastructure

Cloud vendors have extensive AI tools available. For example, Amazon Web Services (AWS), Microsoft Azure, and Google offer AI software products for machine learning, NLP, and automation

along with their innate abilities to store data, perform backups, and administer security. Take time to check out what they offer.

AI “Glue” Programming Source Code

The AI “glue” source code gives access to third-party AI tools, integrates AI platform components, and makes customized data science services possible.

Last but not least, AI differs from traditional programming, since a developer does not instruct the computer to do explicit tasks. Instead, the programmer arranges for data to be absorbed by machine learning software to enable insights not attainable by humans. The AI “glue” source code gives access to third-party AI tools, integrates AI platform components, and makes customized data science services possible. The most popular AI source code is the Python programming language, making it a de facto AI source code standard, but other languages, such as Java, Prolog, Lisp, and C++, may also work for your needs.

Evaluate & Reinvest

It’s unlikely your initial efforts will be tremendously successful and provide immediate benefits to the company’s bottom line. Even in the best of circumstances, you will need to evaluate all your models using a validation data set, a methodology you may be familiar with if you’ve worked in marketing research. To achieve a successful AI initiative:

- **Make changes and updates.** Periodically, verify your AI results and make changes if their efficacy has decreased. Also, as you progress in your AI work, you may learn better techniques to improve earlier ML models.
- **Be aware of data drift issues.** This may be a critical factor in iterations of ML. For example, data sets on the sales of seasonal products need to be subdivided and analyzed accordingly.
- **Analyze your results and compare them with general heuristics.** Sometimes, simple is better than complicated. Consider, for example, how some national retailers understand to stock larger inventories of snow shovels at specific stores when a snowstorm is pending. In that regard, overestimating

using simple heuristics — for example, the occurrence of a snowstorm near the end of the winter season with many snowstorms having already occurred, where it's likely that consumers have purchased snow-removal supplies months earlier — is different than what is done at the beginning of the winter season.

With further investment, analysis, and data, you will reach the state where your AI models are effective tools that will assist in growing shareholder value. Consider having a member of your team focus on learning as much as he or she can and report back. This person could continue the AI and ML quest by registering for accounts with cloud vendors, such as AWS, Azure, and Google Cloud. There are also many online courses from companies like Udacity, edX, and MonkeyLearn in addition to courses from companies focused primarily on AI and ML. We suggest starting your AI journey with focused use cases to define your AI goals, but consider, eventually, using AI to reveal insights on tough business problems with large data sets.

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