

BUILDING DIGITAL ASSISTANTS AND BOTS

A VENDOR GUIDE AND MARKET ANALYSIS
WILLIAM MEISEL, PRESIDENT, TMA ASSOCIATES

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AI World and **AI Trends**, have teamed up with TMA Associates to publish "*Building Digital Assistants and Bots: A Vendor Guide*", a definitive reference to companies supporting the development of digital assistants. The guide can save you months of research, and help make choices that best support your goals. It is intended as a reference, with summary tables and lists that help you quickly find the resources that best meet your needs, along with discussions of the focus and strengths of 274 companies and their products.

Learn About: Delivering Conversations Through Mobile Apps, Text Bots, Home Devices, Google Assistants, Cortana, Automobiles, Specialized Devices, Advertising, and more!

Understand: The report introduces the area by defining terms and reducing the mystery of natural language interpretation technology, focusing on what you need to understand to make your solution fully serve your customers

Authored By: Dr. William Meisel, editor of the industry's leading independent newsletter – LUI News on the Language User Interface – chair of the Conversational Interaction Conference and leader of AI World's Digital Assistants and Bots Workshop.

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Building Digital Assistants and Bots

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About the Author



Dr. William Meisel, Ph.D., president, [TMA Associates](#), is publisher and editor of the monthly paid-subscription, no-ads newsletter LUI News (covering commercial applications of the Language User Interface), leader of the workshop on [Building an Application-Specific Intelligent Assistant](#) at the upcoming AI World Conference and organizer of the Conversational Interaction Conference. His experience in language technology includes founding and running a speech recognition company, technical papers on neural networks, a technical book on machine learning, books on the voice user interface, and eleven patents in the area. His monthly in-depth coverage of companies in the area of this report and his deep understanding of the underlying technology (and its strengths and weaknesses) make this report one of a kind.

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Introduction

“Natural language” is a human language rather than a computer language or artificial commands that must be learned or prompted. A digital assistant, as the term is used in this report, uses natural language—as text or spoken—to interact with a user of a digital system, attempting, as the term suggests, to be like a human personal assistant. A digital assistant should be able to understand and act on human language to achieve an objective. If available on a mobile device, a digital assistant can always be with the person it is assisting, either accessed directly as an app on the device or through a web site. Other channels can also provide access to a digital assistant, e.g., home devices such as Amazon’s Echo and messaging services such as Facebook Messenger. In some cases, the *same* digital assistant may be available on multiple channels.

The core technology behind a digital assistant, Natural Language Processing (NLP), is advancing at an accelerating rate. The improved performance is driven in part by increased use, which provides more data to improve performance; improved performance increases use, providing even more data—obviously a virtuous and continuing cycle.

The Conversational User Interface (CUI) supported by NLP is a major trend. The Graphical User Interface (GUI)—composed of Windows, Icons, Menus, and a Pointing device—that has served us so well in the past is becoming over-burdened with an increasing number of features, forcing long and sometimes confusing navigation or menu searching to complete a task. It becomes even harder to deal with a GUI on mobile devices with small screens. Consumers will come to demand the simplicity of just saying or typing what they want rather than dealing with the growing “digital overload” of today’s growing options in devices, applications, features, and software upgrades that add even more complexity.

Companies have a similar problem internally; full and effective use of enterprise software such as Salesforce is sometimes difficult to motivate because of the complexity of features and the difficulty of engaging them in a mobile environment. Digital assistants can make use of such software more accurate and complete.

Many names have been applied to digital assistants supporting this trend toward a CUI, some implying specialized uses, e.g., “intelligent assistants,” “intelligent agents,” “bots,” “chatbots,” “personal assistants,” “avatars,” “virtual agents,” “virtual assistants,” “Intelligent Virtual Assistants,” “robots,” and more. In some cases, interaction with a computer system may be in natural language, but not identified as a digital assistant. A customer service call center that answers your call with the equivalent of “How can I help you?” or “Please tell me why you are calling” is an important example. In effect, this functionality is a digital assistant without a name, and is considered a digital assistant in this report.

Deep-pocketed companies are driving advances in NLP technology and the use of digital assistants. Many large companies are embracing Artificial Intelligence (AI) as a major strategy, and speech recognition and NLP are an important part of AI. While there is certainly an element of hype in AI, real advances are driven in part by the rapid growth in computer power that makes highly computational AI approaches possible. Cloud computing and integration of specialized devices (such as Graphical Processing Units) in server farms allows practical use of powerful techniques such as “Deep Neural Networks.” NLP can take advantage of these trends. The ability to “rent” machine learning, speech recognition, and NLP on a usage basis democratizes the technology. These trends support the practicality and affordability of digital assistants.

An interview was published by the *Wall Street Journal* on March 6, 2017, with Andrew Ng, then chief scientist at Chinese internet giant Baidu. It provides a view of AI today from a clear expert in the technology. Ng said the recent improvements in accuracy are “the difference between you barely using it, like a couple of years ago, versus you using it all the time and not even thinking about it...At Baidu we have passed the knee of that adoption curve. Over the past year, we’ve seen

about 100% year-to-year growth in the daily active use of speech recognition across our assets, and we project that this will continue to grow. In a few years, everyone will be using speech recognition. It will feel natural. You'll soon forget what it was like before you could talk to computers.”

In responding to the question of whether the AI hype was different than previous overly-high expectations, Ng said, “I do think we’re in the eternal spring phase of AI, because unlike the earlier waves of maybe overhype, today AI is creating tremendous value for firms like Baidu and Google. This creates a very clear revenue stream with which to keep investing in and improving AI technology.”

As an individual who has covered the advance of NLP and speech recognition for decades as both a developer and an industry analyst, I’ve seen the technology struggle as the core difficulty of NLP and speech recognition technology was compounded by the high cost of computing to execute the technology. The Conversational User Interface has now clearly passed the critical threshold of usability when we sufficiently limit the context of the interaction. The threshold of usability has been exceeded even by the ambitious “personal assistants” such as Apple’s pioneering Siri. Most of these general assistants offer companies the chance to partner with them and be part of their success. Examples are Amazon Alexa “skills,” Microsoft Cortana “skills,” Google Assistant “actions,” and Facebook “bots.”

This vendor guide focuses on what the growth of the Conversational User Interface means to all companies, from small to large. The author believes (and has stated in several forums) that every company must be able to reach its customers through a digital assistant available on several channels, and soon will find they must have an independent company-branded digital assistant as much as they must have a company web site today.

Fortunately, the core work required to develop the underlying NLP for company-specific objectives transfers across channels and modalities. The work of developing a digital assistant for one channel can be leveraged for multiple channels.

A wide variety of vendors can help create digital assistants. Some provide tools that are narrowly targeted, e.g., building a bot for a messaging service or a natural-language interface for customer service telephone lines. Others claim to provide a platform that can deliver the assistant functionality across multiple channels.

Some vendors will work closely with you to develop a company-specific digital assistant. You must provide company-specific information, but need not be involved in the details. Other vendors provide tools that let you get more deeply involved in the details. With this approach, you can have more control of the deployed application and its evolution. And some vendors offer services which back up the NLP with human agents that act through the natural language interface without announcing themselves, providing in effect an insurance policy against frustrating customers.

Today, most speech recognition and NLP is done in the cloud. Some specialized systems, such as Alexa skills, can be deployed at almost no cost for moderate use.

However, a company must look at this trend strategically. If your company can only be reached through a channel like Alexa, Amazon has some control over the terms of that access. It is a bit like having a web site reachable only through another company’s web site. That is one reason for this guide taking the position that every company must eventually have an independent company-specific digital assistant. Customer service lines may soon start identifying the digital assistant answering the phone with a name as they find that doing so significantly increases willingness of a caller to use automated services.

This report describes many existing digital assistants from many industries. This view of what exists can help you decide your digital assistant strategy by the tools available to help. The report will also provide insights on what other companies in your space are doing by describing deployed digital assistants.

The number of companies that offer tools and services supporting digital assistants is proliferating quickly. This vendor guide is intended to describe approaches you can use to develop company- or application-specific digital assistants and to indicate which companies can help you achieve your goals. If this guide does not save your company significant time (and help avoid missteps), it will not have achieved its goal.

Using this report

This report is a reference document, as a glance at the Table of Contents hopefully makes clear. The reader can of course read it linearly as a report, and it works quite well used that way. But, given its length, many readers may have specific objectives and want to quickly research vendors that can provide the services or tools specific to their needs. The report is designed to be used that way if desired, with the Vendors section being central to that objective. A summary table helps guide the reader to vendors with specific capabilities, including those that provide a full solution delivering a full text or voice digital assistant that can be customized to your specific company, application, or service.

Companies that provide a part of the technology or tools that can help with this task are also listed; for example, you may want to create a text-to-speech synthesis voice specific to your branded digital assistant. Or you may want to work with a company that specializes in helping with a narrow task such as building a Facebook bot.

However, the other sections of this report will prove valuable references even if you first work with the Vendors section. One section that is recommended reading before delving into vendors is the Technology section; it summarizes terms and differences in technology that may make reading the Vendors section easier. This is true of other sections as well, for example, helping understand Market Segments or which general personal assistants that are supporting outside applications in the General Personal Assistants section. You may also want to scan the section containing Examples of Natural Language Applications to see what other companies are doing, particularly companies in similar businesses; this section may also provide a feeling for what the technology can successfully support at this writing.

The sections immediately following this introduction dig a bit deeper into some of the trends mentioned in the Introduction and the technology behind them:

- *Digital Assistants: Categories, Strengths, and Limitations:* Digital assistants at their core are defined by what they do.
- *Market Segments:* Markets are defined by the objective of the digital assistant.
- *The General Personal Assistants:* In addition to motivating the growth in the use of the Conversational User Interface, these general assistants are conduits to specialized digital assistants and bots.
- *The Technology: Where we are and where we're heading:* An overview of core technologies, what they can do today, and what to expect in the near future.

After discussing these foundations, the report covers more specifics:

- *Examples of natural language applications:* Specific examples of deployments, with some examples of resulting savings and service improvements.
- *Picking vendors that match your goal:* Alternative ways a company or app developer can create a natural-language digital assistant, ranging from contracting out the entire process (other than specification) to using self-service tools that require minimal expertise to hands-on assembly and set-up of the core technology components.

- *Vendors*: Companies that can be part of your creating a specialized digital assistant are listed by company and discussed individually. Introductory sections help you navigate this reference section:
 - a. *Full-service vendors*: A quick introduction to vendors that can help you all the way to deployment.
 - b. *Niche vendors*: Companies that can provide part of the technology required for a digital assistant, e.g., speech recognition, or help indirectly with the process, e.g., analyzing your data to understand customers better.
 - c. *Summary table*: An alphabetical list of all companies covered with categorization and web sites.
 - d. *Vendor descriptions*: Detailed discussions of 274 companies that can contribute to building a digital assistant.

A reader who wants to just dive in without preliminary definitions and overviews could simply jump to the Vendors section.

Description of particular vendors is necessarily a snapshot of their focus as of the writing of this report, and the reader is encouraged to check web sites or talk to companies about additional features or capabilities they have recently added. In addition, this report interprets company focuses and capabilities through the eyes of a specific analyst, and companies may disagree with my interpretation of those capabilities. Those interpretations represent the author's best efforts to describe those capabilities in a summary fashion for readers of this report.

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