Deploying Chatbots to Customer Advantage

A White Paper

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"Virtual agents are quickly growing in popularity, and it is very likely that by the end of the decade all major websites will have some type of virtual agent solution to pro-actively assist and sell customers. Approximately 10 percent of the Fortune 1,000 already have them."

– E-Commerce Times, June 2010

Introduction

In science fiction we are used to characters talking to computers in plain language, and the computers responding in the same fashion. Think Star Trek, Star Wars, Red Dwarf, 2001. Indeed there is a famous scene in Star Trek IV – The Voyage Home where Scotty tries talking to a 1980s vintage Apple Mac and can't work out why it won't understand him.

Yet in the real world our computers are all about text input and output – maybe with the odd picture attached. We talk to computers through moving the mouse, through menus and command lines, and they respond with windows or screens of information.

Chatbots are one of the first steps towards that brave science-fiction version of the future. Chatbots let you and your customers converse with a computer in a similar way to that which you use to talk to a person. And the computer talks back....

What is a Chatbot?

A chatbot is a programme that tries to conduct a natural language conversation with a user. It lets the user enter normal questions and statements (such as "how are you", "what is the weather like", "what is the price of the bookcase", "I'm feeling down today"), and responds in a similar natural language style (e.g. "I feel fine, thank you", "it is cloudy and raining", "the bookcase is £19.99", "why do you feel down"). The "holy grail" for chatbots is when the user cannot tell the difference between talking to a chatbot and talking to a

real human – but we're a long way from that yet (see sidebars on AI and the Turing Test).

What does a Chatbot consist of?

We define a chatbot as having four main components. These are shown diagrammatically below.

The elements are:

■ A **Human Interface** – a way of getting information into and out of the chatbot, typically text typing input, and speech and visual output. Voice input is coming though.
■ A set of **Cases** – the information that the chatbot knows, e.g. about itself, about the world, and about your products and services.
■ **Modules** – to provide added functionality (such as remembering users) and also to let the chatbot interface to the outside world (e.g. to get the news, use Google, read a database, send emails etc.)
■ A set of **Management** tools – to see what conversations the chatbot has had, and improve its performance through analysis and reprogramming – chatbots are an iterative process.

Why Now?

The idea of chatbots has been around for a long time. Only now are they emerging from the universities and research laboratories and becoming ready for prime-time use. Apart for the general advances in technology there are three main reasons why we believe that Chatbots are now ripe for exploitation by businesses:

■ First the technology to deliver chatbots as dynamic and speaking avatars is now ready for mass-market use – making chatbots a far richer and engaging experience than lines of text on a screen
■ Second, rich avatars need reasonable bandwidths to deliver the audio and animation – the widespread adoption of broadband by businesses, and domination of broadband in the domestic market means that this richness can now be delivered across the net to almost any user.
■ Third, chatbots have moved from proprietary platforms to Internet based technologies, such as

Macromedia Flash for the avatar graphics and audio, and XML dialects for data storage.

All this means that we can now deliver users a unique experience using technology they already have on their PC.

Why Use Chatbots?

So why should businesses consider deploying chatbots?

First, they are an ideal way of making your web site stand out. As organisations become more and more au-fait with web technology, and as usability best-practice and web-design experience results in more and more identikit web-sites, it becomes harder and harder to make your web site memorable. Chatbots are still very rare on the web, and even the most well known examples (eg Ikea's Anna) are little more than glorified FAQs. In the US though the uptake of Chatbots is more developed and big brand-names such as Coca-Cola, L'Oriel and ESPN are deploying chatbots to considerable effect.

Second, they provide your site, and your brand, with a human face, and build trust and empathy as a result. There is a lot of research to show that customers develop more of a relationship with a chatbot avatar than they do with pages of text and images. And a strong relationship is linked to greater trust, which in turn can be turned into sales or reduced defections.

Third, they provide an alternate way of accessing the information on your website. As web sites store more and more information, users often find it harder and harder to get to what they want. Also some users, particularly those with visual impairment, or those accessing from a mobile device find the intense graphic layout of most web sites off-putting. Chatbots allow users to access the information as though they had a human guide or assistant to help them. The chatbot can take plain language queries, give plain language responses, and show users the relevant parts of the web page – a true virtual assistant.

Fourth, they can provide a consistent brand interface across multiple platforms – be it web, MSN, IM, email, SMS or even virtual worlds. Different user platforms have different characteristics – the web is 2D and graphic, SMS and IM are linear and text based, mobiles have reduced screen size, virtual worlds are about immersive 3D environments. Trying to deliver a consistent user and brand experience across all three can be impossible. But by creating a character which

users can engage with across all platforms, but just with a different visual manifestation in each, users will feel at home whichever channel they are using.

Fifth, they can help you reduce costs whilst maintaining service. Whilst a bot might be more expensive than a "dumb" web page, it can help deliver higher levels of service and sales than a web page alone, but at a far lower cost than a customer service agent. Forrester estimates that chatbots can reduce customer contact costs from $6 or higher for a typical call centre to around $1 or less.

The bottom line is that chatbots can help you win more customers, grow revenues, improve customer satisfaction and reduce costs.

Typical Uses

So how can businesses make use of Chatbots? The following examples demonstrate just some of the ways in which a chatbot can be deployed.

Site Guide

A chatbot can act as a simple guide to a web site. At its most basic this can take the form of a simple verbal commentary to the contents of each page – highlighting the main message of each page. At its most complex this can be a full chatbot able to deal with any question that a visitor may ask about the site, the organisation, or its products or services – feeding the user with the relevant web pages. This can be a useful way to improve access to your site for those with a visual impairment – although it should always be done alongside have a highly accessible site design.

Frequently Asked Questions (FAQ) Guide

While a Site Guide will be present on many pages on a site, a FAQ Guide will only be present on the Questions and Answers page of a site. Since knowledge has already been collected in question and answer format for the page it is relatively simple to convert this in to cases for the chatbot. At its most constrained the user can be provided with a list of questions to ask the bot – just click and the chatbot replies. Alternatively you can make us of the chatbots basic ability to choose the right answer for the right question.

Virtual Support Agent

A more specialised role than Site Guide is where the chatbot is acting as a virtual support agent. Here the chatbot would have access to your support knowledge

Chatbots in Learning

Chatbots are ideal to provide virtual characters within learning exercises – either as incidental or lead characters.

This screen-shot is from a training scenario we developed for the University of Coventry as part of the PREVIEW project to help train care home managers. The bots were used to create senior management and stakeholder figures with whom the students had to interact in order to manage problems.

We also used the bots as virtual actors to act out vignettes between themselves around the care home which the students could watch and then discuss – like watching a video, but a more immersive experience – something like watching a promenade theatre performance.

base and answer any questions the customer has with the right response from the knowledge base. The bot can also provide links to relevant web pages, show diagrams, or provide files for download to help the user. If the user needs human help the chatbot can use email or SMS to alert a live support person.

Virtual Sales Agent

The Virtual Sales Agent is optimised to discover customer needs, match them to a solution, provide information and ultimately direct them to your ordering system. As well as accessing web pages and other documents about your products and services, the chatbot can also access stock and pricing information from your existing systems. Once the customer is ready to place the order they can be routed to the on-line ordering page – and again live sales support can be requested by email or SMS.

Form Guide and Form Filler

Many users find form filling a daunting activity. An oft quoted figure is that successful form completion halves *for every question* on the form. Chatbots can fulfil two roles to help users complete forms. First they can be on hand to answer user questions as they fill out a form. Second they can actually carry out the form-filling themselves, asking each question in turn – making form-filling a far more enjoyable experience.

Survey Taker

A natural extension of the form-filling role, chatbots are an ideal way to conduct simple surveys on your web site. The chatbot can ask the questions, record answers, and even use logic to ask questions dependent on previous inputs.

Quiz Host

Whilst surveys usually have a serious intent, chatbots are also ideally suited to act as quizmaster and take users through more trivial quizzes. These can range from the classic "cosmo" type life-style quizzes, to promotional games. At the end of the quiz the chatbot can give correct answers, or provide a summary based on the users responses ("You are an excellent lover etc.."). For competitions the chatbot can provide access codes, numbers or URLs for prizes, or capture email and other contact details.

Virtual Characters

Today many brands and propositions are synonymous with an invented character. Chatbots give organisations

"Financial services companies are ... seeing the virtual characters as a way of guiding customers through information about complex products"

"There's hard evidence that avatars on a site can improve its impact on consumers, and can encourage people to give information about themselves that can be used for marketing." – New Media Age, May 2004

the opportunity to bring an extra dimension to these characters – allowing customers to talk with them, and encounter them in new ways throughout a web site. Whilst most chatbots represent human characters there is no reason why they can't look like cartoon characters, animals, appliances, shapes or anything else which you use to communicate your proposition.

Entertainer and Game Player

Many web sites, especially those targeted at the youth or leisure markets, use games and other diversions to keep user interest and deliver "sticky" content. Chatbots can take on the role of a virtual entertainer, from simply telling jokes or telling fortunes to playing games and giving a "face" to the opponent in on-line games. Chatbots can add significantly to the stickiness of your site.

E-Learning Tutor

On a more serious note, chatbots are proving to have a significant impact in the area of e-learning. Many traditional e-learning systems have fallen short of expectations because of the relatively sterile nature of the experience – there is no bond between student and computer in the way that there is between student and teacher.

Chatbots provide a way to recreate that student-teacher bond, giving the user a character to empathise with – increasing their enjoyment and commitment to the learning. The chatbot can take on a simple mentoring role – offering encouragement and general learning advice, or it can be provided with the course knowledge and try and answer questions that a student may have. As ever questions which the chatbot can't answer can be routed to a live tutor by email or SMS for assistance.

Agony Aunt

As in the mentoring role, a chatbot can provide an "agony aunt" service on a web site, listening to users problems and responding with helpful – or not so helpful advice. In fact many early chatbots (such as Eliza) were built around the psychiatrist role, taking user input and using it to build questions to answer back (e.g. User: I'm feeling low today, Chatbot: Why are you feeling low today).

Chatroom Host

Whilst most chatbots are based on web sites they can also be deployed in other environments. One of the

most common is chatrooms. A chatbot can act as just another member of the chatroom, responding to posts according to its programming. And of course with chatrooms users would have no idea – other than from the chatbots responses – whether they were talking to a human or a computer.

Public Sector Opportunities

Whilst most of this discussion of chatbot usage has assumed that they are being used within a commercial context, the fact is that chatbots have considerable potential in the public sector. We often here about the "faceless" nature of public bureaucracies. Here is an ideal opportunity to put a face to your services, and provide access to them in a far more entertaining and imaginative way. Almost all of the uses above have direct parallels in public service, from site guides and survey takers, to virtual characters and service interfaces.

Where Can You Use Chatbots?

Although it is on the web that we are likely to find most chatbots, there are other places where we can deploy them:

- On MSN and other Instant Messaging platforms – bots can answer user queries and always be on-line to respond to questions or even generate discussion
- On SMS – users can text bots and get responses from their phones
- As apps on social media web sites - whether on your own organisation's pages, or made available to your friends and followers
- On twitter – bots can not only answer questions asked of them, but also tweet about their activities. If you want they can even keep their own blog.
- On the phone – either as an App or phone-friendly web pages, or through SMS and IM, or using a speech recognition technology such as VoiceXML as a speech-based chatbot, possibly the ideal virtual personal assistant.
- In virtual worlds – where the bot can take on a full body avatar and look no different from any human driven avatar.

We can also deploy bots in banner ads, on the desktop, on CD-ROMS, and in computer kiosks.

"Efficient online self-service is a critical component to the online purchase experience: 57% of US online consumers report that they are very likely to abandon an online purchase if they cannot find quick answers to their questions.

However, satisfaction with online self-service has room to improve.

To reinvigorate online customer service, eBusiness professionals should give virtual agents another look.

Virtual agent technology is evolving, with capabilities including natural language processing and the ability to integrate with enterprise systems.

Virtual agents offer compelling business benefits, including enhancing customer experiences, reducing live help costs, and driving cross-sells."

– It's Time To Give Virtual Agents Another Look, Forrester Report, Dec 2009

Who's Using Them

Although chatbots are at a relatively early stage of commercial exploitation we are already seeing some major organisations in the USA deploy this technology. Companies already deploying avatar based chatbot technology include:

■ Coca-Cola
■ L'Oriel
■ McDonalds
■ Cisco
■ Xerox
■ Dell

UK operations already deploying chatbots include:

■ Ikea
■ Newcastle Building Society
■ Trainline

Proven Results

We are now beginning to build up a good body of evidence that shows the difference that chatbots can make to websites and advertising campaigns. Here are just of a few of the results being achieved (items marked * from the Sitepal website):

■ "the use of avatars on Dell's site found that users who interacted with them were **twice** as likely to give personal information than those who didn't".

■ "online campaign featuring avatars for V Graham Norton and Celebrity Big Brother.... generated click-through rates of **30%**".

■ "when avatars are used for e-learning content, use of the online courses increases by **400%**"

■ "Revenues increased by **£6,000** a month"*

■ "Sales increased by **35%**"*

■ "Click-through rates increased by **250%**"*

■ "**62%** of visitors converted to registrants"*

■ "Site traffic lifted and sustained by **200%**"*

Chatbots for Customer Service

Working with Wolverhampton University we created a chatbot to provide front-line services to students. The bot was programmed with around 2000 questions that had been captured over previous years by library staff. The bot not only answers the question, but also opens up the relevant web page on the university site to provide related information, and direct access to services.

But there is no reason to limit the bot to providing passive information. As part of the Talis "Mashing Up the Library" competition we created Lillian (shown above), who could ask visitors where they live, and then use a combination the Talis library management system, Amazon and a specialised library service called OCLC to answers specific questions about books including – "who wrote X", "what is X about", "what else is like X", and of course "have you got X in stock".

The bottom line is that chatbots can:

- Differentiate your site
- Build identification and empathy
- Increase loyalty and trust
- Improve usability
- Reduce costs

... with the result that you can:

- Increase sales and profit
- Increase customer service, retention and activity
- Increase course completion and information retention.

Discourse – A Multi-Platform Chatbot Engine

Discourse is Daden's chatbot engine. It perfectly fits the four element model introduced earlier:

- User Interface

Like other Daden applications it is a web services based application. This means that it has no user interface of its own. Instead we use web services to communicate between it and whatever user interface the client needs. We have standards templates for things like plain and iFrames driven web pages, AJAX, SMS, IM, eMail, and for virtual world environments such as Second Life, Open Sim and Vastpark. But in theory we could deliver a Discourse powered chatbot to any web-services enabled platform – even to a physical robot!

For users looking for a web based head-and-shoulders animated avatar we usually recommend the Sitepal system for Oddcast – this has excellent quality graphics, good text-to-speech and is very cost-effective.

- Cases

Discourse uses Daden's own version of the Artificial Intelligence Markup Language (AIML) to store the pattern/response cases – that is the words we are looking for in the user input, and the response we want the chatbot to make. However we have extended AIML to allow keyword spotting, which considerably reduced

Chatbots for Sales

Hanover Chatbot

Hanover Helps: Hello, how can I help you?

Daden developed a chatbot for a leading Housing Association. The bot was aimed at providing their potential customers - who may not be at home surfing through a web site – with an easy and engaging way of accessing information on the site prior to making a sales enquiry.

By linking bots to real-time information on pricing and stock availability you can ensure that your customers are always receiving the most up to date information – and everything they need to make the sale. And with modern e-commerce systems the bot can take the customer right onto the relevant product and shopping cart page.

the number of cases you need to write, and to allow the easy identification of alternate words both in input and output.

All of this helps to yield more natural and varied conversations. We have also considerably enhanced AIML's ability to handle context, so for instance a bot can vary its response based on the day of the week, the month, its emotional state, how long its been talking, how well it knows the users, and whether its being accessed on the web, or in a virtual world or through SMS.

- Modules

The power of a bot in considerably enhanced if it can make use of web resources to answer questions. Discourse comes with standard modules to access RSS feeds, whether from public news services or your own web site, to post to Twitter, for Amazon, to access Wikipedia and weather services, and to break out to your own bespoke code. We can also develop custom modules to interface to your own databases and applications – so for instance a bot can provide the user with live pricing and availability information.

We have also developed a module to support the storage of information in a semantic web language called Resource Descriptor Framework (RDF). This uses the "triple" as a basic unit of information – for instance "the sky" - "is" - "blue". This enables the bot to then make deductions from the information it has and give answers to questions which it has not been explicitly programmed for.

- Management

Discourse is managed through a set of web pages. The bot is more "authored" than "programmed", with a Google like syntax being used to write the cases (rather than the obscure and verbose XML of a pure AIML bot). The management pages also let you:

- Set up any pre-processing – for instance to catch spelling mistakes or slang
- Set up any special pronunciation when using text-to-speech
- Define a list of "banned" words – such as swear words or sexual acts - whose use can result in the bot shutting down a conversation
- Define a list of "danger" words (e.g. suicide) which might trigger human intervention
- Define bot "confidence" parameters, and what the bot will do it if it's not handling the user conversation well
- View the logs in order to improve bot performance

A Typical Chatbot Project

It is worth appreciating from the outset what goes into a successful chatbot project. Just as we said above that creating bot cases is more about authoring than programming, then so is creating the whole chatbot experience more an art than a science.

From the outset you need to have a very clear about what the bot is meant to achieve in business terms – for instance is it just to entertain and build relationships – or is it meant to provide information or generate leads. This will help to guide a decision about whether the bot will have a very open conversational style – trying to answer any question, or a very closed one – keeping to a specific topic.

You then need to map out the typical conversation – in particular how will the bot get the user "on topic", and how will it then gently suggest to the user the things it can talk about, and then keep the conversation focussed on those areas.
Then just like a web site framework you need to map out all the subjects and facts that the bot needs to know. We find Kiplings 6 Good Men (who, why, what, where, when, how) come in very useful here (and not forgetting which of course!).

Next Generation Chatbots

So where is chatbot technology going? Over the next few years we expect to see further incremental improvement in each of the main elements of a chatbot system:

- *The user interface* will see the most visible changes, the photo-realistic avatars now looking almost human, the 3D avatars in virtual worlds being no different from human driven avatars, and text-to-speech technology introducing inflexions and nuances into the spoken speech. It is only in speech recognition that progress is still slow. One of our aims is to promote a generic interface markup between the chatbot's "brain" and the visual interface so that the brain can be written completely independently of the user interface.

  To achieve this we have developed an Avatar Sensory Markup Language to represent sense

Autonomous Avatars

There is no reason why chatbot need be limited to speech conversations on the web. Daden was a finalist in the 2008 British Computer Society Machine Intelligence competition with Halo – our autonomous avatar. Halo is driven by our Discourse engine, but as well as holding conversations she can also navigate around our island in Second Life, interact with the objects in it, post to Twitter and her own blog, and of course talk to visitors.

We are currently working on giving her emotions, so for instance if she's bitten by a snake she will not only act with surprise and fear, but she will also be pleased when the snake disappears, and show fear again when the snake reappears later.

input, and an Avatar Action Markup Language to represent avatar actions. Both are open standards and XML based. This will let us not only control the avatars speech, but also control its facial and body movements – so it can smile, wink, grimace or wave on command. Whole body avatars will also become more common – especially when combined with virtual reality environments.

■ *The knowledge* of the chatbot we see moving from "dumb" technologies like AIML to semantic technologies such as RDF. This will enable the chatbot to make logical deductions and to combine different pieces of information. We will also see more of a move from traditional case-based systems (such as AIML based chatbots) to grammatical parser based chatbots which "understand" the users statements in a way that pattern recognition systems never can. The ultimate aim of both of these changes is to reduce the amount of time and effort it takes to "teach" the bot what it needs to know. Daden are already at work on a new-technology Grammatical-Semantic Parser to power our next-generation of chatbots.

■ *The connectivity* of the bot will increase, so that it can draw on more and more web based resources to answer questions, learn, or find supporting material. As more web sites and applications adopt web services and semantic web services this appropriation of web-resources into the chatbots "brain" becomes easier and more powerful.

■ *The memory* of the bots will improve, so that they can offer a more personalised conversation to each user, whether in style or content, or both.

■ Where required, *the bots will become more emotional.* Our research has shown that users prefer to interact with a bot that shows some emotional variation – although of course typically we want to avoid a bot which will get too angry or too morose with a client! But we can easily set the bounds for "acceptable" emotions.

The result of all this is that chatbots will become more "intelligent". They will be able to make better sense of what we say to them, link it to past conversations with us and other users, develop a better memory, better assess information, and ultimately become far more human – if not actually truly intelligent.

Discourse

Discourse is Daden's chatbot engine. It is managed from a simple set of on-line web pages. Rather than having a dedicated (and inflexible) customer front-end Discourse is implemented as a web-service, allowing clients to "show" the bot however and wherever they way, from text, cartoon or even video on a web site, through SMS, IM, email or even as an app on mobile devices, to a full bodied avatar in a virtual world.

Discourse offers both whole phrase and individual keyword spotting in order to assess what question the user is asking, and can provide suggested and alternate questions alongside its chosen response. It can even tell the user how confident it is in its response.

Discourse also uses web services to access live data when answer questions, and has a sophisticated context model so that replies to the same question can vary based on different situations.

Daden offer Discourse as both a hosted or locally installed solution.

Who are We?

Daden Limited (www.daden.co.uk) is a virtual worlds and artificial intelligence solution provider. We have been working with chatbot technology for over 10 years, and with speech systems for a similar length of time. We have a deep understanding of the possibilities offered by new technologies, but with good understanding of the marketing and usability issues to know what might work, and what wont.

We have worked on strategy, marketing and technology projects for a variety of companies and organisations including FTSE100, hi-tech start-ups, and public sector organisations, in the UK and abroad.

Our flagship chatbot, Halo, took two Top 10 places in the 2004 global Chatterbox Challenge and was a finalist in the 2008 British Computer Society Machine Intelligence Competition.

We are based in Birmingham, England.

Our Solutions

A full description of our Discourse chatbot solutions is available on our web-site at www.daden.co.uk. We have cost-effective solutions from simple 2D chatbots for web sites, through to fully 3D automated avatars within virtual worlds. Please stop by our site and talk to a chatbot for yourself.

If you think that we can help you implement a chatbot for your business or organisation then please contact us:

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