

“Edward”, A Virtual Host for Radisson Blu Edwardian

Implementation and Business Outcomes



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How We Built Edward, An Artificially Intelligent, SMS Virtual Host for Radisson Blu Edwardian

Tobias Goebel, Director Emerging Technologies
April 7, 2016

<http://blogs.aspect.com/how-we-built-edward-an-artificially-intelligent-sms-virtual-host-for-radisson-blu-edwardian/>

In late 2015, our Chief Customer Officer, Joe Gagnon, and I, met with the IT Director, and the COO of Radisson Blu Edwardian in London. A long-term customer of Aspect's, we were there to share what we have been so diligently working on over the past year: our vision for re-imagining customer service that would combine the best of all forms of consumer interaction types, and the best of what we and the industry have been able to develop in next generation CX technology. This included:

- The business value of a blend of personal touch and automation
- The response times and accessibility of self-service
- The proven methodologies of Interactive Voice Response
- The consumer appeal of texting/messaging as a communication channel
- The ubiquity of SMS across the world
- The benefits of Natural Language Understanding for free-form dialog
- The value of CRM to show the guest we know them
- The human touch through live service integration where needed

In essence, the vision for re-imagining customer service has at its core how to use [Interactive Text Response \(ITR\)](#), or what is also known as “bots” to provide the ability to let customers self-serve on text channels at blazing-fast speeds with a User Interface that resembles that of a natural conversation with a person.

Needless to say, it didn't require much convincing that this approach would provide an opportunity to “surprise and delight” in their prestigious hotel chain. With over 2 billion people using texting and messaging solutions extensively today, offering service over these channels *just makes sense*. Furthermore, it has the promise of saving cost through smart automation while providing a state-of-the-art customer experience, or in the words of the COO: “*I want this by Monday.*”

From the outset the solution was designed to let guests send SMS text messages to be served throughout their stay, and even before check-in. We were intrigued when we found out how many different questions a guest could have during a hotel stay. 153 to be precise. From answering general questions such as “*When is breakfast?*”, “*What cuisine does your restaurant offer?*”, or “*What time do I need to check out?*”, to room service needs such as “*Can you send more towels?*”, or “*I'd like a paper delivered to my room?*” – the system would need to understand plain English inquiries, and even distinguish between “*a paper?*” (newspaper) and “*some paper?*” (stationery).

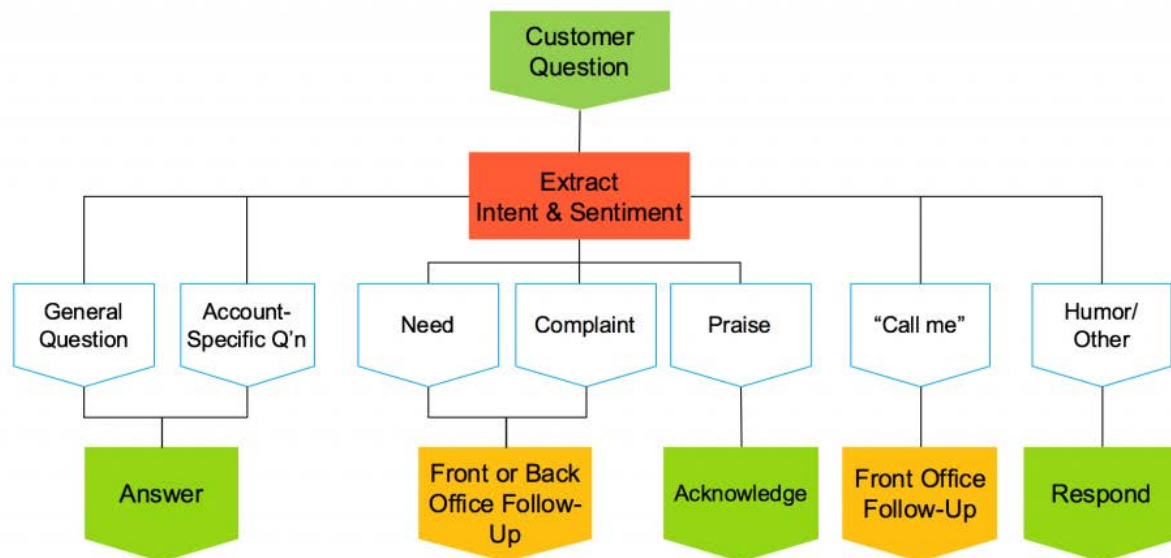
So off we went and built the team. We brought in experts from various areas of our organization:

- Conversational UI Design
 - We got help from our NLU engineers as well as computational linguists to design the front end and develop the Natural Language Understanding scripts
- Aspect® CXP Pro™ app development
 - Our app development team took on the job of building out the ITR and IVR flows on Aspect CXP, our self-service application lifecycle management suite

- Proactive Engagement
 - The solution integrates with the hotel’s reservation system to kick off an outbound SMS message that welcomes the guest after an opt-in from them
- Telephony, IVR, Call Control, System Integration
 - The solution connects guests to staff members when needed (“call me!”)
 - We integrated with the hotel’s home-grown staff management system to accomplish this
- Reporting & Analytics
 - Both the customer and Aspect wanted data to be able to tell us: will the solution work as planned? How is it being used? Where can it be improved? How often are humans needed?

As we designed the solution, we also came up with a universal template for self-service applications in general:

Universal Template for Self-Service



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The generalized model allows us to deal with both the “happy” path and the “reality” of customer interaction that takes the form of complaints (“*the neighbor is loud*”, “*your pillows are too hard*”), praise (“*love your beds, so comfy!*”, “*great job by housekeeping*”), and even humor: it is probably no secret that people LOVE to play with bots. So we went ahead and built our own corpus (response collection) of humorous, witty remarks. However, we were careful to design the solution such that the humor module would only kick in if all other possible interpretations of an utterance could be ruled out – we carefully want to avoid answering a complaint with a snarky comment after all.

Furthermore, we designed the solution deliberately without a machine-learning component. Machine-learning approaches to Natural Language Understanding work well for large or better yet unrestricted domains, but if the domain is restricted, like in our case to hotel service, a rules-based approach is most effective. Also, recent experience across the market has showed that building a completely unsupervised learning bot can backfire quickly.

An important part of the design of the solution was to give the customer full control over what the system would reply with at any time. So we made use of Aspect CXP's Business User Interface (BUI). Through this easy-to-use Web portal, Radisson Blu Edwardian staff can change the system's behavior at runtime, without requiring Aspect's or even their IT staff's help.

After weeks of development, QA, and close cooperation with our early adopter customer, we are proud and excited to release our solution to the public. It will be launched as a production pilot in the Sussex location of Radisson Blu Edwardian. To get a glimpse of how the experience will be, take a look at this screenshot:



Or, better yet: go check yourself in to the beautiful [Sussex Radisson Blu Edwardian](#) in one to two weeks when we are live and experience it for yourself.

We will report on the outcome and guest feedback as soon as we can, and we will also publish more of our experience around the design and development of the solution over the coming weeks and months. So stay tuned! Meanwhile, we are moving over to working on the "World's Most Convenient Car Manual" for a large car manufacturer here in the US, as well as various other messaging-based self-service solutions. Curious? Well, talk to us about how we can help YOUR business enter this fascinating space using the industry's most advanced enterprise bot platform!



How We Deployed Edward the SMS Chatbot on Amazon Echo in 30 Minutes

Tobias Goebel, Director Emerging Technologies
May 20, 2016

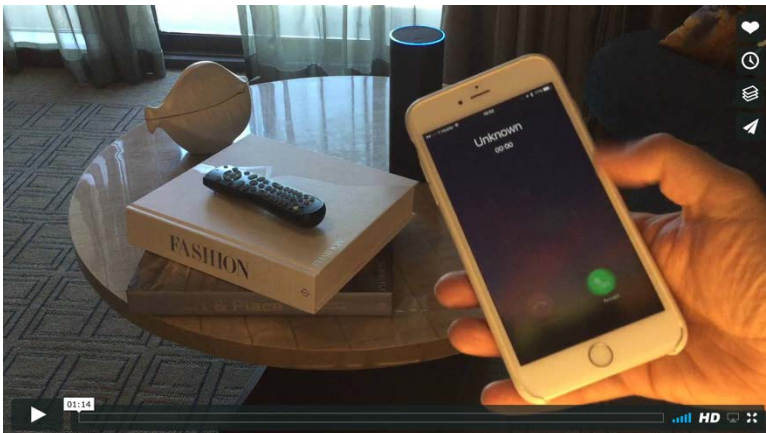
<http://blogs.aspect.com/how-we-deployed-edward-the-sms-chatbot-on-amazon-echo-in-30-minutes/>

A few weeks ago, I [introduced you to Edward](#). Weeks later, we are still being approached from analysts, customers, partners, other vendors, who all want to hear more about this exciting project. It is still very early, but seeing the first guests interact with it and the things it gets right and the mistakes it makes is fascinating, and very insightful to all of us involved.

Edward is Radisson Blu Edwardian's new virtual host – it greets guests via SMS and handles questions or needs as diverse as “*what cuisine does your restaurant serve*”, “*send me some ice please*”, or “*please don't clean my room today*”. (One of the early findings was the guests of the Radisson Blu Edwardian tend to send full sentences. They would, e.g., rather send “*Can I make a reservation in your restaurant*” vs. “*restaurant reservation*”.) Edward is fully automated with human backup when needed, understands natural language, and responds within seconds. A whole new level of service excellence in the hotel!

While the system is still being tuned to become better and better, we are also not stopping experimenting and innovating with it. Edward runs on [Aspect® CXP™](#), a platform that lets us build self-service experiences once and then deploy it on any channel. And by any channel we mean any channel. CXP's unique design-once-deploy-anywhere approach and its adapter framework for adding new channels lets us take an application as is and deploy it on a different channel. As we had been prototyping an adapter to the Amazon Echo, we gave it a try a couple of days ago. How long did it take us? About 30 minutes, give or take.

And here is how it performs out-of-the-box:



<https://vimeo.com/165934123>

Again, it took us only 30 minutes to point the existing application, which was built for the SMS channel, to the Amazon Echo. This is all due to the architecture of Aspect CXP, that lets us deploy dialog applications on a variety of channels, and add new ones easily. Differences among the channels, such as prompting the SMS user “send X” vs the voice user “say X”, can be accommodated easily using CXP's Layer concept.

Now, what can we build for you? The sky is the limit.



Observations of Edward in the Wild, Part 1

Dr. Lisa Michaud, NLP Architect
October 3, 2016

<http://blogs.aspect.com/observations-of-edward-chatbot-in-the-wild-part-1/>

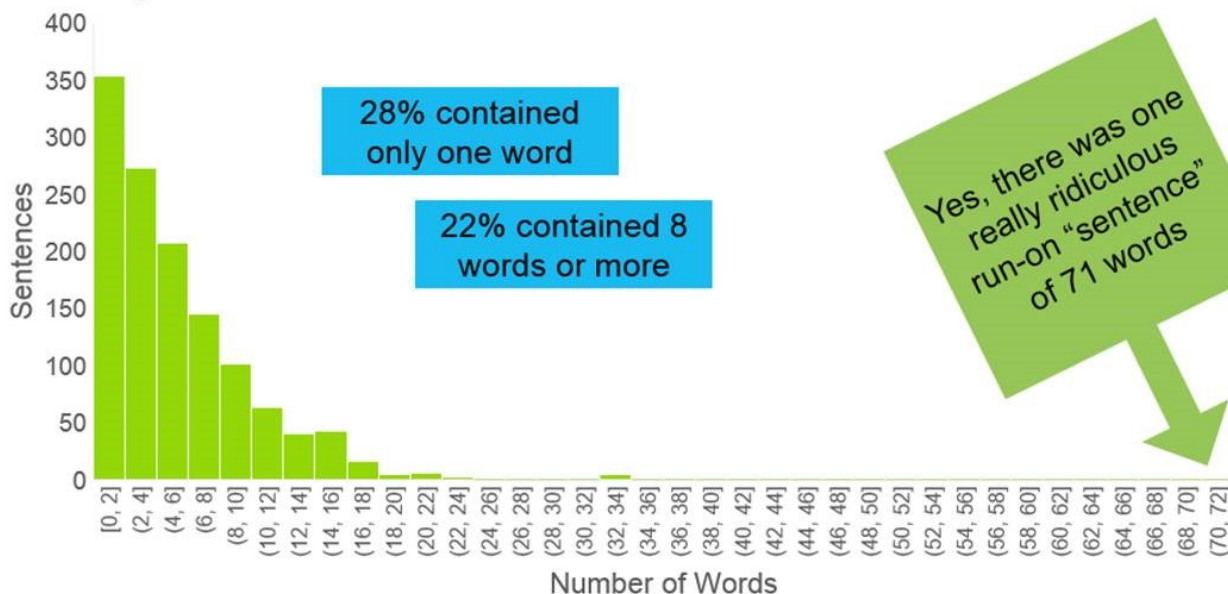
In Spring 2016, we completed work on a pilot [Interactive Text Response \(ITR\)](#) system called [Edward](#), a chatbot for the Radisson Blu Edwardian hotel chain in London helping with front desk, concierge, maintenance, and housekeeping inquiries. Edward responds to user texts over SMS, handling over 180 different questions, requests, and humorous interactions. Real customers first interacted with Edward starting this May.

Edward conversed with 491 unique guests in the first two months of slowly rolling him out; during that time, they sent him 1,023 different texts. As a Data Scientist and one of Aspect's Computational Linguists, I've spent a lot of time with these initial data to come up with some interesting facts about how real people interact with a concierge chatbot.

Not Everyone Uses "Text Speak"

One of the hard questions in [chatbot](#) design is: Do you design your bot to handle concise, telegraphic expressions, or fully articulated sentences? In which way are people going to express themselves in this particular flavor of computer-mediated communication? Our data suggest that the answer is "both;" 28% of the sentences texted to Edward during these two months contained only one word (a large percentage of which were initial sentences saying "hello" and final ones saying "thanks"). But a lot of people were more expressive; 22% of the sentences, in fact, contained 8 or more words. 12% of the customer texts contained more than one sentence. And only 18 sentences total (1%) contained a word that used non-standardized spelling. This is possibly connected to the fact that the guests at Radisson Blu Edwardian tend to be Gen X and older, and obviously, interaction styles can vary greatly between groups of users. But it underscores the possibility that a chatbot may need to understand the request "towels plz" from one user as easily as it understands "I notice we have only three bath towels and we could use two more. Thanks!" from another. The burden of adaptation should be on the system, not the user.

How Long were the Sentences?



Choosing the Use Case, and Setting Expectations, is Critical

Guests were told to “ask Edward anything,” and they did. Only 58% of the sentences texted to Edward in his first two months on the job were covered by the initial set of 180+ use cases we had designed through consultation with subject matter experts from the hotel. Meanwhile, more than half of the use cases Edward was designed to answer never came up in those first two months. Obviously predicting user behavior is not an easy feat. A good initial approach to chatbot design is to look at other channels in which customers reach out with questions and requests and to study those data in order to answer: What small set of use cases represent a large number of historical contacts, to create the most efficient service for the least effort? In some domains, the majority of contacts may be concentrated in only 3-5 core questions. In others, the distribution is more spread out. Looking at real data, however, may give unexpected insights about the most popular things users actually say. The most popular topic for Edward was: *Thanks*. The most frequently asked question was: *Is breakfast included in my reservation?*

It is important for good customer experience that you set the expectations of guests so that they do not expect that a chatbot can answer “anything” without human help. No bot can answer a question or respond to a request that its designers did not anticipate. However, if the chatbot has the ability to hand the conversation over to a human, it can avoid saying “I don’t understand,” and instead say, “Hold on a moment; I need to get some help to answer that,” keeping the experience from being a frustrating one.

False Positives May Be Worse Than False Negatives

This leads me to another important observation about when a chatbot makes a mistake, and which mistakes are more dreadful than others. If we think of Edward as having a classifier that gives a “positive” result when he knows how to answer a text and “negative” when the text is out of scope, then a “false positive” results in Edward giving the wrong answer to a text that should have been a “no match;” and a “false negative” is when Edward fails to realize that he does know the correct response, incorrectly giving an “I don’t understand” response.

Which one of these is the greater evil depends on your objective. At Aspect we champion the idea of [customer service chatbots](#) that can pass the conversation over to a human agent when a human is needed or wanted, as mentioned above. In those situations, the false negative is not a terrible problem; the unknown text can be handed to a human agent, who can answer the question, and the chatbot’s reasoning can later be adjusted to include that way of expressing the question. Using the resource of the human agent because the chatbot did not recognize the question is far better, in many customer service domains, than giving the answer to the wrong question or performing the wrong action. In other situations, where a human fallback is not available or too costly to prefer, it might be better for the bot to take a wild swing. Having the ability to structure your bot either way in order to best address the needs of your particular app is key.

We’re still studying these data and other sets of customer service domain questions to better understand how to help businesses create the best chatbots to serve their customer service needs. I’ll continue this topic with more observations in my next post.



Observations of Edward in the Wild, Part II

Dr. Lisa Michaud, NLP Architect
October 3, 2016

<http://blogs.aspect.com/observations-of-edward-chatbot-in-the-wild-part-1/>

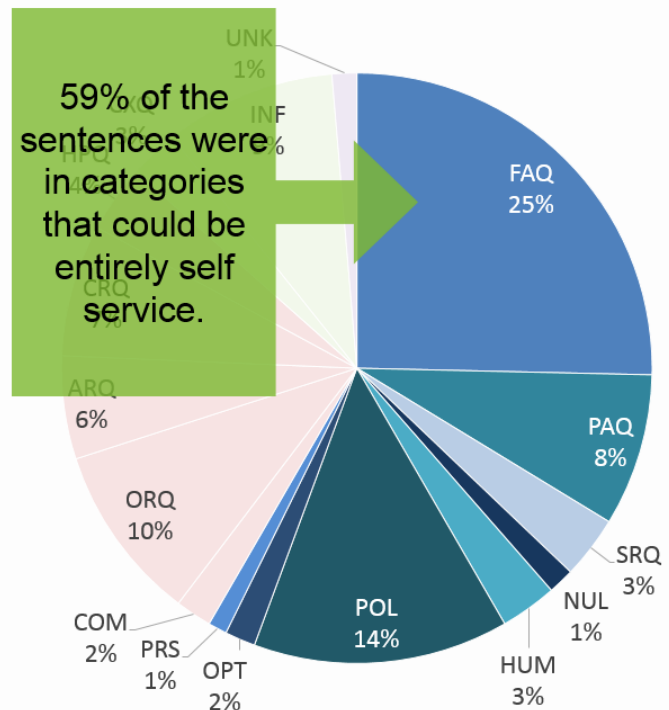
In my [previous blog post](#), I discussed some of the conclusions we have been able to draw from two months of recorded user interactions with Edward, a concierge and [service chatbot](#) deployed at the Radisson Blu Edwardian hotel chain in London. This post is a continuation of those observations.

A Significant Portion of Interaction Can be Handled with Self-Service

While analyzing the data from Edward, we coded each request with a request type. We observed from this effort that 75% of the sentences texted to Edward could be deflected from the front desk staff. Most of these (59% of the total) were divided between pleasantries that Edward could respond to automatically, general FAQs that could evoke a canned response, and personalized account questions that required a dip into CRM data associated with that phone number but still could be fully automated. An additional 16% were service requests that could be forwarded to appropriate staff members such as Housekeeping or Maintenance without involving the front desk staff. This is a strong argument in favor of the success of the Edward deployment; it freed up those behind the check-in desk to handle the individuals who elected to call down or to bring their business directly to the desk in person, while providing such a satisfying user experience that some guests have left tips for Edward, and even nominating him for Employee of the Month, mistaking him for a member of the staff.

Distribution of Sentence Types

FAQ	Frequently Asked Question
PAQ	Personalized Account Question
SRQ	Service Request
NUL	Nullify Request
HUM	Humor
POL	Politeness
OPT	Opt-Out
PRS	Praise
COM	Complaint
ORQ	Object Request
ARQ	Action Request
CRQ	Callback Request
HPQ	Highly Personalized Question
CXQ	Contextualized Question
INF	Information
UNK	Unknown



Chatbots and Humans are Partners in the Customer Experience

Edward could not do what he does without assistance, however. As I mentioned in my last post, Aspect strongly advocates the practice of standing up a chatbot that can hand the conversation over to a human when that is called for. No bot can answer every possible input without help; some requests are too nuanced to be easily recognized by a nonhuman intelligence, and some requests are outside of the scope of the bot's store of answers or actions. The ideal way to provide human backup is to forward requests to a human agent who can respond directly in the same channel, as the Edwardian hotel staff can do. In fact, one very reasonable approach to bot-building that my colleague Tobias Goebel has written about is to create a limited-scope bot as an initial offering, with everything beyond a very small number of questions handled by live human staff responding as if they were the bot. This "[Wizard of Oz](#)" arrangement provides an excellent opportunity to collect data on the nature of requests to expect in this new channel for your business, and then each iterative version of the bot can slowly take over more and more of the questions that fall into the self-service category, until the human staff is only handling those interactions for which they are truly required.

We do not, however, suggest a lack of transparency where a bot's response is presented as that of a human agent. While bots are becoming more and more competent, they will still occasionally fall short of true human competence at understanding natural language. This could adversely affect the customer experience if she believes her conversational partner is human – more so than if she knows it is a bot, of whom she has slightly lower expectations.

It's not Just Processing a Sentence; It's Having a Dialogue

The practice of creating conversational user interfaces (CUIs) needs to recognize that natural language understanding cannot operate as if each sentence were an isolated event. In the Edward data, 13% of the utterances were not autonomous; they were either providing context to a request in another utterance, they were making reference to previous steps in the dialogue by use of a pronoun or another anaphora, or they were cancelling a previously made request (sending something like "never mind – I'm good"). A true CUI needs to be able to handle each of these:

- In the case of a cancellation, there needs to be access to context or history so that an action can be removed from a queue or undone.
- When pronouns or other referring expressions are used, a sophisticated NLU component needs to be able to resolve the reference to the relevant entity from the previous dialogue.
- When context is provided for a request, this context needs to be both used for any anaphora resolution (above), and stored as information to possibly pass on to a human agent as part of the same complex request.

Data Makes Us All Smarter

Looking at these data helps everyone in the bot universe: bot creators, bot buyers, and the bots themselves. We learn from the mistakes and realize what to do better next time. We evolve and become more competent at providing the ideal customer experience. I look forward to what I am going to learn from the next bot.

Business Outcomes

April 21, 2016

For more than forty years, Radisson Blu Edwardian London has built on a simple ambition: to create Britain's most dynamic independent hospitality group. In early 2016, the Group wanted to "take customer excellence to the next level", as expressed by the general manager of one of their hotels at the ACE customer conference of Aspect Software, the provider of their contact center and workforce optimization environment. The means: provide automated text-based engagement to the guests staying in any of their 14 owned properties in London, by designing an SMS "virtual host" chatbot that can converse in plain English and integrate with live assistance when needed.

Edward is the outcome of a shared vision of how an advanced, intelligent digital assistant or "chatbot" can both impact the consumer experience and profoundly benefit workflow and support management of inquiries and tasks of customer-facing employees. Aspect's vision of introducing a "digital employee" to Edwardian's workforce has already led to tangible business outcomes such as being instrumental in **raising the hotel group's NPS score by 13 points**. No other visible customer engagement changes have been implemented during the same time, so Michael Mrini, the Edwardian group's IT Director in charge of the implementation, attributes this gain to Edward, a digital offering they call "Digital Customer Delight".

The positive customer feedback shared on hotel review forums adds to this perception:

The screenshot displays two hotel reviews. The first review, titled "9.6 'FANTASTIC HOTEL'", is highlighted in yellow and states: "know where this is) they have a text service from the concierge so you don't need to ring reception if a cab or anything is required just simply text!! We really really enjoyed our stay!! HIGHLY RECOMMENDED!!". Below it, a review titled "Fantastic!!" with a 5-star rating (5 green circles) and "Reviewed 2 weeks ago" says: "Stayed here as we were attending a concert at the O2. Arrived late morning but they gave us an early check in. Cannot fault the staff at all. They were all cheerful, polite and courteous. Edward the virtual host is a fantastic idea and we were able to book a taxi via text.". The second review, titled "Highly recommended", has a 5-star rating (5 green circles) and "Reviewed 8 August 2016 via mobile". It says: "We stayed here in 6 rooms for my nieces Hen Weekend. We were all upgraded and a special gift was left for my niece. We had a 'virtual host' which was very convenient! The staff were very helpful and friendly." Below this is another review titled "Faultless" with a 5-star rating (5 green circles) and "Reviewed 28 September 2016 via mobile". It says: "... I especially appreciate the new virtual host, accessible by SMS. Having forgot my toothbrush I made a text of 4 words, and upon my return from the always excellent Steak and Lobster Restaurant downstairs, it was waiting for me. Speaking of the dinner, although very expected amenities of a 5 star hotel. Particularly like the new virtual host texting service. Anything you forget to pack just send a quick text and it's in your room within minutes. Beds are huge and comfortable. Room

But Edward has impacted more than just the guest experience. Because more and more guests are using the chatbot for simple requests such as 'when is checkout time' or 'where is breakfast served', **the front desk has become less hectic** and frontline **employees are able to spend more time with guests trying resolve more complicated issues** requiring human touch. The most frequently asked question: 'Is breakfast included in my stay'. While the hotel does inform the guests of this several times throughout the customer journey, this is a typical piece of information that guests need only when they need it, and tend to ignore it when it is delivered at a time when it isn't relevant. With Edward, guests can now ask this question in the most convenient and cost-effective way for the hotel: through a simple SMS text message, which is answered instantly. Another example of how the idea of **a digital employee can benefit both sides**, as everyone can relate to the fact that calling the front desk at 8am can be a disappointing experience...

Guests like kidding around with Edward. "Edward – do you have a girlfriend?" – "Sadly no, I am a computer program, so no girlfriend". "Edward – when do you get off from work?" – "I work 24x7, sorry, no days off for me". Edward works via the SMS channel, attributing to the fact that it "just works" and is easy. While getting the

guest's mobile number is sometimes a challenge, the hotel currently has no plans to introduce Edward to other channels such as Facebook Messenger.

New use cases are being trialed, such as carefully **adding a marketing/sales angle to Edward**. The Group has experimented with sending out messages such as *'Dear Guest, sorry to be a bother, breakfast can get busy sometimes, you might consider going before 8 am to get a table'*, resulting in guests thanking the staff for Edward's kind advice that resulted in a less hectic experience at the morning buffet. When the hotel started sending *'Dear Guest – we have a few slots open in the spa for a massage – please call and make a reservation if you would like one'*, **bookings ran over and Edward even had to slow down selling again** as there wasn't enough staff present to give a massage.

Edward is also being enhanced to **use him for extending a stay and thus contribute to the company's topline** immediately, fully automated. Furthermore, he is "learning" how to be the host for conferences – answering questions about the agenda, rooms, speakers, etc., all wrapped into one.

The Group is also able to collect much more data on the volume and breadth of questions and requests coming from guests. This has **enabled the hotel chain to make staffing and stocking decisions that service guests more effectively and efficiently**.

So overall Edward is here to stay – not only is he a great digital employee, he can get better and do more. There really is no end in sight for what he can get involved in. This chatbot implementation has clearly surpassed the Group's initial expectations and continues to be an outstanding success.