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Research Report

The power of bots: The benefits and pitfalls of automation in corporate communications

Communication Insights, No. 9

Provided in Cooperation with:

Academic Society for Corporate Management & Communication – An initiative of the Günter Thiele Foundation, Leipzig

Suggested Citation: Brachten, Florian; Stieglitz, Stefan; Berger, Karen (2020) : The power of bots: The benefits and pitfalls of automation in corporate communications, Communication Insights, No. 9, Akademische Gesellschaft für Unternehmensführung & Kommunikation, Leipzig

This Version is available at:

<https://hdl.handle.net/10419/234732>

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COMMUNICATION INSIGHTS

THE POWER OF BOTS

The benefits and pitfalls of automation
in corporate communications



ACADEMIC SOCIETY
FOR MANAGEMENT & COMMUNICATION

An initiative of the Günter Thiele Foundation

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Imprint

Published by Academic Society for Management & Communications –
An initiative of the Günter Thiele Foundation
c/o Leipzig University
Nikolaistrasse 27–29, 04109 Leipzig, Germany
info@akademische-gesellschaft.com | www.academic-society.net

Written and edited by Florian Brachten, Stefan Stieglitz, Karen Berger

Proofreading by Chris Abbey

Photos and Pictures by Adobe Stock – jozefmicic (p. 4, 13), SSillapen
(p. 13), ONYXprj (p. 11), apinan (p. 16, 27), stegworkz (p. 36)

Layout and graphics by Raphael Freire (Zitronengrau), Daniel Ziegele

Printed by Merkur Druck, Leipzig/Püchau

Citation of this publication (APA style): Brachten, F., Stieglitz, S., &
Berger, K. (2020): *The Power of Bots – The benefits and pitfalls of auto-
mation in corporate communications* (Communication Insights, Issue 9).
Leipzig, Germany: Academic Society for Management & Communication.
Available online at www.academic-society.net

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EDITORIAL

Digital transformation is making tools and technologies that were previously niche products available to a mainstream audience. Coupled with the massive increase in computing power in recent years, it has made technologies such as virtual reality, machine learning and automated communication very real possibilities for far more companies than ever before. Business corporations now have to decide which of these new applications could be useful for their business – or on the other hand harm it – and work out how to deal with them.

Automated communication in the form of chatbots, for example, has the potential to cut costs and make communication far more efficient. Accordingly, many companies are examining ways in which they can be used. Then again, automated communication may also pose a threat, for example if used against companies in the form of social bots. These potentially malicious bots have already been observed in the political arena, where they are set up to try and influence opinions on key topics. This begs the question of whether social bots are being used to affect communication regarding corporations as well – perhaps without being noticed.

To shed light on this topic and also to better understand the potential use cases for chatbots, Florian Brachten and I from the University of Duisburg–Essen conducted a two-year research project from 2018 to 2020. It is one of the first studies in Germany to provide insights into bots for communication experts. The study was divided into two parts. Firstly, we examined the occurrence of social bots in connection with the top German corporations listed in the German stock index DAX. And secondly, we conducted in-depth interviews with representatives of companies and consultancies to find out about the scenarios in which chatbots are already used.

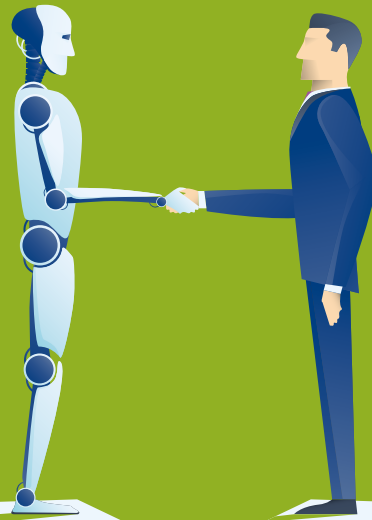
We would like to thank our interviewees for taking the time to share their experience and opinions on automated communication with us. And we are indebted to Karen Berger from the Academic Society for Management & Communication for her vital support and feedback.

We hope you enjoy reading this issue of Communication Insights and that you find the information it contains useful.

Dr. Stefan Stieglitz

Professor of Professional Communication in Electronic Media/Social Media
University of Duisburg–Essen, Germany

» It's important to know what bots are capable of – and what their limits are. They aren't jacks-of-all-trades, but where they fit, they shine. «



THE POWER OF BOTS: KEY FINDINGS

The subject of (social) bots is a hot topic in the media, especially their use in political contexts. However, hardly any attention has been paid to the usage of bots in a business setting, especially corporate communications. Therefore, the University of Duisburg–Essen conducted a two-year research project to examine how chatbots can be actively used to support corporate communications. Furthermore, the project investigated social bots appearing on social media sites that may disrupt the communication of DAX 30 companies in Germany. The project's key findings are published in this issue of Communication Insights. The study was divided into two parts.

How can corporations actively deploy chatbots to make communication more efficient?

- ▶ We conducted **ten interviews** to find out how companies evaluate the active use of automated communication by bots as well as about the current status quo.
- ▶ **Bots are used:** 1) to support customer advisory services, 2) internally by and for employees (e.g. for sharing knowledge, networking, onboarding), 3) to personalize an online presence (p. 8).
- ▶ **The potential benefits of using chatbots** according to the interviewees include the ability to handle repetitive tasks and thus free up employees' time and resources. Chatbots can speed up answers to user inquiries. The data generated during a chat can provide more insights into the user's needs and thus help improve the company's responses. In addition, two of the most commonly mentioned benefits were increased efficiency (e.g. by processing more requests with less effort) and reduced costs (p. 8).
- ▶ The **main worry when implementing chatbots** in a company is systems' inadequacies (e.g. wrong or insufficient chatbot responses), which may frustrate and deter users. Also, their capabilities may be limited by the lack of structured data available that can be accessed by the chatbots to deliver the right answers (p. 10).
- ▶ Different **methods to implement chatbots** exist. They can be programmed from scratch within the company but most of the time, using pre-existing frameworks is a better solution as those are less prone to error, more capable and easier to expand. Several big tech companies offer their own solutions for frameworks (p. 11).
- ▶ **Improving chatbot implementation:** Based on the interviews, a maturity model was developed which can help assess the current status of chatbot implementation within a company or department. It formalizes the findings from the interviews and highlights three levels of criteria by which changes can be made. It can thus suggest options for further developing or improving a chatbot (p. 13).

How can corporations deal with the potential threat of social bots?

- ▶ Reflecting on findings in a political context, social bots could have the **potential to influence public opinion** on certain topics. This may also apply in a corporate context.
- ▶ This study examined whether this threat is real. For this purpose, social media posts mentioning **DAX 30 companies** on Twitter, Facebook and YouTube were logged. The DAX—also known as the Deutscher Aktien Index—is a stock index that represents 30 of the largest and most liquid German companies that trade on the Frankfurt Stock Exchange (FSE).
- ▶ **Low social bot activity:** Automated communication regarding the DAX 30 companies in the form of social bots was indeed found to take place, albeit to a relatively small extent. Social bot accounts were only found on Twitter, but not on YouTube or Facebook. In total, the 426 accounts identified produced almost 275,000 tweets in the dataset, equating to just 2.7% of the overall communication that was tracked (p. 21-29).
- ▶ **Four use cases for social bots:** Based on the literature on bots in a political context, four use cases were identified and transferred to the corporate context. There are social bots that 1) promote their own products, 2) promote or sell other companies' products, 3) cover other topics to promote their own products, or 4) are intended to harm other companies or brands. Examples of all four use cases were found in the dataset (p. 30).
- ▶ **No imminent threat:** Based on our findings, there doesn't seem to be an imminent threat emanating from bots on social media. Accounts exist that pursue certain strategies, but those that were found were meant to drive sales rather than harm other companies (p. 32).
- ▶ **Legal perspective on social bots:** Companies which are maligned by a social bot campaign have recourse to criminal or civil law. In such cases, bot operators may be prosecuted for insulting behavior, libel or slander. As identifying the operator may be difficult, another approach is to request the

platform operator (e.g. Twitter or Facebook) to delete posts. Under the German NetzDG Network Enforcement Act, the platform operator is required to respond promptly (p. 19).

METHODOLOGY

The research project "Bots in Corporate Communications" was conducted by Stefan Stieglitz and Florian Brachten from the University of Duisburg-Essen from January 2018 to March 2020. The study consists of two parts: one addressing chatbots, the other looking at social bots.

Part 1: Using chatbots in corporate communications

This part of the research project focused on the application of chatbots by companies. To find out how they are used in corporate communications as well as about companies' expectations of them, we first held an internal workshop to identify relevant topics and areas where bots are applied in a corporate setting based on prior research. The findings were then used to guide our ten in-depth interviews with representatives of ten organizations.

To explore this topic from different angles, we selected interviewees from:

- a) Companies that develop and offer bot implementation software
- b) Companies that use bots themselves
- c) Management consultancies that help other companies implement bot technology

The interviews were conducted between June and November 2019. The questions addressed the following topics:

- Frontend and backend experience of bot technology
- Usage of bots within a company
- Technical implementation and infrastructure
- Chances, opportunities, risks and obstacles

From these interviews, we derived a maturity model which companies can use to assess their current state of chatbot implementation and which suggests possible next steps and improvements for their chatbot projects (p. 13).

Organizations that were interviewed on chat bots applications

accenture



arvato
BERTELSMANN

Capgemini

DAIMLER

Microsoft

SCHAEFFLER

thyssenkrupp

Part 2: The impact of social bots on the social media coverage of DAX 30 companies

The second part of the research project examined whether bots on social media (“social bots”) are used to influence the social media coverage of DAX 30 companies in Germany. We chose these corporations as they represent the 30 largest German companies in terms of market capitalization, and could thus be a viable target for possible bot attacks. Furthermore, they represent a diverse selection of companies in different sectors and with different products. For this part, we collected data on these 30 companies on Twitter and YouTube as well as 25 companies on Facebook using the networks’ APIs. After researching the relevant content for the networks and adjusting the tracking approach accordingly, data-gathering began in mid-March 2018.

- For Twitter, we collected all tweets that either used #hashtags, @mentions or “normal” mentions associated with the DAX 30 companies (e.g. #allianz, @allianz or allianz). Tracking spanned the period from March 2018 to December 2019. Over this time, we collected 10,000,751 tweets written by 2,800,826 unique user accounts, totaling 9 gigabytes of data.
- Facebook is more restrictive in granting access to its data than Twitter. We tracked the pages of 25 DAX companies as

well as postings by companies and visitors. Tracking took place from March 2018 until November 2018. Although a longer period had originally been planned, Facebook imposed new restrictions on its API after the data scandal involving Cambridge Analytica. But since Facebook allowed posts to be collected from further in the past compared to Twitter, we collected data from November 2017 to November 2018. However, the ban also affected the tracking of individual companies so that we could only access data to 25 of the 30 DAX companies. The dataset consists of 16,297 posts by 25 DAX companies and 13,732 posts by users.

- On YouTube we tracked the channels of the DAX 30 companies, the videos on these channels, and the comments posted about these videos. We gathered data from February 2009 to December 2019 – all in all 22,069 videos with a total of 107,508 comments.

During our research period, three corporations left the DAX and were replaced by other companies: ProSiebenSat.1 Media was substituted by Covestro in March 2018, Commerzbank by Wirecard in September 2018, and thyssenkrupp by MTU Aero Engines in September 2019. We expanded tracking accordingly for Twitter and YouTube; however, this wasn’t possible for Facebook as the company didn’t allow the tracking terms to be modified.

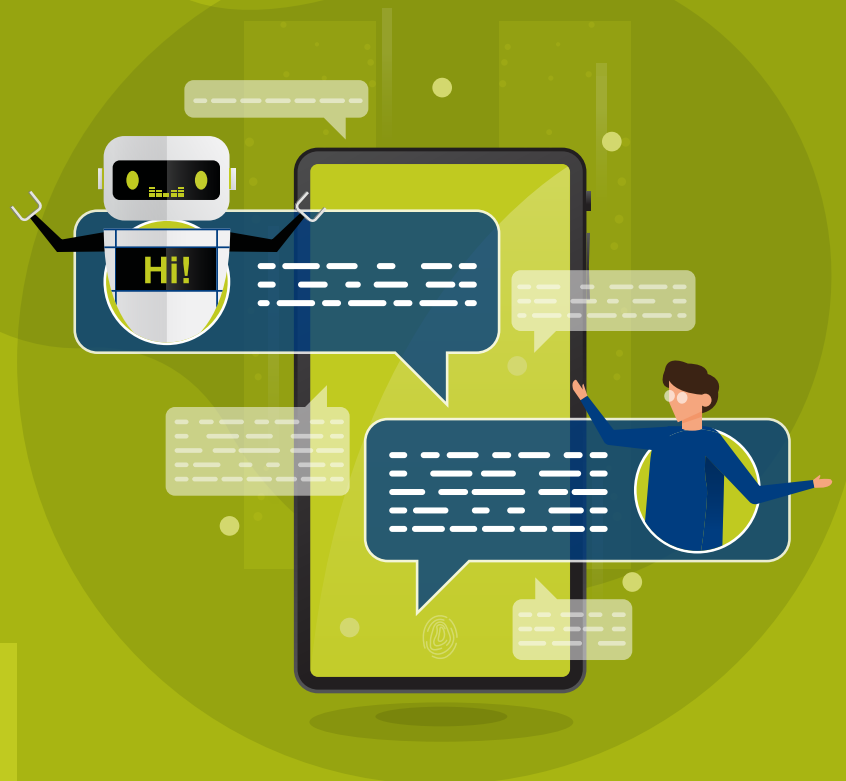
Overview of the DAX 30 companies that were checked for social bots activities



Note: During our research period, three corporations left the DAX and were replaced by other companies. We expanded tracking accordingly which is why overall 33 companies were investigated.

USING AUTOMATION IN CORPORATE COMMUNICATIONS

HOW CHATBOT SYSTEMS CAN SUPPORT INTERNAL AND EXTERNAL COMMUNICATIONS



To understand how companies can (and do) use chatbots to enhance their communication and extend their services, this chapter describes various scenarios while also highlighting the challenges and risks of integrating chatbots. But first, let's take a general look at automated communication and how bots came about.

Automated communication

Digitalization has rapidly changed the way we communicate, from traditional letters to the rise of completely digital channels. These days, enterprises' communication can be totally automated. One simple example is the emails sent automatically after you've bought something online. A more sophisticated type is news articles with standardized content and wording. For instance, weather reports and sports news can be automatically generated from datapoints (e.g. weather data or information about goals scored) and then posted online, giving the impression that they were written by a human. Another, more interactive form of automated communication is applications that interact with human users in a chat environment. They are becoming ubiquitous, especially in the private sector. Applications that carry out automatic tasks for users are commonly referred to as bots.

What are bots?

The term "bot" (short for software robot) in its most basic form describes computer programs which automatically and repeatedly perform routine tasks without necessarily interacting with a human. They can for example be used in computer games to carry out repetitive tasks for a user or trawl the internet for content in the form of web crawlers.

The term bot is also often used in connection with automated communication to describe computer programs that automatically interact with a human user through natural language input (i.e. common human language in contrast to computer commands). This use of the term originates from an abbreviation and synonym for "chatbots" (a compound of the verb "to chat" and "bot"), which has become an umbrella term for all kinds of conversational systems.



- In this issue of Communication Insights, the term **chatbots** refers to automated interactive systems deployed to hold a conversation with a human user in order to carry out certain tasks.

- The term **social bots** denotes accounts on social media sites that automatically post content and aren't immediately recognizable as not being human.

There are several terms describing technology that interacts with human users through natural language, and they are often used synonymously: conversational agents, dialog systems, virtual companions, virtual assistants, social bots, digital assistants, enterprise bots, and virtual personal assistants. Although these terms each emphasize certain aspects of bots, they are all computer systems that can be addressed using natural language.

How do chatbots work?

Chatbots are computer programs that can react to user input based on artificial intelligence, natural language, and a human-computer interface. At its core, a chatbot can read and reply to messages, allowing a conversation with a machine via a natural language interface. With more sophisticated methods, natural language can be processed not only textually but also orally, with AI also playing a role in enabling this conversation.

Bots are programmed to execute certain tasks without the need for human intervention. They can be programmed in two different ways: as rule-based or self-learning chatbots (see infographic).

Using chatbots in corporations

Chatbots can be used in a company for **internal and external purposes**. Internal bots can be accessed by employees, for instance to seek assistance with unfamiliar tasks or to obtain information. External chatbots talk to customers, partners or other stakeholders, and can for example support customer service.

Currently, chatbots in corporate communications are mainly used internally. Many companies first want to gain experience with an audience that isn't as critical as external stakeholders. Said Kai Broeck, Manager AI enabled Automation at Capgemini: "There is a degree of caution in the market. People want to trial bots internally first. If an internal chatbot starts giving wrong answers, the employee won't desert you for a competitor. The worst thing that can happen is that they'll submit negative feedback. But if customers encounter a faulty chatbot, that might scare them off."

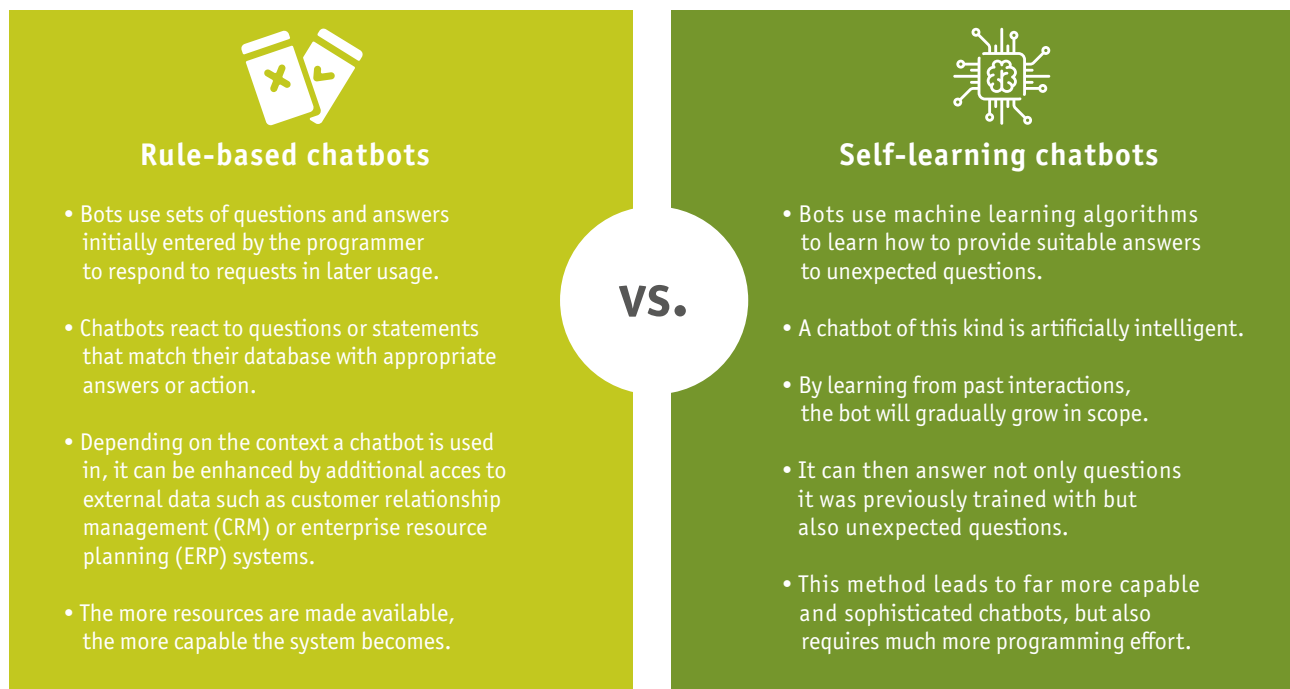
Several interviewees said they were testing the technology in small internal communication projects. Their findings will help avoid problems when external bots are implemented.

Benefits of chatbots

Cost savings, the improved availability of services, and the reduced workload of employees were the advantages of chatbots mentioned the most often. The reduced workload allows staff to devote more time to complex problems and to "quality" communication with customers, stakeholders and other employees. Three specific areas in which interviewees rated chatbots as interesting or helpful were customer service, internal applications for employees, and personalizing the online presence.

+ Customer service: Chatbots are felt to be particularly beneficial in customer service. Simple questions with standardized answers can easily be handled by chatbots. They can, for example, accept customer inquiries, answer simple questions

Different ways to train chatbots



immediately, and forward more complex topics to employees (hybrid approach). Bots can also help assign inquiries to the responsible employees, preventing the multiple forwarding of requests. They could be used to make appointments, too. In addition to saving personnel costs and reducing the workload, the use of chatbots might lead to higher customer satisfaction as they're available 24/7 and customers aren't put on hold, even at peak times. "The biggest advantage is of course that we can now help more users simultaneously," confirms Jakob Muziol, Vice President Marketing at ARAG. This is particularly relevant when there's suddenly a rush of inquiries, such as during a successful marketing campaign or a company crisis.

+ Information for employees: Another area in which chatbots can be put to good effect is providing information internally and supporting the onboarding process of new recruits. New staff in particular are full of questions about the company and its procedures. Instead of reading extensive FAQ documents, employees can simply ask an internal chatbot, which will respond by finding the appropriate answers and resources for them. In addition, questions can be recorded and then used to better adapt the internal knowledge database to employees' needs. Thomas Mickleit, Director of Communications at Microsoft Germany, said that his department can see from the internal chatbot what

questions are being asked and what employees want to find out. New chapters can then be added and the system can be continuously improved. Another idea is a chatbot linked to a database containing information about other employees' skills and knowledge. This chatbot could then, on request, put employees in touch with each other so they can pick each other's brains in order to solve a problem together. Chatbots are also considered suitable for internal, frequently recurring service requests, for example asking for assistance with IT problems or claiming vacation time.

+ Website personalization: A company's website or online presence could also benefit from chatbots. One approach is for a chatbot to start a conversation with website visitors, for example to get information about their interests and previous knowledge. The content and presentation of the website can then be adapted in the background to their needs. For potential applicants, the chatbot could use questions about their qualifications and preferences to determine which vacancies might be of interest to them. Candidates would then be directed to these vacancies, potentially improving the fit between the applicant and the job offer, and increasing the total number of applications. In addition, the use of a chatbot would demonstrate the company's IT affinity and forward thinking, which might appeal to tech-minded applicants.

Chatbots in use

ARAG's travel insurance bot

German insurance company ARAG has a **chatbot to advise users on travel insurance**. The bot has been available since March 2017 and was first implemented in Facebook Messenger. It guides users through the process of choosing the right travel insurance policy and works mainly by asking questions and offering several options to choose from. This first version was rather simple, but Jakob Muziol, Vice President Marketing ARAG, explains their future plans: "It quickly became apparent that if we want to continue down this avenue, we'll have to make it more professional. Therefore, we need a software application that's more workable in the market. In addition, it'd be great if the chatbot could also answer users' questions such as 'I'm going to China, what insurance do I need?' or even fake questions posed by users just to see what happens. Moreover, once the chatbot finds itself unable to answer customers' queries, it needs to be able to hand the conversation over to one of our human agents."

Sarah, Daimler's virtual avatar

Daimler Mobility AG has produced a system called Sarah that includes a **virtual avatar** and might one day be used by the sales department to advise on purchase decisions. Not currently in active use, the system is a proof of concept developed with external

partner Soul Machines. Artificial intelligence based on IBM Watson is used to help the system learn. The animated avatar interacts via spoken language, asks questions, understands the answers, and responds accordingly. She even has a (fictional) biography!

Internal usage of a conversational system at Microsoft

The fact that chatbot data can provide **valuable insights into users' interests** is something Microsoft discovered with its internal chatbot. Azure is the name of Microsoft's proprietary bot-building framework, which can be purchased and used by other companies, too. (p. 12)

This rule-based system is used internally for all questions about the company, its structures, and other aspects that employees, especially new ones, may ask. It replaces an FAQ document by answering specific questions. Similar to thyssenkrupp, the questions entered by users are collected and used to continuously expand and enhance the system. As Thomas Mickleit, Director of Communications Microsoft Germany, reports: "We use the chatbot in our internal communication, and it's also increasingly being used in many other parts of the company. I'd say it's becoming more and more standard, because it's super-easy to integrate technically and can even be done by non-techies. The user flow is so simple that you can build it yourself very quickly."

Pitfalls of chat bots

- **Limited capabilities:** One of the main concerns is that chatbots make mistakes, don't work as planned, or just aren't sophisticated enough to be of any real use. An underdeveloped chatbot may misunderstand questions, give wrong or incomplete answers, and be more of a hindrance than a help. This can deter and frustrate customers, damaging the company's reputation. Communication is often dynamic and unpredictable, yet chatbots are still too static and not flexible enough to deal with unexpected topics. This explains why chatbots are mostly used in internal communication and in cases where standardized services can be offered.
 - **Limited empathy:** Another reason not to use chatbots is their lack of responsiveness, depending on the sector a company operates in and the purpose of the bot. One interviewee from the insurance industry expressed concern about using bots for inquiries involving legal disputes, which are usually nerve-racking and troublesome for customers. Therefore, bots may not be suitable for dealing with conversations in cases where empathy with the customer is important. According to Jakob Muziol, Vice President Marketing at ARAG: "The more emotional the topic, the more empathetic the answers must be and the harder it is to integrate automated communication." However, filtering out such conversations in advance may pose a challenge, while users may feel uneasy about simulated empathy when they know they're talking to an algorithm.
 - **Limited transparency:** Most interviewees agreed that in cases where a chatbot is used, transparency is essential. It should always be clear to users that they are communicating with a chatbot and not a human being, as otherwise they might feel deceived or get angry about any failings. A former spokesperson at thyssenkrupp, confirms this view: "Users should know that they're communicating with a bot, if only to avoid disappointment. I don't think any bot would pass the Turing test."
 - **Limited data:** Chatbots rely on a database to offer added value. If a bot is to be more sophisticated than generating simple if-then clauses and become genuinely helpful, it has to access huge amounts of data. This is especially important for chatbots that need to "understand" aspects specific to the field they are used in. Frequently, however, the data required isn't available in a suitable form to train the underlying algorithms. One way of obtaining this data would be to use the system so it gathers more and more data, which can then be used to keep training it. Even so, there is certain data that is difficult or impossible to access. In some of the interviews, it was revealed that employees are reluctant to share certain information, making it more difficult to build up a database. Projects involving data for chatbots may also be viewed critically by the company, especially by the works council, or even contradict the company's guidelines.
 - **Limited expertise:** Many organizations lack the expertise required to implement and handle chatbots systems, and so have to consult external contractors. But although outsourcing the implementation of chatbots may be easier and quicker for a company, this approach impedes the company's internal learning process. Some interviewees expressed their surprise at how complex the subject of chatbots was despite having monitored the technology for some time. Therefore, companies need to decide early on whether the topic is important enough to build up expertise within the company.
- These pitfalls may give the impression that setting up chatbots is more trouble than it's worth. However, this is not the case. While obstacles should be kept in mind, they should not be allowed to overshadow the positive aspects of using a chatbot. The potential is backed by quantitative findings from market research. According to a forecast by strategy consultants at Gartner, by 2021, 25% of employees will be working with the aid of digital assistants (Gartner 2019), while a 2017 survey from Germany found that 44% of the participants had a positive attitude towards communicating with companies via chatbot (Statista 2018).

i AT A GLANCE

- While bots can be used in internal and external communications, most companies prefer to gather experience internally first.
- Especially routine and repetitive tasks as well as the first line of contact with a company (e.g. customer service) can be handled by bots, as can employee support or personalizing the company's online presence.
- Chatbots mean customers can get an instant response. They make contacting the company more satisfactory.
- The advantages of chatbots for companies are lower costs, increased efficiency, more time for other tasks, and the possibility of learning from the data gathered.
- The main drawbacks are the systems' lack of sophistication and the lack of relevant data.



TECHNICAL INFRASTRUCTURE FOR BOTS

HOW CHATBOTS CAN BE IMPLEMENTED IN A COMPANY

There are several ways to develop and implement chatbots within an organization. They can be roughly broken down into three approaches: 1) programming a chatbot in-house, 2) using external contractors, and 3) using external large-scale bot-building frameworks, e.g. from IBM, Microsoft or Google. The following chapter explores the advantages and disadvantages of these three ways as experienced by corporations that have begun working with chatbots.

In-house development and programming of a chatbot

In this approach, an organization programs the bot mainly from scratch and only uses a few small building blocks ("libraries") contained in the programming language. The bot can be tailored to the company's existing technical infrastructure. This approach was the least popular among the interviewees as it's **mainly suitable for tech companies**, where chatbots or conversational technology in general may even be one of the firm's products.

- ▶ The **main advantage** is that a company developing its own system can build up a lot of expertise and fully customize the bot. Furthermore, no internal information is shared with any outside parties.
- ▶ The **main downsides** are that the chatbot can only be trained on internal data, that development is much more time-consuming than an external solution, and the lack of experience when implementing the chatbot for the first time.

Building a chatbot in-house without any external help is thus a rather exotic approach and not recommendable, according to Kai Broeck, Manager AI enabled Automation at Capgemini, who has long-term experience of implementing chatbot systems in several companies: "99% of the internally developed systems I've seen are the same and not very good." However, in the long run, it could be beneficial to have more employees with chatbot experience working at a company, if only as counterparts for external suppliers.

Using external partners to develop a chatbot system

The more common approach is to collaborate with an **external specialist** in chatbot systems. Often these are **start-ups** dedicated to the specific field of conversational automation. Even large companies work on the basis of these external services as they neither have the capacity nor see the need to build their own systems. The advantages are:

- ▶ Faster implementation as external contractors contribute existing tools for the company to work with
- ▶ Being able to rely on the contractor's experience from previous projects
- ▶ Fewer internal resources are tied up as most of the work is done by external contractors

It's important to **choose an external partner with a scalable solution**. After all, once developed, the system will still need to be expandable to accommodate future needs and cases. Moreover, the system should, at least to some degree, be serviceable by not just the company itself, but also other contractors. This is important if the company decides to switch contractors at some point or if multiple contractors work on the same project.

Furthermore, the company should preferably be able to enhance the system themselves, for example by implementing and training new scenarios based on former user behavior or demands. This was stressed by Kai Broeck from Capgemini: "It's no good if a programmer

Exemplary frameworks for building chatbots



Microsoft Azure

- Microsoft Azure is a cloud computing platform that can be used for a wide array of purposes.
- It bundles several services such as saving data in the cloud, providing computing capacity, and artificial intelligence (AI).
- It also features machine learning applications, including the Azure Bot Service, which can be used to set up and train a bot for an individual purpose.



Google Dialogflow

- Google Dialogflow was specifically built to create conversational systems.
- Like the Azure Bot Service, it uses machine learning and natural language processing to understand user input and provide suitable output.
- While Microsoft's solution is easy to work with if using other Azure services, Dialogflow is a more lightweight solution that focuses on the conversational aspect.
- Once a chatbot has been built with Dialogflow, it can be used for different services, meaning it can be deployed as a bot in Facebook Messenger, yet also as a standalone solution on the company's own website.



IBM Watson

- IBM Watson concentrates on AI
- It can be regarded as an in-between solution that's neither as broad as Microsoft Azure, nor as specialized as Google Dialogflow.
- The part of the program focusing on conversational systems is called Watson Assistant and offers many of the same features as the other services.
- However, it has more emphasis on the AI aspect of conversations with the aim of holding natural dialogues.

from the supplier has to come in every time a system needs adjustment, for this is a constantly evolving system." Accordingly, **proprietary systems** – systems that are developed by a single contractor and don't have a broad user base – **should be avoided**.

Using an external large-scale framework

Most interviewees agreed that the most practical way to implement a chatbot is to rely on existing frameworks from large tech companies. Several such frameworks exist for different purposes. The best-known examples are Microsoft Azure, Google Dialogflow, and IBM Watson (see infographic above).

Although there are other systems with capabilities similar to these solutions, such as **Amazon's Lex**, the three listed above represent a good, diverse overview of the field. When implementing these

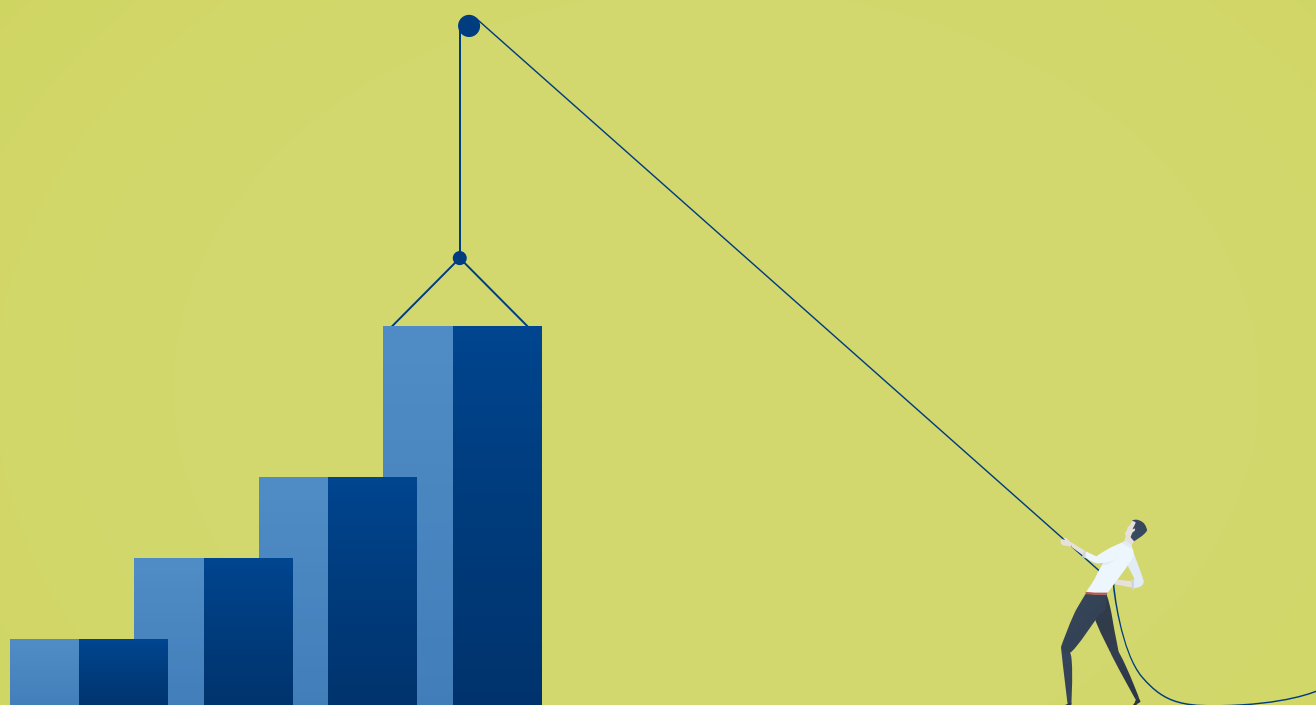
systems, companies can also work with start-ups. They often offer specialized solutions built on these large-scale frameworks and have prior experience of implementation.

Using the frameworks from IBM, Google, Microsoft or other big tech companies located outside the EU also has potential drawbacks in terms of **data security**, according to some interviewees. For example, the data is often stored or processed on servers in the US.

Other tech companies find it hard to compete, as Sascha Pallenberg, Head of Digital Transformation at Daimler AG, confirmed: "Daimler Group employs almost 20,000 engineers. Yet Amazon alone has 10,000 engineers for Alexa. You have to ask yourself whether this is really your core competence. We can't currently expect BMW, Daimler or Siemens to be able to build similar assistants to Google, Microsoft or Apple."

AT A GLANCE

- To develop a chatbot, companies can program bots themselves, bring in external contractors, or use existing frameworks. A tech company may well be able to program its own bots. For most companies, however, the practicable solution is to collaborate with external partners offering systems based on existing frameworks. This will save time during the development phase and make it easier for the chatbot to be modified later on.
- Standardized bot-building frameworks are mostly offered by large tech companies like Microsoft, Google, IBM and Amazon. They offer plenty of built-in features which don't need to be programmed individually.
- While using these frameworks can save a lot of time as not everything has to be programmed from scratch, it should be borne in mind that data is transferred and stored outside the European Union.



REACHING THE NEXT LEVEL IN CHATBOT USAGE

APPLYING A MATURITY MODEL TO IMPLEMENT THE RIGHT STEPS

With the previous chapters having dealt with the potentials and challenges of bots and approaches for their technical implementation, it would be helpful to integrate these findings into a framework. The maturity model we have developed to classify the chatbot use of your department or company into three levels is based on three criteria per level, and points out potential improvements if you decide to make your chatbot applications more sophisticated.

Evaluating the status quo

To make progress in a field like chatbots, the first step is to assess the status quo. A helpful tool is the **maturity model**, which is used to evaluate a company's operations or certain projects. Maturity models originated in software development, but can also be applied to different areas such as chatbots. The model specifies different levels, which are used to benchmark the maturity of a company.

The model we developed to assess the current state of chatbot implementation consists of **three levels: basic, advanced, and expert**. On each level, chatbot use is evaluated by organizational, infrastructural, and technical criteria. Organizational criteria concern the organization of chatbot implementation,

such as who is responsible or how the implementation process is organized. Infrastructural criteria refer to the IT infrastructure within which a bot is implemented, i.e. the data it can use. Finally, technical criteria consider the technical capabilities of the implemented bot systems, such as error tolerance and the system's fidelity.

Note that the model does not stipulate that a high level of chatbot usage must be achieved. For some companies, it might be better to set up activities on a certain level without aiming for the next level. The model merely categorizes and organizes the use of chatbots. It can, therefore, help assess the current status, and also be used to evaluate whether reaching a higher level would be beneficial. In addition, it highlights the potential of extending the usage of chatbots and what the next steps might be.

Maturity model to assess the current state of chatbot-use

1 BASIC LEVEL	2 ADVANCED LEVEL	3 EXPERT LEVEL
ORGANIZATIONAL CRITERIA		
<ul style="list-style-type: none"> • No specific department responsible – several departments may work on the implementation of chatbots • No separate budget for chatbot projects. Cost are mainly covered by a general fund for (digital) projects specific to the departments. 	<ul style="list-style-type: none"> • No specific department responsible • Knowledge is shared regularly within the company – decreased redundancy from repeating mistakes • Knowledge gained in previous projects used to boost efficiency • Still no separate budget for chatbot projects. However, exchange of knowledge can help to bring down costs. 	<ul style="list-style-type: none"> • Process overseen by central department with knowledge and expertise from other chatbot projects • A separate budget exists for projects related to automated communication • Procedures are standardized and planned • Standardized metrics are defined so that the project can be compared
INFRASTRUCTURAL CRITERIA		
<ul style="list-style-type: none"> • Chatbots are domain-specific – each chat bot is limited to one very specific task • Virtually no data is collected • No structured data to work with – chatbots' knowledge has to be built up from scratch and can barely draw from preexisting data 	<ul style="list-style-type: none"> • Chatbots are mainly domain-specific – answers may deviate slightly from the topic • Rudimentary data collection – data that's generated by chatbots use is stored • Collected data is used for improvements – chatbots can be improved based on data from previous conversations 	<ul style="list-style-type: none"> • Chatbots are specialized but can cope with a broader scope • Collection of smart data is standardized – conversational data and metadata is collected and saved in a central database • Improvements to the chatbot are datadriven – based on predefined processes, data gathered is regularly used to improve a system
TECHNOLOGICAL CRITERIA		
<ul style="list-style-type: none"> • System is static – it doesn't allow individual user input and presents the users with predefined requests • Chatbot is developed inhouse without using a framework; expandability is limited and requires developers familiar with the system 	<ul style="list-style-type: none"> • System has low error tolerance – it's able to deal with input deviating slightly from what it was trained to answer (but won't work on requests that are phrased completely differently) • The chatbot implemented is based on a basic framework 	<ul style="list-style-type: none"> • System has a basic error tolerance – it can cope with unforeseen input or deviation from the conversational path • The chatbot implemented is based on a customized framework

Level 1: Basic level

On the basic level, individual chatbot projects are pursued by different departments within an organization without a common goal or strategy. This is often the case when companies start a chatbot project. Each implementation process is different and unique. Rather than relying on predefined procedures for chatbots, development largely depends on the parties involved in the

process. Typical characteristics of this level are that development costs aren't separated from other digital projects, the chatbots don't collect data, and they are mostly static systems that can only answer questions in a narrow field.

The chatbot's abilities are restricted to one very specific task; no other applications are supported by it. Accordingly, only very basic features of its programming can be reused by other projects.

Furthermore, chatbots don't collect any data when they are used: conversations might be saved, but not in a structured manner. What's more, there is no clear plan of what to do with data from previous conversations. Accordingly, a chatbot can't use any structured data when it is first deployed; because it can't usually draw from preexisting data, its knowledge has to be built up. For the chatbot to function properly, a database has to be set up and made accessible to it.

Level 2: Advanced level

On level 2, chatbot projects are more sophisticated and learn from previous bot projects. To make the development of chatbots more efficient, recommendations for best practices can be used on this level (although they aren't mandatory). Standards for chatbot projects exist within the organization and, compared to level 1, knowledge is regularly shared within the company, which can cut costs. In addition, chatbots on this level can store generated data in databases and improve it. Furthermore, while still low, the error tolerance of these chatbots has improved, so input deviating from standard phrasing can still be understood, which is an advancement compared to the static bot systems on level 1.

While the chatbot is still mainly focused on one single task, it can deviate from it to answer very basic (sometimes lighthearted) questions such as regarding its name or birthday, and perhaps requests for support. As it is built using a basic framework, all chatbots in the company now come with some general functionality. While there is still no budget specifically for chatbots, sharing knowledge helps to cut costs as departments don't have to start from scratch. Chatbots can be improved based on data from previous conversations. Although this process isn't clearly structured, previous chatbot encounters are used to assess users' interests and to expand chatbots' abilities and knowledge. Based on this, companies use a pre-existing framework to implement a chatbot. Despite not being fully customized, it still allows for all projects within the company to have a similar level of quality. This enables a uniform basic user experience, and also makes all chatbot systems accessible and expandable to people familiar with the framework.

Level 3: Expert level

On the most sophisticated level, organizations have moved away from individual approaches to bot projects and implement them throughout the organization. While projects may differ in their scope or focus, they all follow established rules. In contrast to level 2, these rules are no longer recommendations but clearly defined processes which have to be followed. For example, the development process is now handled by a central department with experience in chatbot projects. This department has a fixed budget for development, different projects can be compared. Also, the chatbots have the ability to deal with a broader scope of input and can at least partly understand and answer spelling mistakes as well as general or unexpected requests deviating from the overall scope of a conversation. Furthermore, data is collected in a standardized way to further improve chatbot usage within the company.

Based on predefined processes, the data gathered is regularly used to improve a system. This may partly happen autonomously by the chatbot's responses in conversations being evaluated for their helpfulness and appropriateness. Over time, a system thus becomes more efficient and is able to help its users with fewer exchanges. All data generated by chatbots – both conversational data and metadata – is stored in a structured manner in a central database. If there are multiple chatbot projects in a company, they can access the same database and thus over time build up a pool of data that can be used to train new chatbots. There is a budget for projects related to automated communication. A centralized, standardized procedure for rolling out chatbots within the company means project outgoings can be compared and the efficiency of improvements is measurable. To monitor budget efficiency, KPIs to be met through chatbot implementation are defined. Universal metrics applicable to all chatbot-related projects are collected for comparison.

AT A GLANCE

- The maturity model introduced in this chapter improves the classification of the chatbot use of a company and highlights potential for improvements.
- It classifies the use of chatbots and can help assess the current status quo, revealing potential improvements regarding the usage of chatbots and what the next steps could be.
- It consists of three ascending levels – basic, advanced, and expert – which allow the maturity of a company's or a department's chatbot usage to be benchmarked.
- Each level consists of organizational, infrastructural, and technological criteria to help analyze and rate implementation.



In connection with the growing use of social media, social bots have come in for criticism in recent years. Social bots are accounts on social media sites that seem human but are in fact controlled by computer algorithms although users don't immediately realize this. The following chapter introduces the phenomenon of social bots. It provides an overview of their features and the strategies behind them, and briefly considers the impact of social bots on public opinion. Subsequent chapters will then present findings regarding the existence of social bots in the context of corporate communications.

Social bots are algorithmically controlled accounts that automatically produce or share content and interact with human users on social networks. By imitating human activity and behavior, social bots are hard to spot. Besides purely autonomously operating accounts, there are also hybrid accounts where human operators are partly involved and which switch back and forth between automated messages and manually created ones.

- ▶ Bots that mimic human behavior (social bots)
- ▶ Bots that don't imitate humans, e.g. automated news feeds and spam bots

- ▶ Benign bots normally deliver useful automated information such as news or weather reports. They are sometimes also described as good or helpful. One type of a benign bot is a chatbot. Chatbots can be used by enterprises in business-to-customer communication, and can – under certain circumstances – respond to customers' questions.
- ▶ Malicious bots are designed to cause harm. They spread spam, disinformation, fake news, or even malware. They can also steal personal data and identities, and create noise during political debates.



- ▶ Social bots are bots that closely mimic human behavior, regardless of their intent.
- ▶ Although researchers consider all bots with a high degree of human imitation to be social bots, regardless of whether they're benign or malicious, the term "social bots" usually denotes the latter type.
- ▶ As the aim of this issue of Communication Insights is to examine how social bots can disrupt companies' social media presence, we also use the term with a negative connotation.

By contrast, **trolls** are human individuals who send out reams of unpleasant messages manually. This greatly restricts their efficiency compared to social bots. However, trolls may also utilize social bots. Social bots efficiently reproduce on a massive scale the messages sent by trolls in order to reinforce them.

How do social bots work?

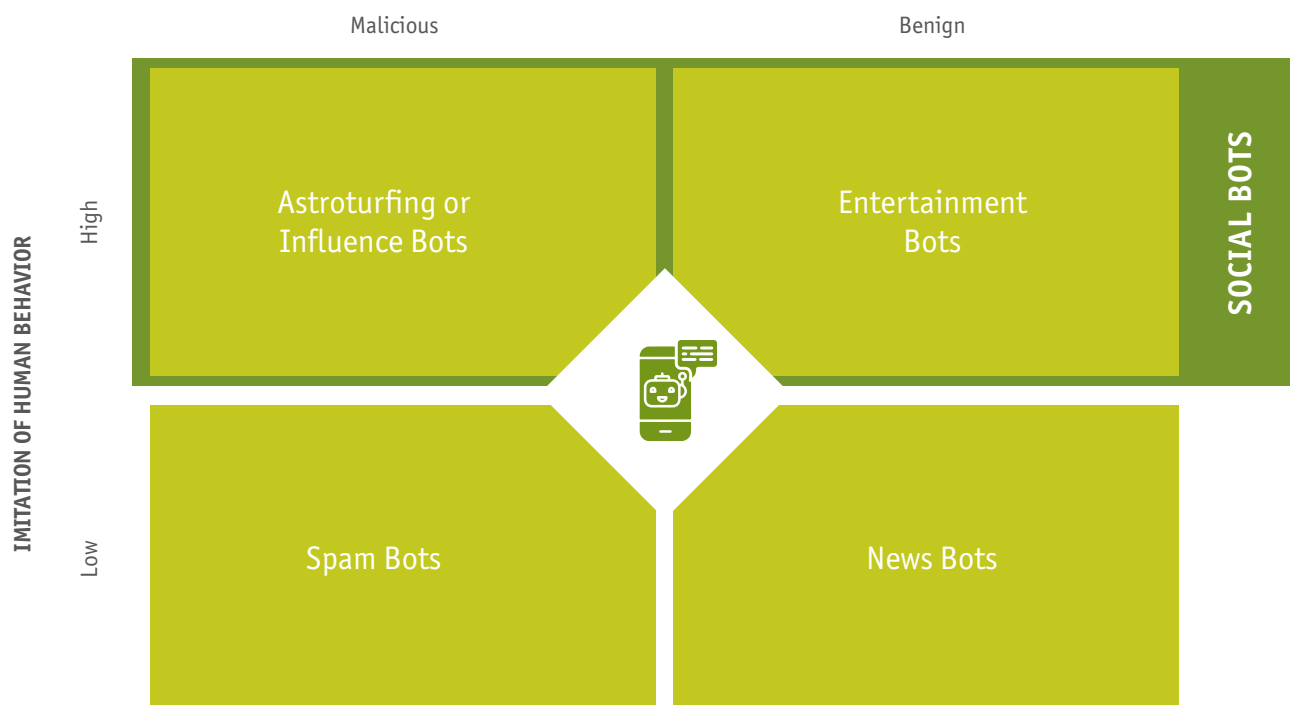
Social bots scan Twitter timelines for certain terms or hashtags by means of simple keyword searches. As soon as they find what they're looking for, they comment, share links, or start a fictitious discussion. They mostly rely on predefined messages and are generally not particularly versatile in terms of their content. They can also comment directly on specific topics. Deployed in combination with other bots (forming a "botnet"), their noise becomes even louder and can mislead other users.

How social bots are intended to behave is written in a suitable **programming language**, for example JavaScript, Python, or Ruby. The bots can then be applied on social networking platforms and are accessible through an application programming interface (API) – a kind of limited access point included by software developers in their projects which allows external parties to connect their services to them.

Strategies pursued by social bots

Many studies suggest that social bots have the power to influence public opinion. Their messages gain traction due to the sheer volume. While one account may not have much of a readership, thousands of accounts promoting the same message do. As human users can't double-check every single post they read, rather than suspecting deliberate manipulation, they might

Categorization of social media bot accounts



sense that many accounts seem to support a certain view and thus overestimate its popularity.

There are three main bot strategies which are employed to try and influence public discussions on social media:

- 1 **Smoke-screening** uses context-related hashtags on Twitter to distract readers from the main point of the debate (e.g. using the hashtag #brexit, but talking about something unrelated to the referendum), thus obscuring the real debate and making it harder to generate context and communicate over the hashtags.
- 2 **Misdirecting** uses context-related hashtags without referring to the topic at all (e.g. using #brexit but talking about something unrelated to the UK). Users searching for a certain term will hence be redirected to, say, a different debate or fake websites.
- 3 **Astroturfing** tries to influence public opinion in for instance a political debate by posting and sharing huge amounts of messages with a certain hashtag, thus creating the impression that a vast majority of people support a certain position. Political campaigns can thus be disguised as spontaneous “grassroots” movements even though in reality just a single person or organization is behind them.

The difficulty of unmasking social bots

Despite extensive research, technical ways of unmasking social bots are still in their infancy. Current studies are exploring machine learning, crowdsourcing, and graph-based detection to uncover algorithmically controlled accounts. However, detection methods are lagging behind the rapid developments in social bots’ underlying code, making social bots hard to detect.

Nonetheless, there are certain characteristics that can be assessed when trying to expose bots accounts:

- ▶ **An unrealistically high number of tweets per day:** Because bots work automatically, the number of posts they can produce in a single day dwarfs the output of human users.
- ▶ **Profile pictures:** Bots’ profile pictures often feature graphics instead of photos of real users.
- ▶ **Friend-follower ratio:** Bot accounts generally follow far more users than they have followers, since it is far easier to follow a user than to encourage another user to follow back.
- ▶ **Unrealistically fast responses:** Since they are based on algorithms, social bots can reply in an instant when they’re addressed.
- ▶ **Quality of comments:** Bot accounts usually have a limited vocabulary and may produce inadequate or imprecise responses.
- ▶ **High number of likes:** Many bot accounts award likes to users’ posts in order to receive follow-backs. This behavior results in an unusually high number of likes given compared to human accounts.
- ▶ **Content uniqueness:** Large amounts of identical, repetitive content in posts is a sign of a bot account. Content uniqueness expresses the quantity of unique content in an account: the higher the CU, the likelier an account is to be human.

It’s important to remember that all methods used to identify social bots have an **error tolerance**. Even the most sophisticated method cannot guarantee complete accuracy and can only be used for a rough assessment. This goes to show that it’s hard for regular users to identify bots in their newsfeeds, for even researchers with sophisticated methods find it difficult.

AT A GLANCE

- Social bots are programmed accounts on social media networks that imitate human behavior, automatically post messages, and aren’t easily recognizable as artificial actors.
- Social bot accounts post comments, share links, or start fictitious debates, largely by relying on predefined messages.
- Although the term social bot is often used to describe malicious accounts, there are also benign forms that post helpful information.
- Detecting malicious accounts is hard as there is no clear way to do so. Besides machine learning techniques and crowdsourcing, there are certain characteristics such as the quality or uniqueness of posts that can be assessed when trying to identify bot accounts.



“TRANSPARENCY AND CLEAR LEGISLATION ARE NEEDED FOR BOTS”

AN INTERVIEW WITH FRAUKE ROSTALSKI ON THE LEGAL IMPLICATIONS OF SOCIAL BOTS

The more social bots operate on social networks, the more urgent the need for legislation. Being a new, fast-moving field, legal regulations for bots have yet to be drawn up, let alone passed into law. But how can something be prosecuted that might not even be detectable? And who is liable for any harm caused by social bots? To better understand the legal situation, we spoke to Frauke Rostalski, a professor of law at the University of Cologne, Germany.

When examining the use of social bots in practice, it would be good to be aware of the laws governing them. After all, bots have the potential to damage the reputation of a company or its products, causing considerable financial loss. Furthermore, they can distort the perception of popularity. For instance, analyses of SoundCloud, the largest social media platform for sharing music, indi-

cate that bots are used to promote certain songs. This affects people's impression of how popular a song is, generating greater airplay. But because social bots are a relatively new phenomenon, their legal ramifications have barely been explored. We spoke to Professor Frauke Rostalski from the University of Cologne to find out more about this murky legal landscape.

Professor Frauke Rostalski holds the Chair of Criminal Law, Criminal Procedure Law, Philosophy of Law, Commercial Criminal Law, Medical Criminal Law and Comparative Law at the University of Cologne, Germany. Her interests include the challenges of AI for law and morals. She also founded the Law and Ethics of Digital Transformation Research Unit at the University of Cologne and is on the German Ethics Council.

Social bots are the subject of considerable debate and also criticism. Is using social bots legal?

There's nothing illegal about social bots per se. But as they imply a certain potential for deception, it all depends on how they're used. Consider the following situation: someone operates a social bot and has programmed it to enable dialogue. The question is whether one party in this dialogue should be allowed to use certain tools secretly. If a social bot is used to automatically take a restaurant order, this is unlikely to be a matter for the law. But when we move into the sensitive area of forming opinions, this is an altogether more serious issue. If someone claims that a certain view is mainstream, and backs this up by having this opinion echoed by an army of social bots, those of a different opinion will be afraid to express it to the (apparent) majority. This is a threat to our opinion-forming process.

Does this apply just in a political context or also in the corporate world – for example, if a post or message suggests that a product is good or bad?

The aspect of product advertising is interesting. The question of whether exaggeration is permissible in advertising has long been examined in criminal law, especially when false claims are involved. There was a famous ruling by Germany's supreme court regarding an ad asserting that a particular shampoo could double the volume of your hair. That's obviously impossible, and so the shampoo manufacturer failed to live up to its promise. The court, bearing in mind that people had spent money on the shampoo, had to decide whether this was a level of deception that was akin to fraud. In the end, the court declared this to be a case of deliberate deception. But is it a form of deception that's socially acceptable – because the truth was blatantly obvious? I would argue that it is.

In another example of product advertising, if someone tells you "Buy this sneaker and you'll be able to run a half-marathon", but you couldn't possibly complete a half-marathon no matter what sneakers you wore, I wouldn't class this as legally relevant deception, regardless of whether social bots were used for the ad or not – again, because the truth is so obvious.

Suppose someone in business used social bots to malign a rival firm, for example by claiming a certain sneaker caused blisters or destabilized the wearer's foot while running.

That's different since it's detrimental to the manufacturer's interests. Companies have a right to protection from damaging allegations. This would come under insults and malicious gossip, which are covered by Sections 185ff. of the German Criminal Code. If a statement isn't factually true, we're not talking about an insult, but libel or slander. Criminal liability then depends on whether it was an untrue statement and whether the person concerned knew this. If so, this would make the offence more serious. But even so, someone can be prosecuted for asserting something which may disparage or belittle someone else if it's not demonstrably true. In other words, if you don't know for sure whether something's true, you shouldn't say it as you'll be liable to prosecution for slander.

What legal recourse do companies have following slander or libel by a social bot?

For one thing, they could prosecute the bot's operator under criminal law. The other, probably easier option for the company is to seek an injunction under civil law. Mind you, in practice, it's often difficult to pinpoint whoever originally implemented the bots. On the other hand, in Germany you could also cite the NetzDG Network Enforcement Act and demand that the posts be deleted by the platform operator. The NetzDG certainly carries some weight because if platform operators are slow to respond, they can be prosecuted.

Has legal action ever been taken against social bot operators?

I haven't read about any cases involving social bots, at least not in my legal databases, although I find it hard to believe that there haven't been any. One thing to consider is that this involves not only criminal law, but possibly also aspects of unfair competition. Denigrating a competitor concerns different laws. I believe that social bots have featured in some lawsuits, but only played a minor role. Consequently, the court regarded them as merely an instrument and the case didn't hinge on whether defamation was carried out manually or automatically.

Would the mandatory labelling of bot accounts be helpful to prevent potential harm?

That would make sense, especially when it comes to influencing opinions. Transparency – telling readers that a message comes from a bot – is important. And I think that whenever messages are sent to an individual automatically, this should be clearly stated.

ARE COMPANIES A TARGET FOR SOCIAL BOTS?

THE FIRST ANALYSIS OF THE EXTENT TO WHICH BOTS INFLUENCE THE SOCIAL MEDIA COMMUNICATION OF GERMANY'S DAX 30 COMPANIES

In a political context, social bots play a dubious role in shaping the discourse on social networks. But what about in the corporate world? The aim of this study was to examine the impact of bots on the social media coverage of German top companies for the very first time. We analyzed two years of Twitter posts, ten years of YouTube videos, and one year of Facebook data. The results show that although social bots are active on social networks, they haven't yet been used to try and harm corporations.

The second part of our research project examined whether bots on social media ("social bots") are used to influence the social media coverage of DAX 30 companies in Germany. We chose these corporations as they represent the largest German companies in terms of market capitalization, and could thus be a viable target for possible bot attacks. Furthermore, they represent a diverse selection of companies in different sectors and with different products. We collected data on these 30 companies on Twitter and YouTube as well as on 25 companies on Facebook using the networks' APIs. After researching the relevant content for the networks and adjusting the tracking approach accordingly, data-gathering began in mid-March 2018.

► For **Twitter**, we collected all tweets that either used # hashtags, @mentions or "normal" mentions associated with the DAX 30 companies (e.g. #allianz, @allianz or allianz). Tracking spanned the period from March 2018 to December 2019. Over this time, we collected 10,000,751 tweets written by 2,800,826 unique user accounts, totaling 9 gigabytes of data.

► **Facebook** is more restrictive than Twitter. We tracked the pages of 25 DAX companies as well as postings by companies and visitors. Tracking took place from March 2018 until November 2018. Although a longer period had originally been planned, Facebook imposed new restrictions on its API after the data scandal involving Cambridge Analytica. But since Facebook allowed posts to be collected from further in the past, we collected data from November 2017 to November 2018. However, the ban also affected the tracking of individual companies so that we could only access data to 25 of the 30 DAX companies. The dataset consists of 16,297 posts by 25 DAX companies and 13,732 posts by users.

► On **YouTube** we tracked the channels of the DAX 30 companies, the videos on these channels, and the comments posted about these videos. We gathered data from February 2009 to December 2019 – all in all 22,069 videos with a total of 107,508 comments.

Overview of the DAX 30 companies that were checked for social bots activities



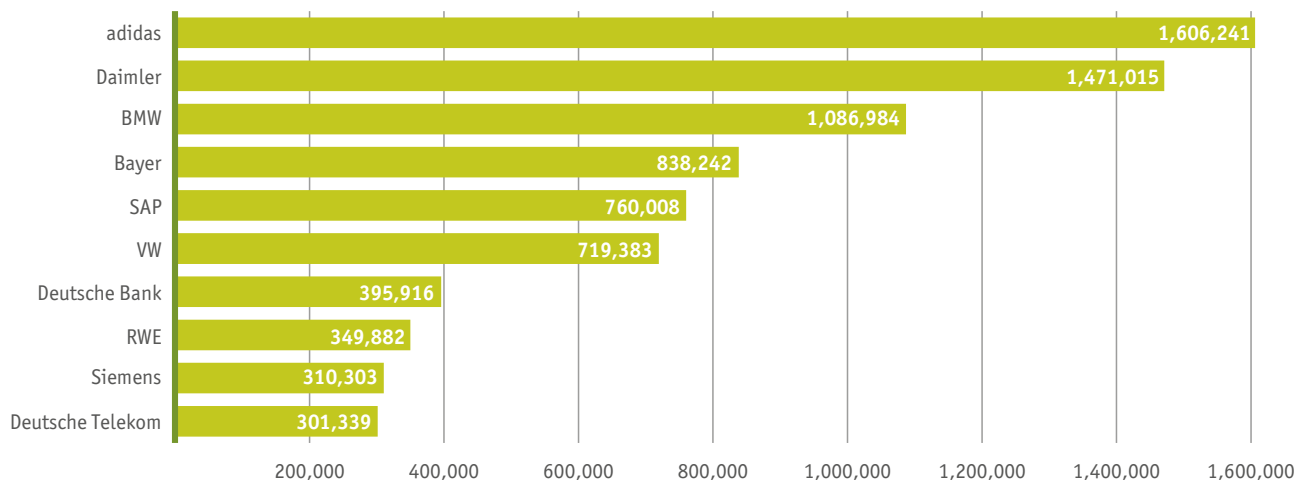
Note: During our research period, three corporations left the DAX and were replaced by other companies. We expanded tracking accordingly which is why overall 33 companies were investigated.



TRACKING #TWITTER

The most prominent companies on Twitter

The companies mentioned most often on Twitter were those that manufactured products for consumers: adidas (1.6 million tweets during the tracking period), Daimler (1.4 million), and BMW (1.1 million). Therefore, these companies are well known in society and discussed by many social media users. The least mentioned enterprises were the Linde Group (2,800), Beiersdorf (1,400), and Fresenius Medical Care (2,700), which mostly operate in a business-to-business environment or don't use their company name as a brand vis-à-vis consumers (e.g. Beiersdorf or Henkel).



The ten most tweeted-about companies and the number of tweets mentioning them

Facts and figures

- ▶ Between March 2018 and December 2019, more than 10 million tweets related to the DAX 30 corporations were logged by 2.8 million Twitter accounts. All data presented here, refer to this timeframe.
- ▶ This equals on average 3.57 tweets per account that referred to a DAX 30 corporation.
- ▶ 64% (1.8 Mio) of all accounts in our sample only posted one tweet, while the top 10% of users were responsible for 65% of all tweets.
- ▶ This is not uncommon for Twitter. Studies on American Twitter accounts estimate that the top 10% of accounts are responsible for 80% of the tweets.

Number of accounts	2,800,826
Number of tweets	10,000,751
Average number of tweets	3.57
Median followers per account	471
Median friends per account*	501

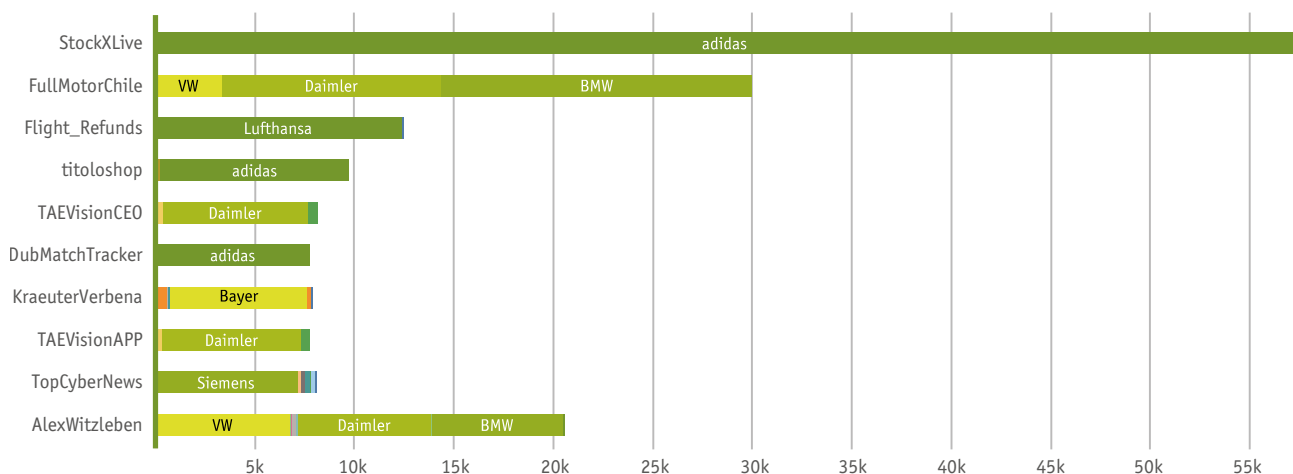
Data on the Twitter dataset (Tracking from March 2018 - December 2019)

*Friends refer to the number of accounts someone is following.

Most active Twitter accounts

The ten most active Twitter accounts tweeting about the DAX 30 companies include none of the corporations themselves. Instead, they are either run by firms selling the corporations' products or report news concerning the companies and their products. Their tweets referred most frequently to adidas, VW, Daimler, and BMW, followed by Lufthansa, Siemens, Bayer, and SAP.

The most active account by far was @StockXLive, which is examined more closely on p. 31. The account posted almost 60,000 tweets over two years, all of them revolving around adidas. This is equivalent to approximately 83 tweets every day. Twitter has meanwhile suspended the account.



The ten most active accounts in the Twitter dataset and the companies they tweeted about. Different colors depict the companies referred to in the Twitter accounts. The most active account, StockXLive, tweeted almost exclusively about adidas.



TRACKING #FACEBOOK

Facts and figures

- ▶ Data was collected from November 1, 2017 to November 21, 2018. (Note: In March 2018, just as tracking of the DAX pages started, news broke of the Facebook–Cambridge Analytica data scandal. Consequently, Facebook radically restricted access to its API, which was used by us to track the communication of the DAX companies. Although we managed to gather data before the restrictions became effective, adjustments were no longer possible, and the dataset – and the following analyses – are less extensive than the YouTube and especially the Twitter dataset as we could only access a narrower time period as well as data for 25 of the 30 DAX companies.)
- ▶ The 25 DAX companies issued 16,297 posts themselves, with Pro7Sat1 being the most active account (4,089 posts).
- ▶ 13,732 posts were published by users of the Facebook pages of the 25 DAX companies. The majority of user posts referred to Deutsche Post DHL and Deutsche Telekom and were mostly written by dissatisfied customers experiencing trouble with either parcel deliveries or their internet connections.
- ▶ Overall, the posts received more than 24 million likes and were shared 1.7 million times, with Daimler (including Mercedes-Benz) leading the statistics of likes and shares.

Data on the Facebook dataset (November 2017 – November 2018)

Total number of posts by companies	16,297
Total number of posts by users	13,732
Total number of shares	1,703,525
Total number of likes	24,625,128
Total number of other reactions (sad, angry, wow, love, haha)	1,895,068

Engagement with companies' posts



Looking at the **likes** the companies received and how often their posts were shared, Daimler (including Mercedes-Benz) ranked top with almost 13 million likes and 1 million shares for the 1,400 posts the company published. BMW came second with 4.5 million likes, followed by Allianz with 1 million likes.



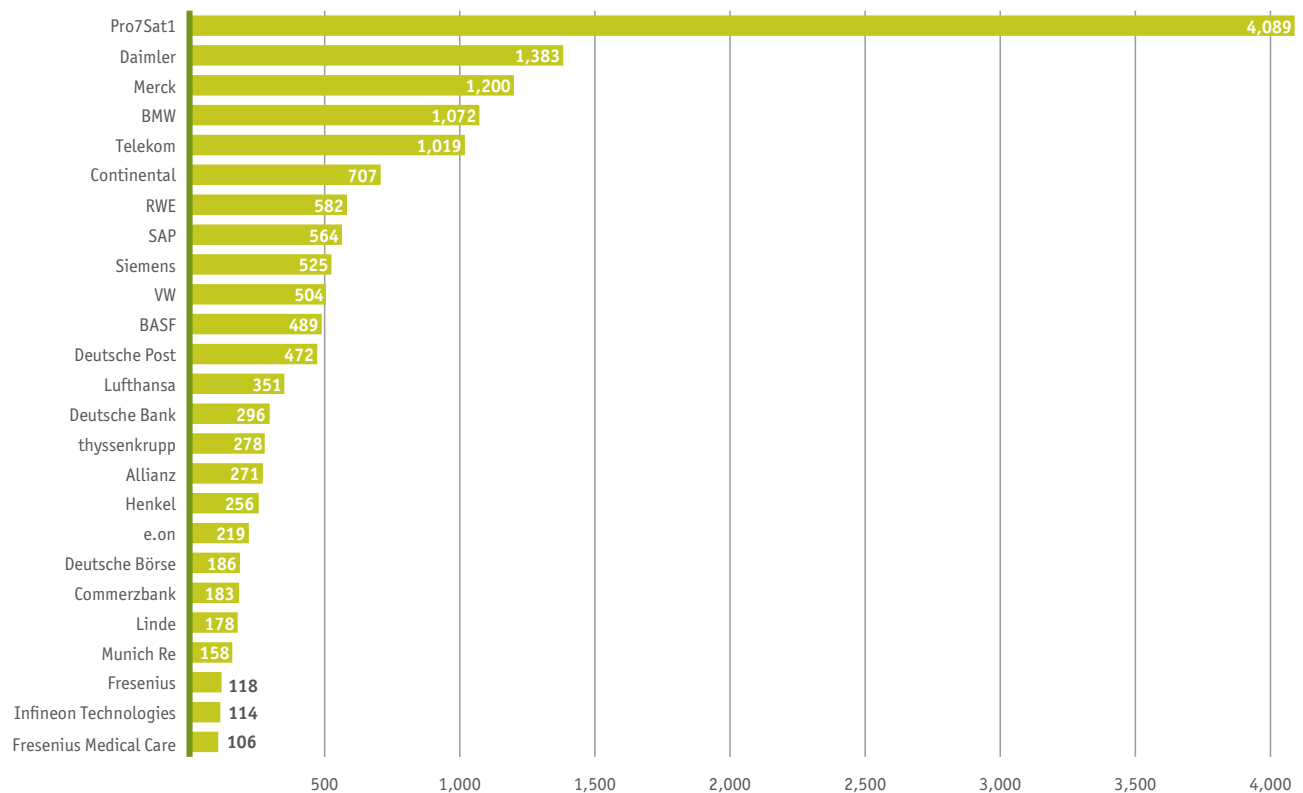
A similar picture can be drawn for the **shares** per post, where again Daimler (730) and BMW (240) were the top companies. Munich Re (2.9) and Deutsche Börse AG (1.4) received the fewest shares per post.



The data shows that in general, **companies with products that interest consumers receive more shares and more positive reactions on Facebook**. Companies that don't have a direct link to consumers (e.g. reinsurance company Munich Re) are less likely to receive the same attention.

This rationale might be true for social bots as well. They would presumably be targeted at B2C enterprises (which have far more followers and activity) rather than B2B companies.

The most active of the 25 observed DAX companies on Facebook (by the number of posts in the dataset)





TRACKING #YOUTUBE

Facts and figures

- ▶ DAX companies posted a total of 22,007 videos on their own channels between February 2009 and February 2020.
- ▶ Siemens published the most videos (7,550), followed by BASF (2,659) and SAP (2,250), while Fresenius Medical Care, Vonovia and Fresenius published the least.
- ▶ In total, their videos were viewed over 676 million times.
- ▶ BMW had the most subscribers (an indicator of lasting interest in a channel) with roughly 1 million, followed by adidas (873,000) and Siemens (181,000).
- ▶ BMW's videos were also watched the most often, recording over 202 million views.
- ▶ Of all the videos posted, only 18% were commented on. The three companies whose videos received the most comments were all car manufacturers: BMW (82,303) followed far behind by Volkswagen (5,236) and Daimler (4,174).

Data on the YouTube dataset (February 2009 – February 2020)

Total number of videos	22,007
Total views of videos	676,743,759
Videos that were commented on	4,029 (18%)
Numbers of users who posted comments	64,218
Numbers of comments posted	104,850



Our data for YouTube indicates that, again, the companies with products that appeal to consumers receive the most attention and interaction (as indicated by the higher numbers of comments). However, overall engagement with the videos by the DAX 30 companies was rather low, judging by the fact that only 18% of the videos received any comments at all, with 87% of all comments being written below videos posted by the three car manufacturers. Here, although YouTube may serve as a hosting platform for companies, the level of interest in them depends on their topics.



SOCIAL BOTS AND THE DAX 30 COMPANIES

ANALYSIS ON TWITTER, FACEBOOK AND YOUTUBE FINDS ONLY MINOR EVIDENCE FOR BOT ACTIVITIES

While common in research on politics, the occurrence of social bots in a commercial context has not been sufficiently examined. To close this gap, we analyzed the data gathered from Twitter, Facebook and YouTube to unmask social bots that might be active. As pointed out in the chapter “The influence of social bots” (see p. 16), identifying social bots is still prone to uncertainties.


Our method of detecting social bots

There are various ways of identifying bots. However, it is always beset by a degree of uncertainty since their creators attempt to make them look as human as possible. The metric we relied on the most in our datasets was **content uniqueness (CU)** as proposed by researchers from the University of Edinburgh, Duisburg-Essen and the Queensland University of Technology. This metric expresses the ratio of unique texts in relation to the total

posts posted by an account. Human users don’t normally post several messages with exactly the same content, whereas social bots do. One advantage of this metric is that it is applicable to all content that can be associated with an account and thus used on all social networks – unlike other approaches that only work within the limits of certain networks. As with all methods used to identify social bots, there’s always an element of doubt. Depending on the defined thresholds, automatic methods will include human accounts, just as they will overlook accounts that could be bots. Even with machine learning methods, there is no 100% certainty. Ultimately, one has to decide which approach to adopt and treat as a basis.

CU is assessed from 0% (all posts are identical) to 100% (all posts are unique). For example, a user may have 100 posts, but 60 of them are identical while 40% are different. This results in a CU of 40%.

Social bot accounts within the overall Twitter sample

	 Bots	All
Number of accounts	426 (0.02%)	2,800,826
Number of tweets	274,431 (2.7%)	10,000,751
Average number of tweets per account	644.20	3.57
Average followers per account	8,635	471
Average friends per account*	701	501

Only on Twitter, but not on Facebook or YouTube the research team discovered postings by social bots. The average social bot account posted 180 times as many tweets as the average account and had 18 times as many followers. This is in line with the assumption that social bots generate a huge amount of content and try to spread it among as many people as possible. *Friends refer to the number of accounts someone is following.

Social bots on Twitter

To identify social bots on Twitter, we used two metrics:

- 1 **Content uniqueness:** We chose a threshold of CU = 50%, which guarantees that at least half the messages by the accounts identified in this way were identical. Also, we only considered accounts that had written at least 40 posts during the research period. This left us with 408 social bot accounts – only 0.015% of all accounts in the dataset. Yet these accounts were responsible for 87,209 tweets – roughly 1% of all tweets. This metric helps identify accounts showing unusual behavior regarding their content.
- 2 **Tweet frequency:** We selected accounts that published at least 1,000 tweets in the dataset and had a frequency of more than ten tweets per day. In this way, we identified another 18 social bot accounts (0.0006% of all accounts), which were responsible for 187,222 tweets, roughly 2% of all tweets in the dataset. This metric helps spot accounts exhibiting unusual behavior regarding their activity.

These two approaches complement each other as they help identify different aspects of bot-like behavior. Taken together,

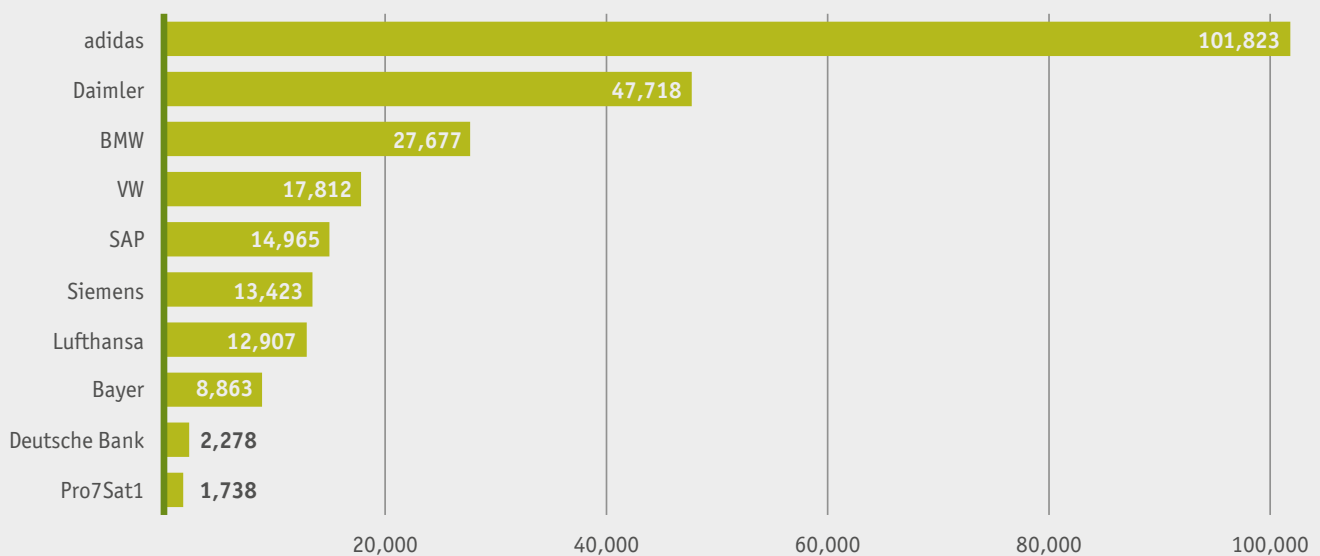
these two methods identified a total dataset of **426 social bot accounts on Twitter**.

Within the dataset, the **individual bot accounts posted between 40 and 57,275 tweets** (644 on average). The highest bot activities concentrate on adidas, followed by Daimler, BMW, VW, and SAP. However, the result is distorted to a certain extent by the most active social bot account @StockXLive (see p. 31), which was responsible for over 50,000 tweets regarding adidas. Excluding these, Daimler would have been the company most tweeted about by accounts identified as bots.

Social bots on Facebook

For Facebook, we initially relied on the metric of high activity to identify potential social bot accounts. However, we could not spot any users with particularly high activity that might stem from a bot. Therefore, we turned our attention to repetitive texts, but only found 25 messages in total that were repeated three to 15 times. As the number of repetitive messages was so low, we took a closer look at the content, but couldn't recognize any clues that these messages had been spread by bots. We hence assume that there is **no significant amount of bot activity on Facebook**. Two possible reasons for this are that

Companies posted about on Twitter by social bot accounts



The social bot accounts identified in our Twitter sample posted most often about adidas, Daimler, and BMW. Only the top 10 are shown here.

the API of Facebook effectively restricts unwanted bots, and that companies' Facebook pages are not considered a valuable target of social bots.

Social bots on YouTube

For YouTube, we applied the metric of Content Uniqueness and spotted far less accounts with a low uniqueness compared to Twitter. As the accounts were overall less active than on Twitter, we lowered the thresholds of these two metrics.

- ▶ We chose a threshold of CU = 60%, which guarantees that at least 40% of the messages by the accounts identified in this way were identical.
- ▶ Also, we only looked at accounts that had written at least 10 posts in our dataset.

This left us with 10 accounts (0.016% of all accounts) that were responsible for 144 comments (0.14% of all comments).

The decision for a lower threshold, especially the number of messages the accounts posted, led to the possibility of more false positives (i.e. more identified accounts that did not qualify

as bot accounts). As the number of accounts was low, we decided to take a closer look at the actual messages of the accounts. Here it became apparent that the overall content of the identified accounts was neither malicious nor necessarily qualified these accounts as bots. Most of them posted several simple messages (such as question marks) while one account repeatedly and optimistically asked BMW for a free car.

As with Facebook, **we did not find evidence of social bots in the dataset from YouTube.** The possible reasons here are:

- ▶ There are no social bots.
- ▶ Social bots do not flock to the accounts of companies to spread their messages (possibly because companies can delete messages in their accounts).
- ▶ Social bots may be more active regarding videos referring to companies posted by other accounts.

Strategies of social bots trying to exert influence



After identifying social bots in the Twitter dataset, we took a closer look at the strategies these bots might pursue. Based on the literature (cf. Abokhodair et al., 2015; Stieglitz et al., 2017), we identified four approaches:

Afterwards, we analyzed whether the bots we found on Twitter pursued one or more of these strategies. For each strategy, we could identify exemplary cases that are discussed in the following paragraphs.

Strategy 1: Promoting their own products or content

The first strategy describes accounts that try to promote their own products, services or content on Twitter – often extensions or additions to products and services of other companies. This is why they refer in their tweets to other companies – in our case to the DAX 30 companies – to gain attention.

We assume that the account @S_POSEA, which was one of the most active accounts in our sample, qualifies as a bot and pursued this strategy. The account belongs to the company SPOSEA, which develops and sells extensions for SAP. Overall, it posted 1,355 tweets, with 99.2% of them being repetitions. The tweets promoted certain SAP solutions SPOSEA offers and contained links to the SPOSEA website. Looking at the original source, they were found to stem from the service If This Then That (IFTTT) – a popular automation service that posted the tweets every day at fixed times.

Strategy 2: Promoting or selling products of other companies

The second strategy bears resemblance to the first. However, one important difference here is that the accounts promote or sell products produced by other companies, rather than those produced by the account holders themselves as in strategy 1.

Example for strategy 1: Promoting their own products

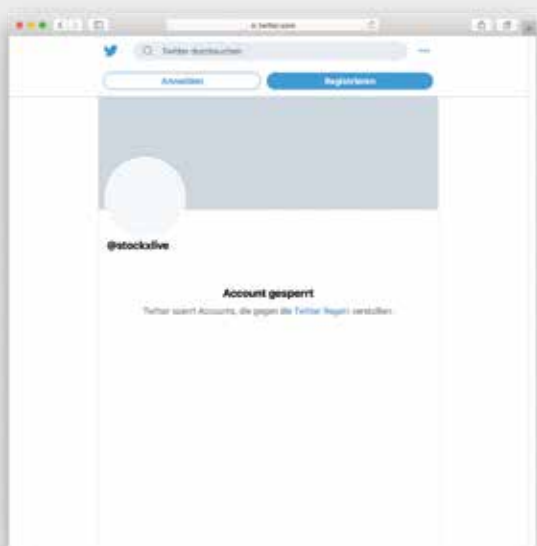


Exemplary tweet published by the account @S_POSEA with IFTTT as source

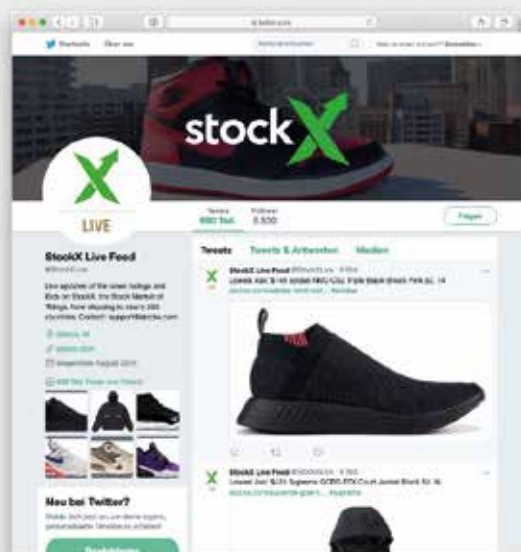
01.05.2019 08:30:16	05.05.2019 04:15:12	08.05.2019 08:30:38
02.05.2019 04:15:34	05.05.2019 08:30:27	09.05.2019 04:15:42
02.05.2019 08:30:33	06.05.2019 04:15:33	09.05.2019 08:30:03
03.05.2019 04:15:11	06.05.2019 08:30:03	09.05.2019 15:32:14
03.05.2019 08:30:17	07.05.2019 04:15:24	10.05.2019 04:15:26
04.05.2019 04:15:29	07.05.2019 08:30:08	10.05.2019 08:30:14
04.05.2019 08:30:36	08.05.2019 04:15:13	10.05.2019 15:31:15

Posting time of tweets published by the account @S_POSEA that show high regularity

Example for strategy 2: Selling products of other companies



The Screenshot shows the now blocked account on Twitter of @stockxlive.



Example for strategy 4: Harming other companies



A typical tweet by @DesignationSix exposing sponsors of the US TV channel Fox News – here also referring to Fox host Laura Ingaham – that got retweeted many times.

How harmful are social bots for companies?

Twitter most vulnerable to social bots

Twitter seems to be the platform most vulnerable to social bots, even though **bot activities are very rare and not (yet) trying to harm other corporations** or competitors. Our study identified roughly 426 social bot accounts – a very low figure compared to the 2.8 million accounts we analyzed. Even though they were responsible for a disproportionately high number of tweets, they only made up around 3% of all the overall communication we tracked on Twitter. In most cases, **the aim behind the bots was to boost their sales**, be it of their own products or brands they resold. The messages were not randomly released but with a clear purpose and in a structured manner.

Overall, we found that social **bots in the business world do not seem to be as active as in the political domain**, which is also indicated by several other studies. There are some possible explanations for this:

- ▶ Bots in a political context are mostly active when there are two opposite sides separated by highly divisive views (e.g. the Brexit vote). Such deep separation on a large scale is unlikely in a corporate context. Here, it may be hard or unfeasible for bots to influence the conversation.

- ▶ It would be very risky for larger companies to actively make use of social bots as this could lead to a public backlash and damage their reputation. However, smaller individual actors who want to push their individual businesses face fewer repercussions and may proceed to use bots (as seen in the cases presented on the previous pages).
- ▶ The benefits of trying to denounce a competitor might be too low compared to the risk and effort involved, especially for large companies. For smaller, individual actors, there might be less at stake, but even so their overall activity is low.
- ▶ Twitter has developed tools to detect unusual behavior and close down such accounts. We found that several bot accounts had been suspended when we checked them again during our analysis (see reading recommendation “Bot or not”, p. 37).

No bot activities on Facebook or YouTube

In contrast to Twitter, we did not detect any bot activities on Facebook or YouTube. Again, there are several possible reasons:

- ▶ Through restrictions by **Facebook**, we could only gather data from the company pages. As companies have control over their Facebook pages and can ban users or delete posts,

social bots might be noticed and handled by the companies themselves.

- ▶ Also, Facebook works different than Twitter. Posting huge amounts of messages in a news stream on a certain topic might work on Twitter to gain visibility. However, at Facebook, users mostly see posts by people (or accounts) they follow.
- ▶ (Closed) Facebook groups on certain topics or likes may be more prone to attacks.

For **YouTube**, similar explanations exist:

- ▶ Although we looked at the individual videos, they were all posted via company accounts, which have control over the videos and comments posted there. Like Facebook, companies could thus delete any comments made by social bots.
- ▶ Judging from the cases of bots we found on Twitter, they might have a greater impact when they post comments under videos on generally relevant topics rather than beneath videos from specific companies. For example, for social bots trying to sell sneakers, comments under general videos on sneakers might be a more viable option than comments under videos of certain brands.
- ▶ This is also backed up by the overall low number of comments the videos received. As reported, only 18% of the videos were commented on, and the majority of companies received less than ten comments per video. This might make YouTube video less attractive for bots.

Learnings and consequences for other companies

What do these findings from the DAX corporations mean for other companies? Do social bots pose an imminent threat with the potential to cause harm? How should companies react if they are attacked by bots with malicious intent?

As we have seen, **social bots currently pose no imminent threat** to companies as their impact was found to be very small compared to the general debate. Twitter, the channel that was most prone to bots, keeps a close eye on accounts that generate large numbers of tweets. Besides, in almost all cases, the aim of the bots was to promote sales, something that doesn't directly interfere with the companies or their reputation.

Nevertheless, **social bots have the potential to harm companies**. They might either overshadow companies' communication with their own messages (as happened with the accounts @StockXLive, which issued over 57,000 posts regarding adidas), or could potentially harm companies by maligning others.

As a consequence, **companies should monitor the social media conversations** on topics related to them or their products, even if not directly about them. These may be a more viable domain for social bots as the audience is broader and larger. If companies want to take precautions against such occurrences, they could monitor deviations from normal mentions of their name and then look into the data. Here, a minimal threshold for mentions is helpful – a point from which the amount of mentions is so far above the norm that it's worth digging deeper.

The first step to counter possible negative campaigns is to **inform the network operator** (e.g. Twitter) and demand the messages to be deleted. Should these claims be false, the operator is obliged to react without delay. However, this may still take a while, since the operators have to check a large number of claims every day. Companies must also be prepared for crisis communication and should be able to issue statements acknowledging and debunking false claims. However, it should be remembered that negative claims spread much faster on social networks than denials.

i AT A GLANCE

- Social bots were detected in the Twitter dataset, albeit to a very low extent. We did not find any bot activity on Facebook or YouTube.
- The social bots on Twitter use four different strategies to create traffic or attract attention for their own purposes – which are mostly to sell products.
- While social bots have the potential to harm companies, they currently pose no imminent threat. At the moment, there doesn't seem to be malicious intent on a large scale.
- To spot social bot activities in time, companies should monitor the social media conversations surrounding their brands and products, and define a threshold that separates the usual amount of activity and mentions from sudden, unexpected peaks.



“IT’S IMPORTANT TO GET TO GRIPS WITH THE TECHNOLOGY AND ITS POSSIBILITIES”

STEFAN STIEGLITZ ON THE FINDINGS OF THIS RESEARCH PROJECT AND FUTURE PROSPECTS

Stefan Stieglitz is Professor and Head of the Research Group for Professional Communication in Electronic Media/Social Media at the University of Duisburg–Essen. Furthermore, he is a member of the scientific board of the Academic Society for Management & Communication. His work focuses on the impact of social media on commercial companies and society. He examines and develops applications and methods of social media analytics in order to conduct empirical research in areas such as marketing, internal corporate communication, and crisis communication. We talked to Stefan Stieglitz about the key findings of his research project on bots and the implications for companies.

How far have companies come in introducing and using bots?

From what we have seen, most companies are currently in the early stages of introducing chatbots into their toolset and becoming familiar with them. All the interviewees in our study expressed interest in the technology. However, judging from the interviews, many companies are still learning how to use them. The maturity model we introduced in this issue can help achieve a better understanding of possible options to handle chatbots. A common

strategy seems to be to test them internally first before introducing them to external parties – which seems a sensible approach to me.

What are the main advantages of automated communication?

As several interviewees pointed out, the main advantage of chatbots lies in handling repetitive tasks in order to free up time for personal communication that can’t be replaced. However, chatbots are a financial investment that must eventually pay for itself by

cutting costs. This potential is currently mainly seen in customer service, where more requests could be serviced by fewer employees.

Do you have any recommendations for dealing with chatbots that are applicable to all companies?

It's important to get to grips with the technology and its possibilities. As one interviewee stated, the technology isn't a universal remedy that can be applied to every task. Companies should a) determine scenarios where it makes sense to use chatbots, b) decide who is responsible for the projects within the company, and c) introduce measurable KPIs to assess the added value of the projects. This will take some time, but eventually help the company figure out the value of automated communication. Especially in the early stages, it's probably helpful to work with external partners like agencies and consultancies, and rely on their knowledge.

What do you see for future developments?

I think that over the next few years, companies will gain more experience, and the use of automated communication will become more customary. Much will be accomplished in collaboration with external agencies that specialize in consulting and implementing such bot projects. As some interviewees mentioned, there will also be a growing awareness that chatbots aren't a panacea and can't be applied to all scenarios equally well. However, where an application is useful and well implemented, efficiency gains and cost savings are possible.

In the long run, it will be interesting to see what new technologies enable and how they will spill over into mainstream use. If you think about Google Duplex, a service that can autonomously make phone calls and mimic human conversations so convincingly that it's hard to tell it apart from human conversations, very sophisticated automated communication will be hard to distinguish from human communication.

Regarding the research project on social bots in connection with the DAX 30 companies, were you surprised that you didn't find more bots in a business context?

Maybe a little. Given the findings in the political domain, it seemed reasonable to expect more bot activity in our data sample concerning commercial companies. Although we did find some automated activity on Twitter, the number of accounts was lower than expected. Nevertheless, they were responsible for a disproportionately large quantity of content compared to the rest of the dataset.

Do you think social bots currently pose a threat to companies?

Judging from our findings, this is not the case. Among the cases we found, we did not observe harmful intent on a large scale.

The success rate of any such attempts is so low that they are not very widespread.

Is there any way to prevent bot accounts from posting about a company?

I don't think it's feasible to try and stop this from happening. The amount of data generated on social media is simply too vast to completely monitor every last bit. It's more important to notice any signs of odd behavior by social media communication in good time.

What are your recommendations for companies?

First of all, social bots don't pose an immediate threat, so there's no need to panic! Automated activity does exist, but that was to be expected. It's at a low level and the accounts we found mainly tried to boost their sales, not to harm other companies. Nevertheless, it's a good idea to monitor the social media activity related to your own company and brands, look for heightened or unusual activity, and analyze it. If a company then discovers harmful intentions on a larger scale, the first step may be to alert the network operator and demand that they intervene. It may also be wise to proactively respond by posting a statement acknowledging an adverse campaign and contradicting any false claims.

How do you think social bots will develop in the future?

The presidential election in the United States in 2016 accelerated the debate on social media bots. It will be interesting to see, which impact the election in 2020 will have on the future of bot communication on social media. Regarding steps to combat harm inflicted by bot campaigns, as I said, this is in the hands of the network operators. As Professor Frauke Rostalski from the University of Cologne mentioned in her interview, there have been no lawsuits regarding social bots yet, although German legislation (NetzDG) allows for claims against network operators if they don't act. It will be interesting to see how the court rules in such a case and if the operators take more precautions to limit harmful bot activities on their platforms.

What other technologies, besides bots, do you think will have an impact on corporate communication?

Currently, we see many new technologies and concepts that might have an impact on enterprise communication. Based on AI, fake content can be automatically generated, e.g. so called deep fakes. On the other hand, technologies such as voice assistants or virtual reality applications offer new possibilities to communicate with stakeholders in the near future.



OUTLOOK

This issue of Communication Insights examined bots and their significance for corporate communications. As this is still a new field, the current findings lay the foundations for research on this topic. Future work could address additional aspects to broaden and enrich our analyses.

Research ideas regarding chatbots in corporate communications

- ▶ Future research may be used to apply the **maturity model** to real-world scenarios. The findings from the current research would thus be used for future improvements and the findings generated could in turn be used to expand and adjust the model.
- ▶ Research could be conducted on **concrete application scenarios of bots**, e.g. how certain bots affect human interactions, or how certain characteristics of bots influence their effect. Initial academic research findings indicate that bots are capable of reducing the cognitive load when solving memory-intensive tasks (Brachten et al., 2020). Projects could examine these findings with respect to concrete real-world tasks. It's also possible to research the opposite, i.e. to determine the kinds of tasks bots aren't suitable for. The findings could help companies save time and money on such projects.

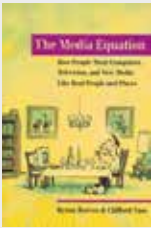
- ▶ A **case study** could study companies developing and introducing chatbots as well as evaluate their use and success. This would give a thorough, objective insight into very concrete learnings from projects. The learnings could then be compared to conclude measurable success factors and obstacles.

Research ideas regarding social bots

- ▶ Regarding bots on social media, future studies could take different approaches and **concentrate on topics** rather than companies. Here, one approach could be to first identify topics related or relevant to companies and their products, and monitor the conversation. Also, **different networks** such as reddit could be included in analyses.
- ▶ Another approach might concentrate on more **qualitative analyses**, e.g. by considering (closed) Facebook groups as well as instant messaging apps like WhatsApp, Telegram and Facebook Messenger. These partly public services are used to spread fake news and could form a feasible basis for social bots' operations.

FURTHER READINGS

Books



Reeves & Nass (1996):
The Media Equation: How People Treat Computers, Television, and New Media like Real People and Places



Gentsch, P. (2019):
AI in Marketing, Sales and Service. How Marketers without a Data Science Degree can use AI, Big Data and Bots.

Articles

Ross, B., Pilz, L., Cabrera, B., Brachten, F., Neubaum, G. & Stieglitz, S. (2019). Are social bots a real threat? An agent-based model of the spiral of silence to analyse the impact of manipulative actors in social networks. *European Journal of Information Systems (EJIS)*, 28(4), pp. 394–412.

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ACADEMIC SOCIETY FOR MANAGEMENT & COMMUNICATION

The Academic Society for Management & Communication is a joint initiative of leading companies and universities. Through collaborative research and knowledge sharing, it aims to actively shape the future of corporate communications. The initiative was founded in 2010, and is currently supported by six professors, four universities and around 40 corporate partners.

The Academic Society initiates practical, forward-looking research projects. These extensive, multidisciplinary studies are designed to support the ongoing professionalization of corporate communications.

The Academic Society is part of the Günter Thiele Foundation for Communication & Management, an independent non-profit entity that is dedicated to advancing science and knowledge transfer in the field of communications.

Value Creating Communication

From 2015 until 2020, the Academic Society conducted the world's most extensive research program in strategic corporate communications: Value Creating Communication. Researchers from the universities of Duisburg-Essen, Leipzig, Münster, and Vienna collaborated with corporate communications executives from leading companies to explore the key challenges facing communications management today, such as digitalization and digital technology, value creation, and coping with agility.

In recent years, four research modules have been completed.

Module I: How will corporate communications change due to new social conditions and megatrends – above all digitalization and big data? (2015–2017, University of Münster)

- Communication Insights, Issue 2: Wohin geht die Reise? (German)
- Communication Insights, Issue 4: Startklar für Big Data (German)

Module II: How do corporate communications create value for an organization? How are communications and business strategy aligned? How can communications contribute to overall business success? (2015–2017, Leipzig University)

- Communication Insights, Issue 1: Was bringt das alles? (German)
- Communication Insights, Issue 3: How to play the game

Module III: How will agility transform corporate communications? How will collaboration with internal and external partners change? What can agile content management look like? (2017–2019, Universities of Leipzig, Münster, Vienna)

- Communication Insights, Issue 5: Fast and flexible
- Communication Insights, Issue 6: It's all about content
- Communication Insights, Issue 7: Erfolgsfaktor Beratung (German)
- Communication Insights, Issue 8: Redesigning communications

Module IV: How do bots influence the social media communication of organizations? How can corporate communications apply bots for more effective communications? (2018–2020, University of Duisburg-Essen)

- Communication Insights, Issue 9: The power of bots

The research project in this issue studying bots in the context of corporate communications was conducted under the Value Creating Communications research program. It was carried out independently by the University of Duisburg-Essen.

From digitalization to value creation, from big data to agility: Our previous issues of Communication Insights



All issues of Communication Insights can be downloaded at bit.ly/ComInsights

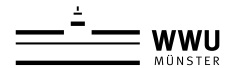
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