



# A study about potential use cases of conversational interfaces

**A scientific and practical venture project in the area of  
digital communications and business models**

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**Industry partners**

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# Executive Summary

## **The Study**

This study about potential use cases of conversational interfaces (CI) is the result of a collaboration between students of the University of St.Gallen and the following member companies of the swiss mobile association (smama): Aduno Group, gotomo GmbH and Netcetera AG. Prof. Dr. Katarina Stanoevska-Slabeva and Vera Lenz-Kesekamp, both researchers at the Institute for Media and Communications Management at the University of St.Gallen, supervised its production.

## **IMPRINT**

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# Overview

## Content

Based on a literature analysis, we define CI, explain essential technologies enabling CIs, determine their current acceptance among users and illustrate potential use cases in different industries. Grounded in the technologies described and the use cases analyzed, the study goes on to develop a generic CI architecture as well as a decision making model concerning the application of CIs.

## Definition of CI

CIs are innovative, interactive user interfaces that use language, in written or spoken form, to enable the communication between humans and machines (computers).

## Classification of CIs based on type of communication

CI can be divided into two categories: 1) chatbots which are based on a text, i.e. written dialogue, and 2) voice assistants which rely on spoken dialogue as input and output.

## Technological basics

While chatbots receive written input from users, voice assistants have to detect spoken input and convert it to processable text first. Accordingly, voice assistants deliver the results of machine processing in spoken language. This is why voice assistants, in contrast to chatbots, require technologies that convert Speech to Text (STT) and Text to Speech (TTS). After the conversion of spoken input to text, the processing of user inputs is identical for chatbots and voice assistants.

In a first step CIs apply Natural Language Processing and Understanding (NLP and NLU). These technologies aim first to understand the meaning and the coherence of user contributions in natural language. Then they transform them to a form suitable for the input in various inference engines that generate insights about possible answers. Different types of inference engines are employed for this purpose: on one hand varied types of rule or pattern based inference engines or systems, on the other hand Artificial Intelligence (AI) and machine learning. Rule based systems proceed according to strictly prescribed rules and decision paths curated by humans. A common type of rule that is employed is IF... THEN... ELSE. The whole decision space is transformed to suitable if-then-else rules and paths. CIs built on rule-based systems are therefore predefined and only as smart as the programming undergirding the rule-based decision paths and the data available to produce answers. They do not support dialogue which goes beyond the defined rules and paths. The prescribed rules and decision trees stake out the decision space for which rule-based CIs are able to generate answers. Rule-based CIs are suited for text based dialogue environments which are usually found in the context of messenger platforms. Popular messenger platforms, e.g. Facebook Messenger, WhatsApp, WeChat and Viber, offer technologies for the implementation of company specific chatbots.

More flexible and more intelligent CIs are made possible through the application of AI and machine learning. Machine learning enables computers to communicate in natural language and to complete tasks on the grounds of learning through data crunching. An indispensable requisite for machine learning is the availability of large quantities of data. Instead of relying on a fixed set of rules for the execution of tasks, computers learn from data and previous decision to generate new knowledge. An example illustrating machine learning is the forecasting of customer behavior on the basis of existing customer data in Customer Relationship Management Systems (CRMs). CIs based on machine learning are considerably more flexible than rule-based CIs but they are more error-prone too.

# Conversational interface

## CI specialists and generalists

The inference technology employed defines the scope of tasks CIs can cover. Specialist CIs focus on a single topic or task. For example, a chatbot that handles damage claims at an insurance company or books airline tickets is a specialist CI. Because specialist CIs operate within a clearly demarcated area of knowledge and decisional range, they are usually realized by employing rule-based systems. Generalists, in comparison, are capable of taking on a variety of tasks. To make this possible, generalist CIs are designed as complex systems built on machine learning which are able to autonomously expand their knowledge and learn from every additional interaction. Voice assistants like Google Assistant, Amazon Alexa, Apple Siri and Microsoft Cortana are generalist CIs.

## Generic architecture of CIs

Figure 1 illustrates a generic architecture of CIs. The front end, i.e. the interface between a CI and a user, consists of either a text based or a spoken language based dialogue component. User inputs are relayed to the “Conversational Intelligence” component which analyses the inputs and generates answers. The third component of a CI is its back end, i.e. the data from which answers can be generated for users.



Figure 1: Architecture of CIs

## Benefits of CIs

CIs make possible a tailored and intuitive communication, perpetual availability, the integration of knowledge as well as the aggregation of information about customers from distributed sources to create entirely unique customer experiences.

## User acceptance

Especially Google Now, Apple Siri, Microsoft Cortana and Amazon Alexa contributed to the increase of CIs' acceptance among users. Except Alexa, all of the above are installed on smartphones and all show growing user numbers. According to Statista, a market research and business intelligence company, 504 million users have interacted with voice assistants until 2016 and the company expects this number to rise to 1'831 million in the run up to 2021. Voice assistants mainly perform simple tasks such as retrieving and calling contacts on a smartphone or operating web mapping services (e.g. Google Maps). Studies put the acceptance rate of CIs for the communication with companies between 25% and 40% for German, Austrian and Swiss users. This illustrates that large groups of potential customers are still unaware of or grappling with CIs. In the future, it is expected that CIs will be increasingly deployed in B2B customer relationships. Critical for the widespread acceptance of CIs will be ease of use, the ability to provide answers quickly as well as a flawless understanding of languages.

# Use cases

# Decision making model

## Use cases

The study provides an overview of different use cases for CIs and describes sample applications in the retail, banking, insurance and medical industries. Table 1 provides an overview of potential applications of CIs in different industries.

INDUSTRY	TASKS/USE CASES	EXAMPLES
Banks and insurance companies	<ul style="list-style-type: none"> <li>- Customer service</li> <li>- Payment orders</li> <li>- Account queries</li> <li>- Password resets</li> <li>- Debt payments</li> <li>- Buying insurance</li> <li>- Insurance claims</li> </ul>	Wells Fargo (Bot) Erica (Bot) Lemonade
Education and training	<ul style="list-style-type: none"> <li>- Language learning</li> <li>- Personal assistants at universities</li> <li>- Onboarding of new employees / students</li> </ul>	Duolingo (Bot) Ad-mitHub (Bot)
E-Commerce	<ul style="list-style-type: none"> <li>- Navigation</li> <li>- Orders / Payments</li> <li>- Sales advice</li> <li>- Personalization of orders / delivery types</li> </ul>	1-800-Flowers (Bot) Starbucks (Alexa)
Entertainment	<ul style="list-style-type: none"> <li>- Video games</li> <li>- Recommendation (movies)</li> <li>- Ticket sales (cinema)</li> </ul>	Poncho (Bot) Fandango (Bot)
Health	<ul style="list-style-type: none"> <li>- Medical consulting</li> <li>- Counseling</li> </ul>	HealthTab (Bot)
Delivery services	<ul style="list-style-type: none"> <li>- Browse shops</li> <li>- Recipe search</li> <li>- Recipe compilation</li> </ul>	DOM the Pizza (Bot) Domino's (Alexa)
Public sector (administrative bodies)	<ul style="list-style-type: none"> <li>- Career counseling</li> <li>- Processing visa applications</li> </ul>	WhatsMe (Bot)
Publishing / Media	<ul style="list-style-type: none"> <li>- News distribution</li> <li>- Inform users</li> <li>- Track specific topics</li> <li>- Play back website content</li> </ul>	CNN (Bot) theScore (Alexa)
Travel and traffic	<ul style="list-style-type: none"> <li>- Travel planning</li> <li>- Travel booking</li> <li>- Itinerary management</li> <li>- Flight tracking</li> </ul>	Instalocate (Bot) Hipmunk (Bot)
Recruitment	<ul style="list-style-type: none"> <li>- Job interviews</li> <li>- Answer questions</li> </ul>	Jobo (Bot)
Service and support	<ul style="list-style-type: none"> <li>- Personal assistant</li> <li>- Answer customer request</li> <li>- Provide information</li> <li>- Notification</li> </ul>	Meekan
Smart home	<ul style="list-style-type: none"> <li>- Operate household appliances</li> </ul>	Alexa Google Home

Table 1: Use cases of chatbots based on Etlinger (2017, pp. 6-7) and own research.

## Decision making models for CIs

Based on the analysis of both the technological foundation of CI and existing use cases in various industries, the following generic architecture for the decision making concerning CIs was developed.

### CI FRONTEND

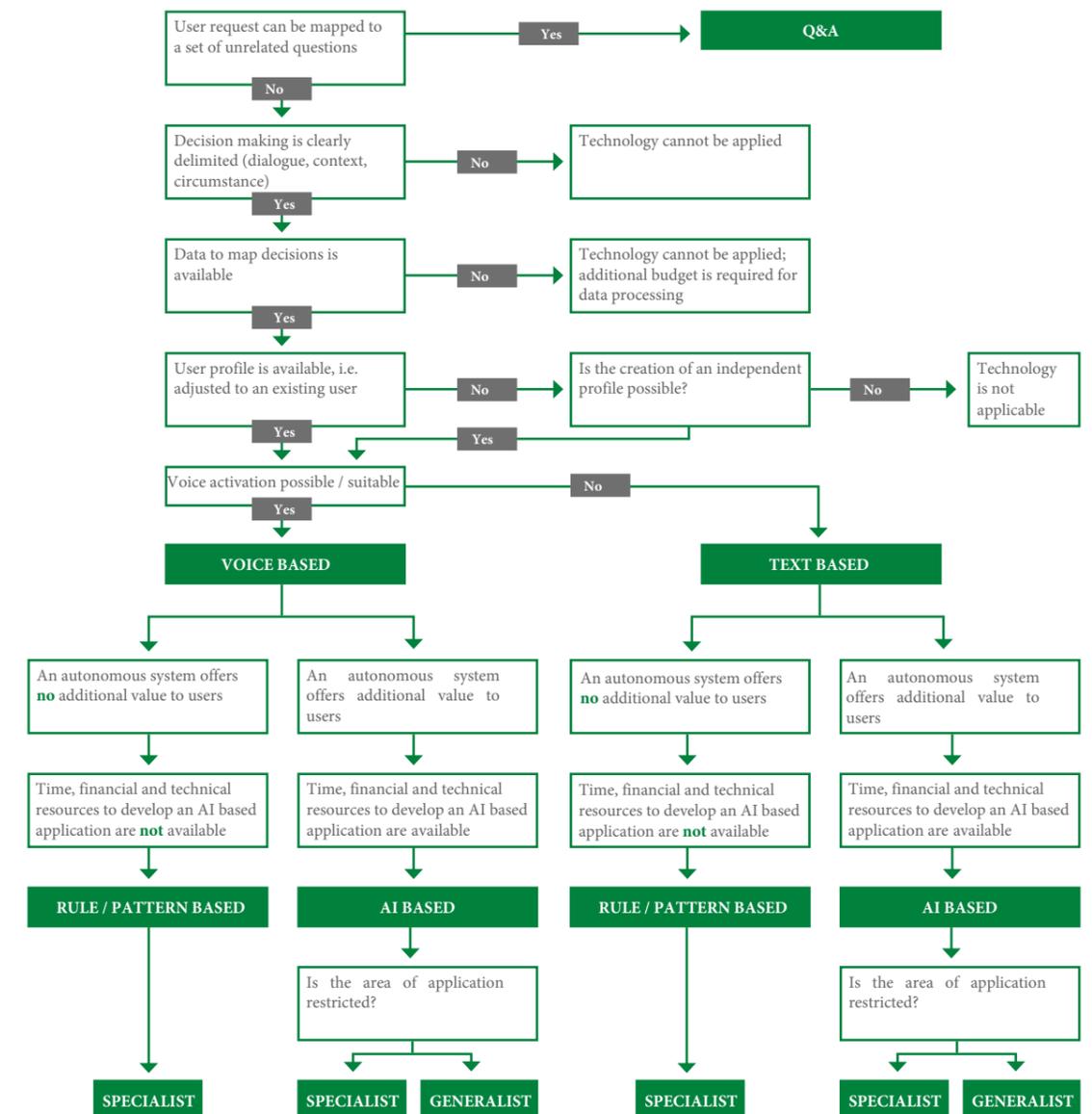


Figure 2: Decision making model Conversational Interfaces – Front End

# Conversational Knowledge

## CI BACK END

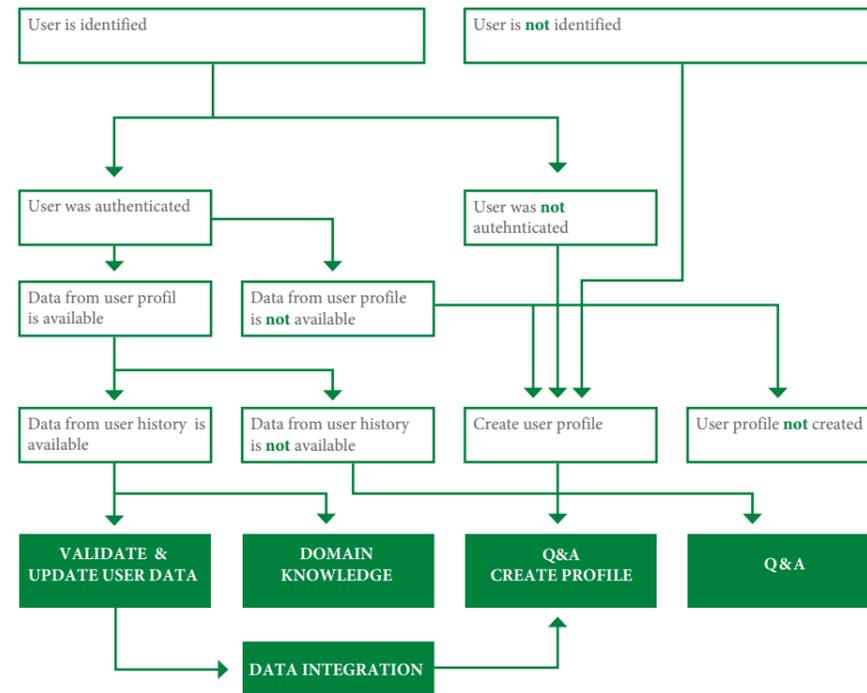


Figure 3: Decision tree Conversational Interfaces – Back End

## Limitations of CI

Research about AI, specifically in NLP, has progressed in strides in the past few years and made the breakthrough of chatbots and voice assistants and their widespread practical application possible. However, the ability of chatbots and voice assistants to interact with users through complex dialogues, to recognize and analyze behavioral patterns and character traits as well as to react to complex instructions isn't sufficiently developed yet, despite recent scientific progress. The lack of a "human touch" makes it hard for customers to build trust with bots. A further inhibiting factor is the uneven progress in understanding the different natural languages. The quality of the language processing of many Swiss-German dialects, for example, still is somewhat rudimentary.



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