

# iFetch

Requirements Analysis and Specification

# iFetch

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# Notation

Abbreviation	Description
AI	Artificial Intelligence
CA	Conversational Agent
CR	Conversion Rate
CRS	Conversational Recommender System
CRM	Customer Relationship Management
CS	Customer Service
DDD	Domain-Driven Design
FC	Fashion Concierge, Fashion Connoisseur
KB	Knowledge Base
MCA	Multimodal Conversational Agent
PC	Private Client
SME	Subject Matter Experts
SO	Scientific Objective

## Nomenclature

Name	Definition
Actor	An actor is someone or something that interacts with the system. There are only three types of actors: users (“maintainer”, “customers”), devices (“ios device”), and other systems (“dialogue policy orchestrator”). Actors are not part of the system being described but live outside of the system boundary (Leffingwell, 2003).
Batch	(synonym. batch processing or batches) It refers to the capability of the system to process data in small samples.
Business Case	A complement of the “use case”, the business case describes “why” a given use case is necessary.
Context	Describes a state coupled with the multimodality of a passage of the dialogue at a given time.
Customer	A subtype of the user's actor. In our case, a FARFETCH customer willing to browse, search or purchase apparel.
Episodes	Set of conversation flows that occur in a scenario encompassing different dialogue states.
Passage	One or more dialogue interactions between the user and system.
Scenarios	To describe tasks that customers will perform to accomplish a specific goal (like, purchase).
System	The MCA.
Use/System Case	Describes the “what” the Customer/User will get when using the system.
User	A subtype of the user's actor. In our case, an internal user of the system that will manifest actions to maintain and improve product catalogue, KB and other orchestration mechanisms.



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# 1 Introduction

High-fashion marketplaces require top-class customer interaction. Users of such online platforms demand a reliable, precise and timely service, but also expect the best in class customer experience throughout the customer journey. Therefore, a frictionless experience with a high-touch feeling is key for clientele satisfaction. As our high-end fashion business continues to grow, our services are more than ever under increasing pressure. More recently, with the impact of COVID, it created an additional demand that was not anticipated.

So it is without surprise that scaling up FARFETCH business to our ambition while maintaining our customer's loyalty is a challenge. Recent findings show that live, human, conversation services (i.e., WeChat) - the main shopping channel in China at FARFETCH - translates into significant conversion rates (CR) improvements.

We are currently witnessing an enormous paradigm shift from the traditional search and click search thanks to conversational assistants in online shopping and other social media-related tasks, especially in the younger generations. WeChat, the largest social network in China, and WhatsApp, now a core service in Facebook, are the most clear signals of this paradigm shift by closing the gap between consumers and brands.

The challenge addressed by iFetch is to mimic a fashion specialist that understands the customer needs and provides fashion advice leveraging the vast textual and visual data together with knowledge accumulated by past experiences with a massive number of users. Our vision is to make a step-change in the online high-fashion marketplace by advancing conversational AI technology with multimodal capabilities, see Fig. 1.

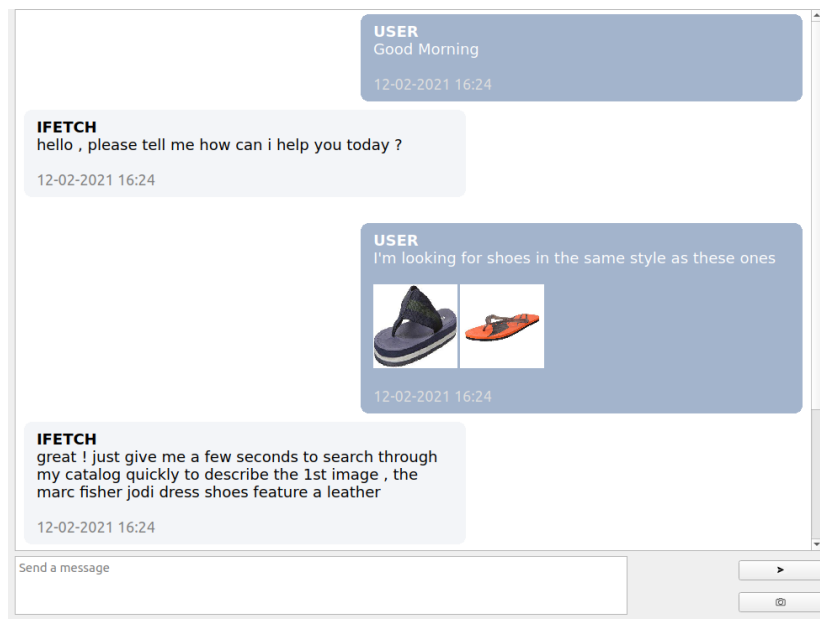


Fig. 1: An early version of the iFetch visualizer.

For an e-commerce marketplace, task-oriented multimodal conversational agents (MCA) have the potential to make a groundbreaking shift in the way users do their online shopping.

A key element of the project is the deployment and validation of a solid demonstrator. To achieve this outcome, we will run validations with focus groups at given instants. We will quantify (1) the customer perception of iFetch value and (2) collect statistics concerning the actual changes in customer behavior through several indicators, such as % of products viewed and added to the shopping cart, and customer survey for quality control.

## 1.1 Document Scope

After clarifying and explaining the innovation research avenues of iFetch in Deliverable 1.1, the consortium presents a definition of each of its contributions towards the goal of this project. This is a publication deliverable detailing the specifications for the design of the framework that springs from the requirement analysis and interaction design. This deliverable will guide the overall design of the implementation. It should be noted that diagrams specified throughout this document on the design constraints do not reflect the design in every detail. It is expected for the application and architecture of the system to evolve in the course of its execution following a flexible architecture.

The structure and scope of this document are illustrated in Fig. 2 which high-level depicts the 1) discussions with stakeholders, 2) subject matter experts (SME) know-how and 3) technical experts which result in the design.

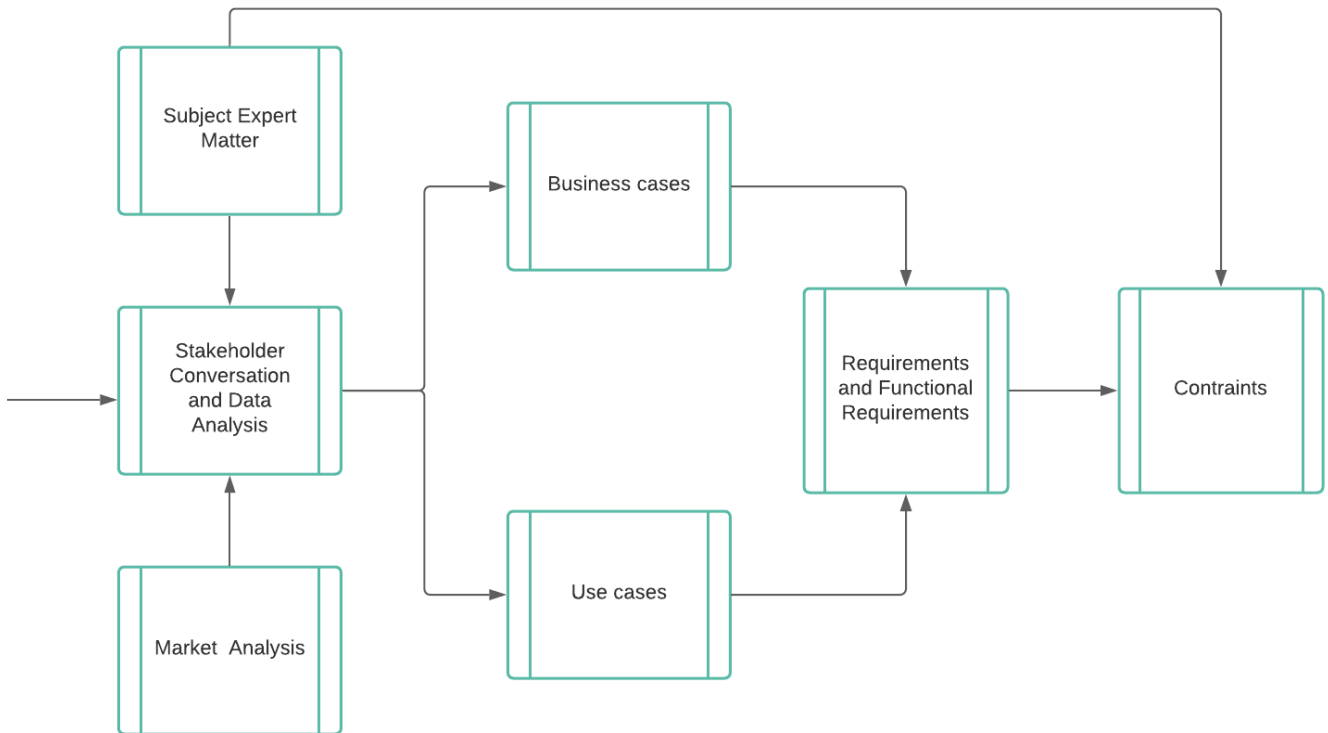


Fig. 2: Document scope and iFetch planning flow of Year 1.

## 1.2 Structure of the Document

As for the structure of this document, throughout Section 2 we describe the different use cases and business cases that FARFETCH business will be leveraged by the iFetch project. This analysis will then be extended by an exploration of the market landscape which will sprint into key innovation requirements (Section 3). Consolidating the work described in the previous section, an enumeration of the project requirements is promptly addressed (Section 4). This fundamental work-block paves the way for the discussion of the specifications of the iFetch framework and product features that our teams will enable in Section 5. We conclude this document with consideration on how we will guarantee the quality of the iFetch system ending with final remarks.

## 2 iFetch Modeling Description

The positioning of FARFETCH's brand will be empowered through the iFetch that will allow it to have closer and faster interactions on the point of purchase and, therefore, elevate the service level on an increasingly on-demand market where the customer requires immediate answers to their needs.

FARFETCH aims to: (1) customize the service to each client, tailoring it to its needs; (2) increase the CR of all the potential clients that visit the platform bringing more revenue to all the parties involved in the sale, FARFETCH and its partners; (3) increase online penetration in the high-end market, by decreasing some of the barriers that characterize the online purchase, therefore convincing the more conservative audience; (4) enter new geographical markets and increase the penetration in markets in high demand such as the emerging markets; and finally (5) improve the efficiency and the quality of the company in terms of its customer service (CS) response rate and backlog rate.

With iFetch, we will empower the brand by providing advice and acting as an influencer shaping the purchase journey by narrating to the customer the brand's origins - storytelling: how to style this piece, who the designer is, what the values of the brand are -, product relationships and providing an intersection of conversational apps with shopping that is so keen for younger generations.

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Before jumping into the description of the use cases, it is important to highlight the different stages of a conversation that happen in an e-commerce domain. Specifically for *recommendations*, dialog systems are designed to provide the resources to fill a customer's needs. To understand them, one first needs to understand and process the intents of those customers. iFetch will focus on the following intents as shown in Table 1 (Jannach et al., 2021):

INTENTS (I#)	
<p>Types of intents:</p> <ol style="list-style-type: none"> <li>1. Initiate Conversation</li> <li>2. Customer Criteria                             <ol style="list-style-type: none"> <li>a. Refine Customer Criteria</li> </ol> </li> <li>3. Ask for Recommendations                             <ol style="list-style-type: none"> <li>a. Obtain Explanation</li> <li>b. Obtain Details                                     <ol style="list-style-type: none"> <li>i. Items, show more</li> </ol> </li> </ol> </li> <li>4. Feedback on the Recommendations                             <ol style="list-style-type: none"> <li>a. Refine Criteria</li> </ol> </li> <li>5. Reset Conversation</li> <li>6. Accept recommendation</li> <li>7. Exit</li> </ol>	<p>Description:</p> <ol style="list-style-type: none"> <li>1. Self-explanatory</li> <li>2. Customer specifies interests for the goal of the conversation                             <ol style="list-style-type: none"> <li>a. Customer can specify the criteria if too broad or relax if criteria is too strict</li> </ol> </li> <li>3. Customer asks for recommendations w.r.t. to the goal of the conversation                             <ol style="list-style-type: none"> <li>a. Customer ask for an explanation from the system showing the set of items</li> <li>b. Customer wants to learn more about items</li> </ol> </li> <li>4. Customer identifies that the recommended items are not of their liking or system asks for feedback                             <ol style="list-style-type: none"> <li>a. Customer refines criteria (e.g., refine customer preferences) or asks to see similar items</li> </ol> </li> <li>5. Customer wishes to restart the conversation</li> <li>6. Customer accepts the recommendation</li> <li>7. Concludes the conversation (by abandoning or purchase)</li> </ol>

Table 1: iFetch will take as core intents to understand customer task criteria, recommendations and feedback based on previous turns.

## 2.1 Use Case Description

### 2.1.1 Purchase Journey for Luxury Commerce (U1)

*Purchase Journey* is when the customer navigates through an e-commerce site most likely to buy apparel. For this, the customer will go down a shopping funnel that encompasses in a very coarse fashion the

following stages (Fig. 3):

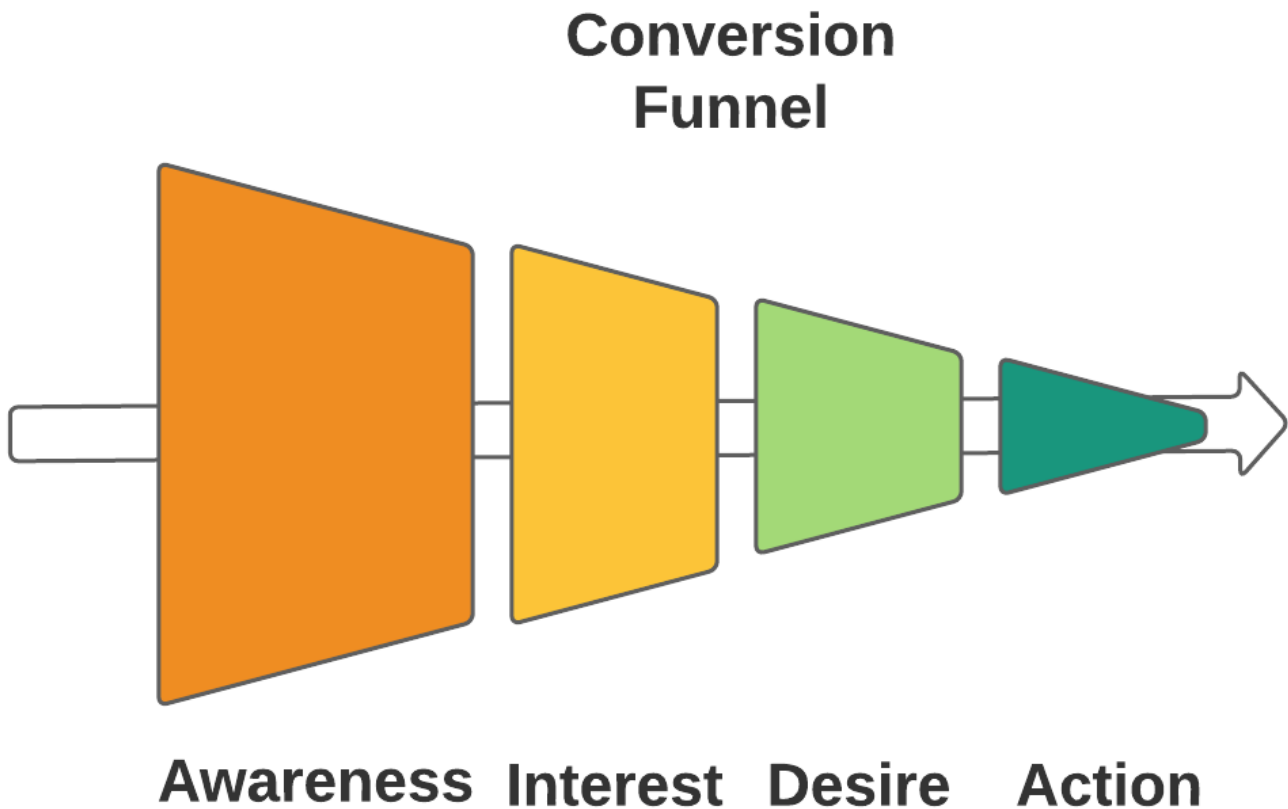


Fig. 3: Traditional e-commerce funnel. The customer is aware of the shopping brand (in this case, FARFETCH.com or one of its relative brands) and navigates through the catalogue until the purchase.

On each of the stages mentioned in the figure above, a customer can go explore the catalogue on different levels. Putting in practical terms, through dialogue, one customer can inquire about the brand, the product, manifest interest or eventually mention the intent like shopping for someone else. Once that appetite is satisfied, the customer will follow with the purchase. Let's analyse the former.

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One core component for any e-commerce business, specifically fashion, is inspiration. By uncovering customer patterns circling novelty, discoverability and surprise, one can maintain the appetite for purchases. This is key to engage, retain and increase our customer base.

During the navigation, customers can feel frustrated when not finding the product that they were looking for. Like finding a needle in a haystack, navigating in a sea of information can be a daunting and overwhelming chore. More specifically, searching for the right apparel in a catalogue of millions of products, consisting of several thousands of categories with hundreds of attributes will lead to a premature abandonment and increased costs (like the cost of acquisition).

The question is how can we, through dialogue, enhance customer's intent discovery and help the efficient decision on the agent dialogue actions (see Scientific Objective (SO) 2). Even though traditionally most of the contacts are related to campaigns, below follows an overview of other possible scenarios that we need to address:

## Brand/Category Related Questions

1. Searching for items
  - The customer is looking for garments of a specific category or brand;
  - Our customers are searching for garments within a price range or items of clothing only sold by FARFETCH.
2. Browsing and discovering
  - Customers are also looking for inspiration, or;
  - Will browse novel apparel.

Customers tasks encompass dialogues such as:

1. Searching
  - *Hi, I am looking for a dress that I have seen at this year's Paris fashion week. Can you help me?*
2. Browsing and discovering
  - *Hi, what are the trending brands with a casual look?*

Scenarios mentioned above usually do not end up with purchase as the customers are more interested in surfacing and getting acquainted with the catalogue. However, customers usually return and eventually finalise the interaction with the marketplace with a purchase based on previous interactions. When then happens, the following two scenarios result:

## Brand/Category Related Questions

In a situation where a customer is looking for a product, usually it starts by identifying key brands or categories that he is interested in. These informative aspects are crucial to initiate a collaborative process towards narrowing down the product search space. Here are some examples of typical starting conversations that happen with our customers:

- *Hi, my brother is getting married next week and I need help finding the perfect dress. It will be a beach wedding and I was thinking about something light and floral;*
- *Hi, I'll be traveling next week and I am searching for comfy activewear to wear on the plane;*
- *Hi, I am searching for some stylish comfy shoes I could wear at work without getting tired.*

## For someone else

Related situations happen when our customers are searching for a product to offer to a relative. Usually, the conversations start with an idea in mind (type of product, brand, occasion).

- *Hi, next week is my wedding anniversary and I need help finding a nice gift for my wife. Her style is very minimal and she loves Stella McCartney, can you help me find something?*

## §

From the above, it is clear that our customers have a purpose when engaging with our system in a purchase goal-oriented task. However, and it naturally happens with any human conversation, much of these starting points go through different steps in the dialogue.

The multi-turn nature of a conversation allows us to explore different realities. Although stimulating, it is important to map how those interactions flow in the dialogue.

## Business Cases and E-Commerce Funnel

A customer journey is structured around different stages of the purchase funnel. We identify some of those as follows:

1. Onboarding of new or returning customers
2. Navigation on the product catalogue
3. And, order placement



For each of the granular steps of the aforementioned funnel, it requires the following business components:

1. Marketing funnel
2. Recommendations
3. And, Checkout

Fig. 4 depicts the different stages of the conversation coupled with a description of what can make the customer and/or system transition to another stage of the dialogue. But first, we will introduce another use case that is strongly tied with this one.

### 2.1.2 Customer Support (U2)

When scaling FARFETCH business, one must continue to provide the same high-end quality of customer service (CS) as it happens on pre-order stages like we have seen in the previous section. We should stress that the customer journey does not end with the purchase of apparel. It is vital to retain and continue to expand our customer base.

Then, the question surges on how to continue to provide the same touch and feel to luxury clientele by giving the mandatory glamour associated with high-end apparel in a post-purchase environment. Highly trained CS staff is key for this area of the business. Even though traditionally most of the contacts are related to complaints, below follows an overview of other possible scenarios that we need to address:

1. Customer wishing to return items because:
  - There is a defect on the apparel that was purchased;
  - The item does not fit to customer size and erroneous product labeling related with size;
  - The item does not match the one shown in the website (photo);
  - Apparel does not match with customer intent.
2. Contacts related with order:
  - Status of the order (e.g., packaging, in transit);
  - Information about the delivery (e.g., when and where it is going to be delivered and by who).
3. General queries regarding product catalogue:
  - Confirm that order matches received product;
  - Ask for opinion regarding brands and what type of products are suitable for special occasions.
4. Order related queries:
  - Purchase of items for oneself or for someone else.

It is important to stress that functional scalability is of paramount importance specifically for high-sale seasons like Black Friday when there is a significant increase of demand at a CS level. The multi-turn nature, which also happens on our CS teams, allows conversations to take different directions. Although stimulating, it is important to map how those interactions flow in the dialogue to provide a clear sense on the stages which will be needed on an autonomous conversational AI system.

As part of the purchase funnel and how conversations can flow, Fig. 4 depicts the different stages of the conversation coupled with a description of what can make the customer and/or system transition to another stage of the dialogue.

### **Business Cases and E-Commerce Funnel**

Customer services supports the following cases:

1. Engagement of the customer problem;
2. Information regarding our product catalogue;
3. And, order placement.

For each of the granular steps of the aforementioned funnel, it requires the following business components:

1. Marketing (promotional campaigns, exclusive offers);
2. Recommendations;
3. And, order management.

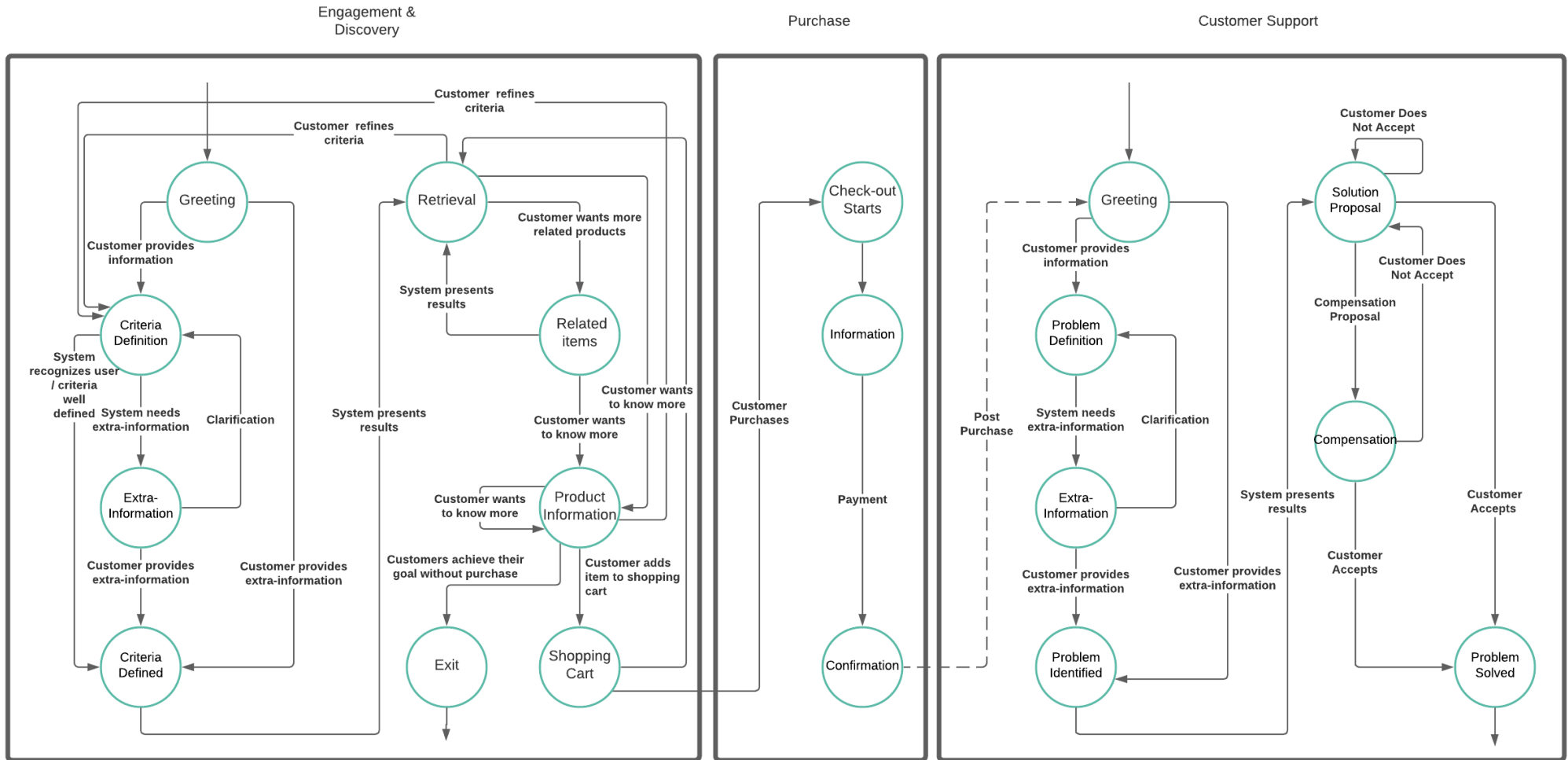


Fig. 4: A flow of the dialogues and each step.

### 2.1.3 Private Clients Early Access (U3)

FARFETCH is keen on delivering an exclusive shopping experience to its clients. In particular, it is pivotal to show potential high-value customers the luxury experience offered by FARFETCH to increase loyalty and improve the customer base.

With that, one provides tools to reward a loyal customer base by giving them a service where they feel appreciated and more aware of benefits like exclusive offers.

In a nutshell:

- Ensure Private Clients feel recognized and valued when they browse with us;
- Make it easier for Private Clients to communicate with their Stylist by enabling them to connect over channels they currently use and love.

To support our customers throughout their journey and allow them to access a reliable set of products that most resembles their tastes, one surveys their preferences such as:

- *Designers that the customer is more interested in based on their style;*
- *Fashion colour, based not only on yearly trend reports<sup>1</sup> but as well as customer usage frequency;*
- *Information regarding sizes and fitting styles;*

### 2.1.4 Store of the Future (U4)

iFetch has the vision to empower the staff in the store. As new products are added to the inventory on a weekly basis it is a daunting task for the staff to be up to date with current trends. As described next, a couple of challenges are faced daily by the boutique staff:

- *What are the new garments and from which brands?*
- *Which details are more relevant for the products, which brands/designers are emerging and for which seasons?*
- *I would like to make a styling appointment. Are you available next Monday?*

Given that the staff is a key representative of the brands in the store, the focus gravitates around the customer. Having in mind the importance of building a strong connection with the clientele around the garments in the store, it is paramount to provide the tools when that is not possible. In this specific situation, a sales associate keeps cohesion of the customer journey while navigating through the product catalogue in the boutique. In that case, it can provide assistance to a multitude of tasks, such as:

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<sup>1</sup> [Fashion Color Trend Report New York Fashion Week Spring/Summer 2021](#)

- General queries regarding product catalogue:
  - Requesting more details about the apparel and getting acquainted with the brand;
  - Ask for opinion regarding brands and what type of products are suitable for special occasions.

## 2.2 Business Case Description

Stakeholders<sup>2</sup> are part of the team because their role is far too important to leave to an outsider. Any project will fail if the customer isn't able to steer.

In a nutshell, it is someone (based on Beck, 2000, 2001):

- Understands the domain well is knows how it works;
- Able to understand how software can provide business value;
- Can support or make decisions about what's needed.

After presenting the different use cases, we will deep dive into the which of the individual business cases, from where stakeholders will provide customer feedback which will help us steer the mission of iFetch.

### 2.2.1 Augmented Retail to Bring E-Commerce Experience to Physical Store (BC1)

As we move to hybrid environments where physical meets virtual, new challenges emerge. FARFETCH has constructed a road of innovation at different levels in this sector with the Store of the Future and the Augmented Retail concept. The digital mirror, one key component of the Store of the Future, allows customers to view their wishlist and ask for items in different sizes and colors. But, with iFetch it can endow it with the possibility to seamlessly interact with the catalogue through dialogue. Questions like “What are AW (Autumn Winter) trends for 2019?” followed by a list of products which can result in questions about the story of a brand, of a product that was presented to the customer and items that fit the customer's size. If the customer is willing to buy the previewed product in the magic mirror, the customer can automatically proceed to the checkout with iFetch support.

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<sup>2</sup> Here we use a slightly different notation from Beck. Stakeholders are internal clients holding a position as business associates that include subject matter experts and acquainted with customer needs and pain points.

## 2.2.2 Enabling Consumers through Fashion Connoisseurs (BC2)

One key challenge addressed by iFetch is to mimic the fashion concierge (FC). This multimodal conversational agent (CA) will need to understand the customer needs and provide the correct answers which will be leveraged by the vast textual and visual data. This will be joined together with knowledge existing in the FARFETCH product catalogue (product descriptions and attributes) and fashion experts, followed by an unprecedented accumulated sequence of past experiences on a massive number of users.

When we refer to mimicking, we idealize situations where customers engage with a Brand searching for products that are not available. The boutique staff can refer to iFetch as a fashion connoisseur (FC) and support to search through their associates to provide a proper answer and product. But, such a scenario does not apply only to the store. iFetch can provide a way to enrich the catalogue with a new curation process for outfits or provide suggestions to designers or fashionistas. In other words:

- *What is the best apparel for a sports event or for a gala?;*
- *Is our concept of fashion restricted only to a set of experts or through automated means is it possible to identify current trends and influencers to devise new styles for fashion?*

Not only is it possible to provide a curated, unique and tailored selection of items, it will also augment FARFETCH as a fashion authority in the market. This automatic fashion connoisseur can inspire or influence the FARFETCH staff in better product catalogue description.

Before deep-diving into the FC scenarios, it is important to highlight a particular aspect of the system. FC encompasses three entities to aid support the customer: customer, Private Client Stylist and Brand Specialist. When the customer engages with FC looking for an item that is most likely not available in the catalogue, a Private Client Stylist will engage with a Brand Specialist to understand if the products are available. The Brand Specialist can thereafter engage in conversations with the brand for retrieving the desirable item.

How those conversations follow, is described below as an overview of other possible scenarios within FC.

- Customer looking for a specific or similar item that they are willing to purchase:
  - For this goal, the customer usually describes the requested item (through text and/or image);
  - According to the product availability, Brand Specialist may provide information regarding the product (size, price, fabrication year, product state, dispatchment date, etc);
  - Brand presents the price and order details;

- Normal order processing and shipping follows.

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We should note the following:

- For our analysis, taking into account the available conversation registrations, we may consider the FC Private Client Stylist as the chatbot. However, that does not mean that the chatbot could not play the role of both FC Private Client Stylist and Brand Specialist;
- A limitation of this process is the access to knowledge from external sources which often are not available during the course of the conversation.

### 2.2.3 Customer Service (BC3)

Customer service is a wider area that supports our customers in different stages of their journey. Traditionally, Customer Service (CS) is a business unit that helps customers to solve issues, by phone and/or e-mail, throughout the customer journey (pre-order and post-order). It creates a relationship with the customer and generates retention and loyalty. As a key partner of our operational teams, CS can be involved during all the operations workflow, from the discovery phase till the end of the platform relationship with the partner.

As mentioned above, customers, in particular younger generations, are adopting messaging channels such as Facebook Messenger, Twitter, WeChat and WhatsApp to communicate with the brands. While increasing our operational efficiency since human agents are not blocked on a single call, on the customer side, chat allows them to solve problems on the go, with more privacy while easily sharing rich media such as images and videos to help solve their problems faster. As described next, follows a set of queries that our staff is faced daily:

- *What is the status of my order?*
- *I would like to return an item?*
- *Is this product available and what is its size?*

For other scenarios, the reader is referred to Section 2.1.2.





## 3 Market Analysis

There has been a massive shift from the search-and-click paradigm into conversational assistants in online shopping and other social media-related tasks. With the growth of online commerce, providing the best service to the clients becomes a necessity. Companies and brands around the world are designing their chatbots in a way to provide the service that would be present in the physical store. Therefore, the urge to combine online commerce with a message service has been growing, aiming to improve the client's usage of the online website/application. Mostly because of this, the development of chatbots has been growing, to help the customers find the product that they are looking for as well as give suggestions of products that go with the one that is being bought or in the customers personal preferences, being this trend called “*conversational commerce*”.<sup>3</sup>

### 3.1 Current Trends

WeChat, the largest social network in China, and WhatsApp are the most apparent signals of this paradigm shift by closing the gap between consumers and brands. In fact, Revolut, the rising star in fintech and digital banking services, relies on chatbots as the main frontend to provide technical support and assistance to its customers.

On the fashion side, multiple brands have made their catalog available through chatbots.<sup>4</sup> LVMH launched a “virtual adviser” on Facebook Messenger for their US clients in December 2017 and others followed: *Burberry*, *Tommy Hilfiger*, *Jaeger-LeCoultre* are some of the brands that have a conversational agent to mimic simple search and browsing capabilities. Established brands began to adopt conversational agents in their business models around 2016. *Tommy Hilfiger* and *Burberry* were the first ones to announce its usage; *Estée Lauder* by partnering with *No.6 Mortimer* followed soon after. Naturally, mainstream brands like *H&M* and *Levi's* also presented similar solutions in their retail websites.<sup>5</sup>

Although the fashion industry is still in the early days of chatbots technology, a common aspect goes around brands leveraging their apparel through public frameworks such as Facebook Messenger. Similarly, and, to the best of our knowledge, established commercial solutions are mostly focused on text. Take, for instance, the Enki ASOS fashion bot. By allowing its customers to experience their marketplace differently, it enabled a functionality for customers to search for items similar to the ones they already like.<sup>6</sup> By being

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<sup>3</sup> Chatbot analysis by [Jasoren.com](http://Jasoren.com)

<sup>4</sup> Top luxury brands with chatbots, by [LuxurySociety.com](http://LuxurySociety.com)

<sup>5</sup> Retail analysis by [snaps.io](http://snaps.io)

<sup>6</sup> Asos ENKI analysis by [econsultancy.com](http://econsultancy.com)

built on top of Google Assistant, the system can automatically interpret customer intent, but it does not allow multimodal input.

A CA that is designed to work on an e-commerce website/application should have the capacity to complete a buyer's purchases, offer recommendations, and give support throughout the customer journey. Nowadays, customers prefer communicating with chatbots, instead of customer service<sup>7</sup>, and so, companies and brands are diving into chatbot development. Some of the companies that are already using it are Satisfi, Jumper, Haptik, Discourse, Trio, Avaamo, Sherpa, Liveperson, Mindmeld.

Any company or brand willing to develop a chatbot needs to understand the failures and successes of their competitors, to understand the minimal features that should be implemented. When the chatbot is live, the developers should bear in mind that they need to offer the same or more than what already exists to get the customers to prefer their chatbot. In Table 1 we represent all strengths/opportunities, weaknesses/risks for companies and customers.

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<sup>7</sup> Chatbot infographic by [Oracle](#)

<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>- 24/7 customer service (anytime/anywhere)</li> <li>- New &amp; direct customer contact points</li> <li>- Automation of communication</li> <li>- Reduction of service &amp; support costs</li> <li>- Time &amp; cost-savings</li> </ul>	<ul style="list-style-type: none"> <li>- Malfunctioning chatbots &amp; unanswered questions</li> <li>- Investments in IT infrastructure &amp; chatbot tools</li> <li>- Extension of IT &amp; analytics architectures</li> <li>- Lack of awareness &amp; acceptance by customers</li> <li>- Artificial/non-human conversation</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>- Increase customer base without region specialization</li> <li>- New data entry points</li> <li>- Personalization</li> </ul>	<ul style="list-style-type: none"> <li>- Privacy, Data protection of personal &amp; sensitive data</li> <li>- Lack of experience &amp; understanding</li> <li>- Biased personalized information</li> <li>- Social isolation &amp; ethical concerns</li> <li>- Brand damage</li> </ul>

Table 1: Conversational Agents SWOT analysis (based on the work of Zumstein and Hundertmark).

Being FARFETCH, the world's leader in the online marketplace for high-fashion, connecting customers to the world's best luxury brands through its e-commerce platform, its main competitors are those that insert themselves into sales, Customer Relationship Management (CRM), and retail.

Essential functionalities that we have analysed so far in state-of-the-art product ready CAs are live agent escalation, NLP agnostic and plug-and-play bot integration. From a customer perspective, capabilities such as evaluation of customer engagement through personalized touchpoints are also essential.

A very interesting feature of the more recent CA systems is the capability to allow customers to be interacting with a sophisticated engine at any given point in the conversation. The conversational AI organizes, understands, and learns.

### 3.2 Innovation Requirements

Innovation requirements for iFetch are defined following the nomenclature mentioned below:

1. **IR#** - This is the identifier of the innovation requirement (IR) that we are going to work on;
2. **TID#** - technology innovation requirement broken down into sub requirements identifiers (**TID**) for a clear identification of the work blocks that encompass iFetch;
3. **Description** - Each requirement is followed by a short description of its function w.r.t. the IR# that it belongs to;
4. **Priority** - Defining the priority that iFetch needs to deal with;
5. **WP#** - Finally, each of the innovation requirements will be part of a given work-package (**WP#**).

#### 3.2.1 Customer Base

ACQUISITION		
TID	Description	Priority
IR1.1	Customers are engaged in a multimodal conversation by discovering the product catalogue	HIGH
	<b>Observations</b>	WP
	FARFETCH customer base will engage in conversations that will improve our product coverage and viewability,	WP2, WP3, WP4

	diminishing the long tail of the product catalogue. That will be achieved by rich product metadata and representation	
<b>ENGAGEMENT</b>		
<b>TID</b>	<b>Description</b>	<b>Priority</b>
IR1.2	Customers' preferences from previous interactions are recognized	<b>HIGH</b>
	<b>Observations</b>	<b>WP</b>
	FARFETCH customers will be recognized and criteria from previous sessions will be applied	WP2, WP4
<b>TID</b>	<b>Description</b>	<b>Priority</b>
IR1.3	New customers engage directly with the high-end luxury marketplace through multimodal conversation by submitting photos of their interest	<b>HIGH</b>
	<b>Observations</b>	<b>WP</b>
	Customer will be capable to do visual search on FARFETCH product catalogue	WP2, WP5
<b>PURCHASE</b>		
<b>TID</b>	<b>Description</b>	<b>Priority</b>
IR1.4	Customers start purchase through a multimodal conversation	<b>HIGH</b>
	<b>Observations</b>	<b>WP</b>
	iFetch will guide the customer towards the purchase	WP2, WP4
<b>SUPPORT</b>		
<b>TID</b>	<b>Description</b>	<b>Priority</b>

IR1.5	Customers will establish a good rapport with the brand	HIGH
	<b>Observations</b>	<b>WP</b>
	iFetch to provide a luxury touch	WP2

### 3.2.2 Catalogue and Knowledge Base Management

<b>CONTENT MANAGEMENT</b>		
<b>TID</b>	<b>Requirement Name</b>	<b>Priority</b>
IR2.1	iFetch will be able to ingest all relevant metadata to support multimodal conversation	HIGH
	<b>Description</b>	<b>WP</b>
	To be able to provide the best customer experience and avant-garde garments, iFetch will use up-to-date product information	WP2, WP3
<b>TID</b>	<b>Requirement Name</b>	<b>Priority</b>
IR2.2	iFetch will be able to relate entities to support multimodal conversations	HIGH
	<b>Description</b>	<b>WP</b>
	System will be capable to correlate information to provide data in an easy and quick manner	WP2, WP3, WP5

### 3.2.3 Uniqueness and unrival solution

<b>HIGH-END EXPERIENCE</b>		
<b>TID</b>	<b>Requirement Name</b>	<b>Priority</b>

IR3.1	Customers will have access to high-end fashion advices through multimodal conversational agents	HIGH
	<b>Description</b>	<b>WP</b>
	iFetch will be capable to provide fashion opinions	WP2, WP3

# 4 Analysis of the iFetch Requirements

Our requirements are defined following the nomenclature mentioned below:

- 6. **MR#** - This is the identifier of the macro requirement (**MR**) that we are going to work on;
- 7. **RID#** - Macro requirement broken down into sub requirements identifiers (**RID**) for a clear identification of the work blocks that encompass iFetch;
- 8. **Description** - Each requirement is followed by a short description of its function w.r.t. the MR# that it belongs to;
- 9. **Dependencies** - One or several requirements have a dependency from other requirements;
- 10. **WP#** - Finally, each of the requirements will be part of a given work-package (**WP#**).

## 4.1 Shopping Dialog Manager

MR1		
DIALOG POLICY AND STATE TRACKING		
RID	Requirement Name	Dependencies
MR1.1	Detection of dialog stage	Dialogue States
	<b>Description</b>	
	Detect the dialogue stage (i.e., Customer-info)	
RID	Requirement Name	Dependencies
MR1.2	Dialog policy management	Detection of dialog stage (MR1.1)
	<b>Description</b>	
	Decides the action that the dialog direction will take next, as defined in MR3 (response generation). This should provide a rule/graph based approach with addition to key business rules or needs	
RID	Requirement Name	Dependencies
MR1.3	Switch dialog initiative	Detection of dialog stage



		(MR1.1)
	<b>Description</b>	
	System needs to take the dialog initiative, when the user's requirements and preferences are ambiguous	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR1.4	Generation of dialog clarifying questions	Dialogue policy decisions (MR1.2)
	<b>Description</b>	
	System needs to generate dialog clarifying questions, when the customer's requirements and preferences are ambiguous or not clearly stated	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR1.5	Answer opinion questions	Dialogue policy decisions (MR1.2)
	<b>Description</b>	
	Understand requests and generate sentences when asked to give an opinion	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR1.6	Neural dialog state tracking	Encoder of input language (MR2.1) Encoder of current target Selected products images (MR2.2)
	<b>Description</b>	
	Compute probability distribution of current successor states given history	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR1.7	Slot filling according to dialog state	Dialogue State (MR1.1) Encoder of input language

		(MR2.1) Encoder of current target Selected products images (MR2.2)
	<b>Description</b>	
	Fill the different conversation context slots using customer input, history and knowledge base	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR1.8	Dialogue Policy Learning	Encoder of input language (MR2.1) Encoder of current target Selected products images (MR2.2)
	<b>Description</b>	
	System by interacting with customer needs to improve its policy	

## 4.2 Processing of the Language

<b>MR2</b>		
<b>UTTERANCE PARSER</b>		
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR2.1	Encoder of input language	Dialogue States, Customer Utterance
	<b>Description</b>	
	Text utterance encoding in terms of intent(s) and slot value(s) expressed by the customer	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR2.2	Encoder of current target selected products images	Dialogue States, Customer Utterance
	<b>Description</b>	

	Embedding of the selected products retrieved (e.g., images, metadata) by the system in a previous interaction	
RID	Requirement Name	Dependencies
MR2.3	Extraction of keywords	Dialogue States, Customer Utterance
	<b>Description</b>	
	Extract product- and attribute-related keywords (e.g., slot-filling for faceted search)	

## 4.3 Response Generation

<b>MR3</b>		
<b>RESPONSE GENERATION</b>		
RID	Requirement Name	Dependencies
MR3.1	Neural answer generation based on state	Dialog policy decisions ( <b>MR1.2</b> )
	<b>Description</b>	
	Answer will be based on knowledge of the state of the dialogue	
RID	Requirement Name	Dependencies
MR3.2	Product grounded answers generation	Dialog policy decisions ( <b>MR1.2</b> )
	<b>Description</b>	
	Answer will be based on the retrieved product list	
RID	Requirement Name	Dependencies
MR3.3	Answer generation based on templates	Dialog policy decisions ( <b>MR1.2</b> )
	<b>Description</b>	
	Common answers will be generated using templates	

RID	Requirement Name	Dependencies
MR3.4	Tone of voice	Neural answer generation based on state ( <b>MR3.1</b> ) Product grounded answers generation ( <b>MR3.2</b> ) Answer generation based on templates ( <b>MR3.3</b> )
	<b>Description</b>	
	When necessary, answers must follow a specific utterances and code of conduct (e.g., exquisite, fabulous)	
RID	Requirement Name	Dependencies
MR3.5	Safe Language Generation	Neural answer generation based on state ( <b>MR3.1</b> ) Product grounded answers generation ( <b>MR3.2</b> ) Answer generation based on templates ( <b>MR3.3</b> ) Tone of Voice ( <b>MR3.4</b> )
	<b>Description</b>	
	Prevent the agent's answers to be offensive or to cause harm to the customer	

#### 4.4 Product Recommendation/Suggestion

MR4		
PRODUCT RECOMMENDATION/SUGGESTION		
RID	Requirement Name	Dependencies
MR4.1	Detection of product-range ambiguity	Dialogue state Detection of dialog stage ( <b>MR1.1</b> )

	<b>Description</b>	
	System may not be able to understand the scope of the query of the customer (e.g., identify ambiguity to reduce search space)	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.2	Constrain product range with clarifying questions	Detection of product-range ambiguity ( <b>MR4.1</b> )
	<b>Description</b>	
	Identify missing/problematic attributes and ask customers to refine such product attributes	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.3	Constrain product range with comparative questions	Detection of product-range ambiguity ( <b>MR4.1</b> )
	<b>Description</b>	
	Ask customers to provide additional information where the product can be compared with. Example, <i>“Do you prefer a v-neck or round neck t-shirt?”</i>	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.4	Product suggestion type detection	Detection of product-range ambiguity ( <b>MR4.1</b> )
	<b>Description</b>	
	Detect type of the suggestions that the system will trigger (e.g., by category, by category and attribute, similarity, etc)	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.5	Suggest products by category	Product suggestion type detection ( <b>MR4.4</b> )
	<b>Description</b>	

	Retrieve an ordered list of products by category based on customer logs and/or business criteria	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.6	Suggest products by category with attribute	Product suggestion type detection ( <b>MR4.4</b> )
	<b>Description</b>	
	Retrieve an ordered list of products by category and attribute	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.7	Suggest products based on visual similarity	Product suggestion type detection ( <b>MR4.4</b> )
	<b>Description</b>	
	Retrieve an ordered list of products by similarity	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.8	Suggest products based “goes well with”	Product suggestion type detection ( <b>MR4.4</b> )
	<b>Description</b>	
	Retrieve one item or an ordered list of products that can complement the product being considered	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.9	Suggest products based on business shopping rules	<b>MR4.5-MR4.8</b>
	<b>Description</b>	
	Prioritize products based on stock or price	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR4.10	Suggest products using external knowledge	Web Crawlers + metadata
	<b>Description</b>	

	Information from external sources to enrich our knowledge base	
RID	Requirement Name	Dependencies
MR4.11	Product QA using internal knowledge base	Product metadata + photos
	Description	
	A knowledge base based on the product catalogue and knowledge graph for QA	

## 4.5 Knowledge Management and Retrieval

MR5		
PRODUCT REPRESENTATION AND INDEXING		
RID	Requirement Name	Dependencies
MR5.1	Visual utterance encoding	Product photos
	Description	
	Representation for product images	
RID	Requirement Name	Dependencies
MR5.2	Visual structural encoding	Product photos
	Description	
	Representation for product images and its relationships	
RID	Requirement Name	Dependencies
MR5.3	Product encoder	Product Photos + metadata
	Description	
	Representation of the product in the catalogue and/or knowledge base	
RID	Requirement Name	Dependencies

MR5.4	Product categories, brand and attributes	Product metadata
	<b>Description</b>	
	Given product metadata, we will extract product categories, brand and attributes into our product catalogue	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR5.5	Taxonomy	<b>MR5.1-MR5.4</b>
	<b>Description</b>	
	A rich representation of our product catalogue base (e.g., casual outfit)	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR5.6	Graph index for search	<b>MR5.1-MR5.5</b>
	<b>Description</b>	
	An offline process that populates a KB to allow a graph search of the product catalogue	

## 4.6 Product and System Management

<b>MR6</b>		
<b>USER PRODUCT ORCHESTRATION</b>		
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR6.1	Products / rules priorities can be configurable	Product metadata
	<b>Description</b>	
	Products based on their metadata will be prioritized according to business user needs	
<b>RID</b>	<b>Requirement Name</b>	<b>Dependencies</b>
MR6.2	Orchestration of MCA Models	<b>MR1, MR2, MR3</b>
	<b>Description</b>	
	User defines each model will take place in predetermined situations	



RID	Requirement Name	Dependencies
MR6.3	Conversation Templates Updated Easily	MR1
	<b>Description</b>	
	User update templates used the MCA system	
RID	Requirement Name	Dependencies
MR6.4	Conversation flow can be monitored	Dialogue States
	<b>Description</b>	
	A monitoring functionality to record the time spent on each stage of the conversation	
RID	Requirement Name	Dependencies
MR6.5	System recommendations will be monitored	-
	<b>Description</b>	
	A monitoring functionality to record the recommendations quality	
RID	Requirement Name	Dependencies
MR6.6	System metrics	-
	<b>Description</b>	
	A monitoring functionality to record the retrieval time and storage metrics	

# 5 System Specifications of iFetch

This document follows a product oriented methodology to navigate on the use cases identification and requirements analysis of the iFetch system. Yet, it is important to refine the requirements mentioned above to provide a high-level view of the different work-packages that will be shared and spread across the consortium that encompasses **FARFETCH, Carnegie Mellon University, Instituto Superior Técnico and Universidade Nova de Lisboa.**

As designed, iFetch follows an iterative nature of the methodology guaranteed by an appropriate feedback loop, where focus groups will inform the project research and development team. Being conducted through discussions and observations from SMEs, we collected generic requirements and fleshed out the scenarios in the form of use cases which will lead to the CA proposed here. Following the same rationale, business stakeholders provided similar guidance and influenced the specification of the use cases. All of the artifacts mentioned above provided a concrete definition of functional requirements which were then constrained by the feedback of the aforementioned SMEs. The flows mentioned above will govern the creation of user stories (US) which will be translated into the development plan. Still, on the same lines of thought, developments of these projects will continue to be assessed by focus groups and SMEs which will provide feedback to iFetch followed by corrective actions. In a nutshell, these steps are grounded by:

1. SME: subject matter experts with expertise on the customer need, pain-points and desires when:
  - a. interacting with a high-end marketplace;
  - b. when engaging with a fashion expert;
2. Stakeholders and Business Cases: business owners which steer the strategic decision w.r.t. the market trends;
3. Focus groups: encompassing of early-adopters users/customers which will provide fundamental insights qualitatively and about innovation directions;
4. US: Development units-of-work of the innovation pillars of iFetch.



### 5.1.1 Multimodal Language Processing to Assist Shopping Dialogues (WP2)

FARFETCH customers will engage with our marketplace to understand more about the products that exist in our product catalogue. Scenarios can go as our customers look for more information about our products such as: “*asking for attribute information*” or “*product description*”; asking for opinions “*what goes well with this*” or “*is it suited for an occasion*”.

What we will describe here is related to those scenarios where the customer is wishing to purchase apparel, which as mentioned above, can be split into technical aspects of the system. They go as follows:

1. Recommendation (which encompasses cold-start and product list refinement based on products recommended);
2. Product details need to be promptly prepared for the system to describe or refine product search in the following iterations.

#### 5.1.1.1 Dialogue Presentation

NAME		DIALOGUE PRESENTATION		PRIORITY: URGENT	
PROBLEM STATEMENT		Customers join the iFetch MCA willing to purchase or just navigate in FARFETCH product catalogue. The system will greet and the customer will or will not present the information requested by the system.			
WP2		Relevant Scenarios and respective episodes		USE CASE	
		<ol style="list-style-type: none"> <li>1. Customer joins iFetch system;</li> <li>2. System greets;</li> <li>3. Customer provides information that encompass its intent and goals;</li> <li>4. System will ask for more information if previous interaction is ambiguous.</li> </ol>		U1, U2, U3	
FNRI	RID	DESCRIPTION	YEAR	PARTNER	
WP2.01.FN01	MR2.1	Encoder of the input language (i.e., in terms of customer’s intent(s) and slot value(s)).	1	UNL	
WP2.01.FN02	MR1.1	System is capable of understanding the stage of the dialog and identifying the corresponding fields (e.g., category, brand, gender) that it	1	UNL	
	MR1.2			UNL	
	MR1.6			IST	

	MR1.7 MR2.3 MR5.3	needs to search in the product catalogue.		<b>FARFETCH</b>
<b>WP2.01.FN03</b>	MR1.3 MR1.4 MR3.1 MR4.1 MR4.2	If information presented in the previous turn is missing or still ambiguous, the system will generate clarifying questions.	1	<b>IST</b> <b>UNL</b>

## OBSERVATIONS

### Previous turn: “None.”

1. Customers are greeted by the system;
2. Customers present their intent (e.g., “I want red shoes”);
3. Customers may not be clearer on their intent (e.g., "I want shoes". System will need additional information: What kind of shoes? For who? Age? Gender?");
4. We don't have a retrieval step.

### 5.1.1.2 Product Description

NAME	PRODUCT DESCRIPTION	PRIORITY HIGH
<b>PROBLEM STATEMENT</b>	Customer wants to know more about the product and the system needs to be able to describe the retrieved products.	
<b>WP2</b>	<b>Relevant Scenarios and respective episodes</b>	<b>USE CASE</b>
	<ol style="list-style-type: none"> <li>1. Customer is interested in a product with the intent to discover the product catalogue and/or willing to purchase;</li> <li>2. System presents a list of products;</li> <li>3. Customer wants to know more about one of the specific products (What is the material in the 2nd and 5th images?).</li> </ol>	U1, U2, U3, U4

FNRI	RID	DESCRIPTION	YEAR	PARNER
<b>WP2.02.FN01</b>	MR2.1 MR2.2 MR2.3	Encoder of the input language (i.e., understanding the category-/attribute-related questions for “what is the material in the 2nd and 5th images”).	1	IST UNL
<b>WP2.02.FN02</b>	MR1.1 MR1.2 MR1.6 MR1.7 MR5.3	System is capable of understanding the dialog stage and identifying the corresponding fields (e.g., category, brand, gender) that it needs to search in the product catalogue.	1	UNL IST FARFETCH
<b>WP2.02.FN04</b>	MR3.1 MR3.2	Generation of the response based on the retrieved products.	1	UNL
<b>OBSERVATIONS</b>				
<p><b>Anchor: “regarding the retrieved products.”</b></p> <p>1. Product information should encompass product description, brand history and details on other product metadata.</p>				

### 5.1.1.3 Customer Wishes to See More Products

NAME	CUSTOMER WISHES TO SEE MORE PRODUCTS	PRIORITY: HIGH
<b>PROBLEM STATEMENT</b>	To give a recommendation the system needs some applicable information about the customer, so it can recommend a product accordingly with their personal preferences. These bits of information allow the system to retrieve products satisfying the customers intent.	
<b>WP2</b>	<b>Relevant Scenarios and respective episodes</b>	<b>USE CASE</b>

<ol style="list-style-type: none"> <li>1. Customer wants the system to show him more products like the ones retrieved in a previous interaction;</li> <li>2. System:                     <ol style="list-style-type: none"> <li>a. Provides the results (ordered by a criteria);</li> <li>b. Does not understand. Asks for more details. Go to: 1).</li> </ol> </li> <li>3. Customer likes and asks for more items.</li> </ol>				U1, U3
FNRI	RID	DESCRIPTION	YEAR	PARTNER
WP2.03.FN01	MR2.1 MR2.2 MR2.3	Customer submits a query that needs to be encoded for MCA understanding (e.g., “Show me more in the style as in the 1st image”)	1	UNL IST
WP2.03.FN02	MR1.1 MR1.2 MR1.6 MR1.7 MR5.3	System is capable of understanding the dialog stage and identifying the corresponding fields (e.g., category, brand, gender) that needs to search in the product catalogue		UNL IST FARFETCH
WP2.03.FN03	MR1.3 MR4.1 MR4.2 MR4.3	System needs to take the dialog initiative, when the customer needs and preferences are ambiguous		UNL IST
WP2.03.F06	MR4.4 - MR4.6	System presents the first results (e.g., by category, designer, brand)		IST FARFETCH
WP2.03.F07	MR4.9	Products that are going to be provided need to guarantee a minimum set of rules (e.g: popularity).		FARFETCH
WP2.03.F08	MR3.1 MR3.2 MR3.3	System generates a text response that meets the customer’s information needs or solicits additional direction.		UNL
<b>OBSERVATIONS</b>				

**Anchor:** “regarding the retrieved products.”

- System asks for additional information about the customers criteria;
- Customer is looking for information about the product;
- Systems provides a response of the customer queries with suggest products;
- Anchor: “the input is a set of retrieved products”.

#### 5.1.1.4 Customer Does not Like Recommendations and Asks for Products Similar to the Input Image

NAME		CUSTOMER ASKS FOR PRODUCTS SIMILAR TO THE INPUT IMAGE	PRIORITY: HIGH	
PROBLEM STATEMENT		Customers ask to see products similar to the one shown in a given image.		
WP2		Relevant Scenarios and respective episodes		USE CASE
		<ol style="list-style-type: none"> <li>1. Customers wish to see more products like the one he provided;</li> <li>2. System provides results.</li> </ol>		U1, U3
FNRI	RID	DESCRIPTION	YEAR	PARNER
WP2.04.FN01	MR2.1	Customer submits a query that needs to be encoded for MCA understanding (i.e., the “show me shoes like these but round-toe”, “show me something in shape as in this image” )	2	UNL IST
	MR2.3			
WP2.04.FN02	MR1.1	System is capable of understanding the dialog stage and identifying the corresponding fields (e.g., category, brand, gender) that needs to search in the product catalogue	2-3	UNL IST FARFETCH
	MR1.2			
	MR1.6			
	MR1.7			
	MR5.3			
WP2.04.FN03	MR1.4	System detects ambiguity and triggers clarifying questions policy	2-3	UNL
	MR3.1			
	MR4.1			
	MR4.2			



	MR4.3			
<b>WP2.04.FN04</b>	MR4.4 MR4.7	System will retrieve a set of candidates based on visual similarity	2-3	<b>IST</b>
<b>WP2.04.FN05</b>	MR4.9	Products that are going to be provided need to guarantee a minimum set of rules (e.g: popularity)	1	<b>FARFETCH</b>
<b>WP2.04.FN06</b>	MR3.1 MR3.2	System generates a text response that should meet customer objectives	2-3	<b>UNL</b>

<b>OBSERVATIONS</b>				
<p>1. The system should generate clarifying questions to understand what different categories and/or attributes it should look to guide the search of the products.</p>				

### 5.1.1.5 Customer wants an opinion and asks for products that go well with related categories/attributes or products

<b>NAME</b>	<b>CUSTOMER ASKS FOR PRODUCTS THAT GO WELL WITH RELATED CATEGORIES/ATTRIBUTES OR PRODUCTS</b>	<b>PRIORITY: MEDIUM</b>
<b>PROBLEM STATEMENT</b>	Customers want an opinion from a specialist and ask which product goes well with one previously selected.	
<b>WP2</b>	<b>Relevant Scenarios and respective episodes</b>	<b>USE CASE</b>
	<ol style="list-style-type: none"> <li>Customers wish to see more products that go well with the one he provided;</li> <li>System provides results.</li> </ol>	U1, U2, U3, U4

<b>FNRI</b>	<b>RID</b>	<b>DESCRIPTION</b>	<b>YEAR</b>	<b>PARNER</b>
<b>WP2.03.F01</b>	MR2.1 MR2.2 MR2.3	Customer submits a query that needs to be encoded for MCA understanding (i.e., the attribute-related question in addition with an image)	1	<b>UNL</b> <b>IST</b>

<b>WP2.03.F02</b>	MR1.1 MR1.2 MR1.6 MR1.7 MR5.3	System is capable of understanding the dialog stage and identifying the corresponding fields (e.g., category, brand, gender) that needs to search in the product catalogue	2-3	<b>UNL</b> <b>IST</b> <b>FARFETCH</b>
<b>WP2.03.F03</b>	MR1.5	System identifies that opinion is being asked and employs the necessary plan	2-3	<b>UNL</b>
<b>WP2.03.F05</b>	MR4.4 MR4.8 MR5.6	System will retrieve a set of candidates that goes with another, or fills an outfit	2-3	<b>FARFETCH</b>
<b>WP2.03.F06</b>	MR4.9	Products that are going to be provided need to guarantee a minimum set of rules (e.g: popularity)	1	<b>FARFETCH</b>
<b>WP2.03.F07</b>	MR3.1 MR3.2	System generates a text response that should meet customer objectives	2-3	<b>UNL</b>

#### OBSERVATIONS

1. System should clarify what different categories and/or attributes it should look to guide the search of the products.

## 5.1.2 Product Enrichment and Knowledge Generation (WP3)

Supporting the customer in its e-commerce journey is pivotal to any conversational AI agent. In a high-end fashion market, iFetch should provide the same capabilities as a fashion specialist that can inspire or influence the customer through her journey. Therefore, it is paramount to have rich information to allow the customer to navigate through the garments available, thus enhancing their knowledge about the FARFETCH catalogue, its brands and partnerships.

The specifications that follow will endow the system with the functionalities to support the conversations and customer interactions previously identified. They are:

- Enrich the catalogue with a new curation process for outfits or provide suggestions to designers or fashionistas, and an ultimate way to capture customer preferences;
- Implementation of a multimodal graph that captures multiple properties of the products, allowing faster queries over the full set of products and development of the functionality of supporting product searches with multiple criteria and feedback mechanisms for pre-selected products.

### 5.1.2.1 Catalogue Enrichment for Product Metadata

NAME		CATALOGUE ENRICHMENT FOR PRODUCT METADATA		PRIORITY: URGENT
PROBLEM STATEMENT		FARFETCH catalogue grows along the time and customers have an appetite to discover new and fashionable garments. To accommodate that need, users upload products into the FARFETCH catalogue.		
WP3		Relevant Scenarios and respective episodes		USE CASE
		<ol style="list-style-type: none"> <li>1. User adds new product and its metadata information;</li> <li>2. System triggers a process to enrich the catalogue description and fashion ontology according to the product features;</li> <li>3. A repository stores and indexes information about the product <b>description</b> and its <b>attributes</b>;</li> </ol>		U1, U2, U3
FNRI	RID	DESCRIPTION	YEAR	PARNER
WP3.01.FN01	MR5.1 MR5.3	When a user submits <b>new products</b> , the system will need to process the item and generate the corresponding representation (for photos and metadata).	1	<b>IST</b> <b>FARFETCH</b>

<b>WP3.01.FN02</b>	MR5.2 MR5.4 MR5.5	System enriches the product metadata with a thorough product description and also with detailed attributes about the product.	1	<b>IST</b> <b>FARFETCH</b>
<b>WP3.01.FN02</b>	MR5.6	Products are represented in a graph-like structure	2-3	<b>FARFETCH</b>
<b>OBSERVATIONS</b>				
<ul style="list-style-type: none"> <li>- Helps MR4.2 to achieve its success.</li> <li>- We are assuming that we have a basis for product metadata and photos (see WP5)</li> </ul>				

### 5.1.2.2 Knowledge Representation

<b>NAME</b>		<b>KNOWLEDGE REPRESENTATION</b>	<b>PRIORITY: HIGH</b>	
<b>PROBLEM STATEMENT</b>		The catalogue can be represented in different manners. When trying to retrieve products, it should be done in the fastest way possible. Representing the FARFETCH catalog with a knowledge graph		
<b>WP3</b>		<b>Relevant Scenarios and respective episodes</b>	<b>USE CASE</b>	
		<ol style="list-style-type: none"> <li>1. User uploads new products;</li> <li>2. Tasks, such as matching products, complementary based on a certain taxonomy.</li> </ol>	U1, U2	
<b>FNRI</b>	<b>RID</b>			
<b>WP3.02.FN01</b>	MR5.1 MR5.3 MR5.4	Product catalogue enrichment by processing product photos and metadata.	1	<b>IST</b>
<b>WP3.02.FN02</b>	MR5.5	Extension of the product catalogue by enriching it with fashion taxonomy information	1	<b>IST</b>
<b>WP3.02.FN03</b>	MR5.6	Products are represented in a graph-like structure	2-3	<b>FARFETCH</b>
<b>OBSERVATIONS</b>				
N/A				

### 5.1.3 Goal-Oriented Customer Journey (WP4)

It is key to delve into the design of a conversational agent aiming to deliver a frictionless experience as a point of contact while providing the same experience that clients would have in a real-world boutique. More importantly, should be its capability to inspire or influence and discuss the particular looks that the customer is trying to achieve. In doing so, the system needs to have the right characteristics of a goal-driven chatbot that can steer the conversation towards the desired purpose.

In this section, we will entail on the two principal aspects that will govern this work-package:

- Engage customers in conversations, in particular with luxury fashion by facilitating the discovery of new brands, providing tools to allow consumers to find the items they are looking for, based on a deep understanding of its consumers;
- Relate product categories and characteristics to the conversation which thus leads to a better user engagement with the shopping experience.

#### 5.1.3.1 Customer conversations with iFetch are not being effective

<b>NAME</b>		<b>CUSTOMER CONVERSATIONS WITH iFetch ARE NOT BEING EFFECTIVE</b>		<b>PRIORITY: HIGH</b>	
<b>PROBLEM STATEMENT</b>		Customers struggle to find the right products that match their interest. In a conversation scenario, the customer will not progress in the purchase funnel. The agent by using its memory, guides the conversation based on facts to assist future decisions.			
<b>WP4</b>		<b>Relevant Scenarios and respective episodes</b>		<b>USE CASE</b>	
		<ol style="list-style-type: none"> <li>1. After introduction, customers present their goal to the system;</li> <li>2. If not, the system needs to understand by means of conversation what is customer intent.</li> </ol>		U1, U2, U3	
<b>FNRI</b>	<b>RID</b>	<b>DESCRIPTION</b>	<b>YEAR</b>	<b>PARNER</b>	
<b>WP4.01.FN01</b>	MR2.1 MR1.6	Encoder of the input language (i.e., the attribute-related question). System is aware of the course of the conversation	1	<b>UNL</b>	
<b>WP4.01.FN02</b>	MR1.8	System needs to enforce shopping policies or	2-3	<b>UNL</b>	

		other constraints such as product availability, price ranges, to keep conversation constrained		<b>CMU</b> <b>FARFETCH</b>
<b>WP4.01.FN03</b>	MR3.3 MR3.4	Response generation to guide the customer to specific products, promotions.	2-3	<b>UNL</b> <b>CMU</b> <b>FARFETCH</b>
<b>OBSERVATIONS</b>				
<ul style="list-style-type: none"> <li>- eventually the system should learn from its interactions and improve its function. e.g. reinforcement learning could allow it to optimize policies on its own. (c.f., Dialogue Learning With Human-In-The-Loop)</li> </ul>				

### 5.1.3.2 System Promotes User Engagement

<b>NAME</b>	<b>SYSTEM PROMOTES USER ENGAGEMENT</b>			<b>PRIORITY:</b> <b>MEDIUM</b>
<b>PROBLEM STATEMENT</b>	Monitor and maintain engagement level			
<b>WP4</b>	<b>Relevant Scenarios and respective episodes</b>			<b>USE CASE</b>
	<ol style="list-style-type: none"> <li>1. Customer is losing interest in the conversation;</li> <li>2. Navigation pattern is irregular;</li> <li>3. System takes action to capture the attention of the customer.</li> </ol>			U1, U3, U4
<b>FNRI</b>	<b>RID</b>	<b>DESCRIPTION</b>	<b>YEAR</b>	<b>PARNER</b>
<b>WP4.02.FN01</b>	MR2.1 MR1.6	Encoder of the input language (i.e., the attribute-related question). System is aware of the course of the conversation	1	<b>UNL</b>
<b>WP4.02.FN02</b>	MR1.2	System needs to decide what action to take	1	<b>UNL</b>
<b>WP4.02.FN03</b>	MR3.3 MR3.4	System will adhere to a social engagement (through the usage of specific tone of voice and/or safe language) that will capture customer attention	2-3	<b>CMU</b> <b>FARFETCH</b>

OBSERVATIONS
<p><b>Anchor: None</b></p> <ol style="list-style-type: none"> <li>1. Satisfying the customer’s product goals, creating connection and gaining trust</li> <li>2. Social engagement by the system (e.g., “that looks fabulous”, “how did that sweater you bought work out?”)</li> </ol>

## 5.1.4 iFetch Integration (WP5)

The previous specifications gravitated to the user and customer perception of iFetch functionalities. In consequence, the system needs to support the characteristics of a multimodal conversational agent in regards to the statistics concerning the actual changes in user behaviour through several indicators, e.g., user retention and time spent in the conversation. Not just that, but the backbone that holds all of its functionalities following state-of-the-art design practices.

In a nutshell, we are referring to:

- Capabilities to add and replace algorithms in the system for maintenance with an affordable budget as well as its orchestration;
- And, capture customers signals and their interaction with the system (size, favorite designers, material preferences), which will provide the means for the team to be able to evolve iFetch over time and troubleshoot in the case of an incident.

### 5.1.4.1 User Registers New Dialog Policies

NAME		USER REGISTERS NEW DIALOG POLICIES		NEED: HIGH
PROBLEM STATEMENT		Integration of a conversational agent, allowing interaction between system and user throughout.		
WP5		Relevant Scenarios and respective episodes		USE CASE
		<ol style="list-style-type: none"> <li>1. User inserts new policies in the system;</li> <li>2. MCA updates its internal policies.</li> </ol>		U1, U2, U3
FNRI	RID	DESCRIPTION	YEAR	PARNER
WP5.01.FN01	MR6.1	Products and actions that will be used by the	2	FARFETCH

	MR6.2	system		
<b>WP5.01.FN02</b>	MR1.1 MR1.2	New policies need to be updated	3	<b>FARFETCH</b>
<b>WP5.01.FN03</b>	MR1.6	New algorithms to track the dialogue	3	<b>FARFETCH</b>
<b>OBSERVATIONS</b>				
- N/A				

#### 5.1.4.2 Orchestration of iFetch components

NAME		ORCHESTRATION OF iFetch COMPONENTS	NEED: HIGH	
<b>PROBLEM STATEMENT</b>		Integration of a conversational agent, allowing interaction between system and user throughout multiple QA, having an orchestrator that follows a setup that will apply a set of flows of the dialog and invokes predefined algorithms according to the state of the conversation and user goals/intents.		
<b>WP5</b>		<b>Relevant Scenarios and respective episodes</b>	<b>USE CASE</b>	
		<ol style="list-style-type: none"> <li>1. User inserts new algorithms in the system;</li> <li>2. User inserts new policies in the system;</li> <li>3. MCA updates its internal policies.</li> </ol>	U1, U2, U3	
FNRI	RID	DESCRIPTION	YEAR	PARNER
<b>WP5.02.FN01</b>	MR6.1 MR6.2	Products and actions that will be used by the system	1	<b>FARFETCH</b>
<b>WP5.02.FN02</b>	MR1	Integration of new algorithms that will be used by iFetch in regards to dialogue policy and state tracker	1-2	<b>FARFETCH</b>
<b>WP5.02.FN03</b>	MR2	Integration of new algorithms that will be used by iFetch in regards to utterance parser	1-2	<b>FARFETCH</b>
<b>WP5.02.FN04</b>	MR3	Integration of new algorithms that will be used	1-2	<b>FARFETCH</b>



		by iFetch in regards to response generation		
<b>WP5.02.FN05</b>	MR4	Integration of new algorithms that will be used by iFetch in regards to product recommendations	2-3	<b>FARFETCH</b>
<b>WP5.02.FN06</b>	MR5	Integration of new algorithms that will be used by iFetch in regards to Product Representation	2-3	<b>FARFETCH</b>
<b>OBSERVATIONS</b>				
- N/A				

### 5.1.4.3 Quality of Service

NAME		QUALITY OF SERVICE	NEED: HIGH	
<b>PROBLEM STATEMENT</b>		Users need to be aware of the status of the dialogues that are happening of the system.		
<b>WP5</b>		<b>Relevant Scenarios and respective episodes</b>	<b>USE CASE</b>	
		<ol style="list-style-type: none"> <li>Conversations are being logged;</li> <li>A report of the interactions, dialogs flows and recommendations that are provided the customer will be registered.</li> </ol>	U1, U2, U3, U4	
FNRI	RID	DESCRIPTION	YEAR	PARNER
<b>WP5.03.FN01</b>	MR6.4	The user will insert into the system a predefined list of metrics to track the dialogue	1	<b>FARFETCH</b>
<b>WP5.03.FN02</b>	MR6.5	The user will insert into the system a predefined list of metrics to track the recommendation results	2	<b>FARFETCH</b>
<b>WP5.04.FN03</b>	MR6.6	User will define the metrics for the system to perform with reliability	2	<b>FARFETCH</b>
<b>OBSERVATIONS</b>				

## 5.2 Data Requirements

It is important to identify iFetch requirements in regards to the data that we will explore throughout this project. For clarity of the following sections, we will be focused on describing the fundamental framework following the concepts of the domain-driven design (DDD) community that the system needs to follow to have a fully functional multimodal conversational agent. These requirements will pave the way to clarify the boundaries of the functional requirements so that our (data) models can fully satisfy their needs.

### 5.2.1 Events

The system will need to be able to ingest data through streams of information of the dialogue that the system is having. This requires that a processing layer will be capable of processing and real-time querying features to be included for the data acquisition (event sourcing).

In doing so, our system will be built based on immutable events that will be written to an event log. By not storing information in a mutable database, we will be able to evolve our application over time and troubleshooting in the case of an incident. This will help the team to understand why an error occurred and what actions one should take to avoid similar problems (see Martin, 2017, #457).

### 5.2.2 Consistency and Boundaries

Functional integration is limited as it hinders an agile research and development (R&D) plan due to the unknown-unknowns as a result of the investigation. For iFetch, we will opt for bounded contexts which are defined by each partner associated with its activity and work-plan. Nonetheless, the specifications mentioned below will avoid the duplication of effort to avoid losing the benefits of a common ubiquitous language (see Evans, 2004).

To facilitate Functional Integration, the two conditions must be met:

1. A product function must be available inside the source application's business logic;

2. An API of the source application must be available.

As part of this deliverable, groundbreaking business and functional functions are available in the first version of the iFetch framework such as Domain (Data Integration, Encoding, Model Learning and Evaluation), Service (for the dialogue visualizer, see Fig. 1) and adapters (e.g., DataLoader). This approach has fewer side effects and is generally available for most types of applications. There are naturally, a couple of points that are identified:

1. Layers where the teams encompassing the consortium will work independently (e.g, infrastructure layer);
2. And, the shared kernel (e.g., the AI model or framework interface) to avoid too much overhead to fully synchronize the entire model and codebase.

## 5.3 Constraints

It is customary that any design faces some form of hindrance. In this section, disregarding the natural constraint of time, we will analyse different limitations of the design specifications mentioned in the previous sections following the principles of (Cohen, 2010, 2004).

### Performance

1. Ninety percent of:
  - a. Product searches should return results in less than 300 mili-seconds;
  - b. Visual product searches should return results in less than 1 second;
  - c. Recommendations should return results in less than 1 second;
2. Ninety-nine percent of:
  - a. Each service->customer interaction should be in less than 1 second otherwise provided with an informative message of the process

### Accuracy

1. Offline system:
  - a. Should have a minimum recall of top-1/3 on key customer interactions/dialogues
2. Online system:
  - a. A minimum confidence threshold must be met for the system to provide a correct answer

### Portability

1. iFetch is not planned to be portable between different devices.

### **Reusability**

1. The information retrieval module will be reusable by other applications;
2. AI recommendation modules will be reusable by iFetch and by other applications;
3. Taxonomy, Knowledge Base (KB) and Knowledge Graph will be reusable by other applications.

### **Maintainability**

1. Automated unit tests must be written for all new code and be run after each build;

### **Interoperability**

1. Annotated datasets will be stored in compressed with schema evolution;
2. Project documentation will be shared in portable document format (PDF);
3. Other documentation will be shared in markdown and/or jupyter notebooks.

### **Capacity**

1. iFetch must be able to store a million of transactions and serve a thousand of real-time conversations.

## 6 Quality Control

A key aspect that will govern the project will be the capability to assess its performance throughout the dialogue. Besides the qualitative results that will come out from surveys that be shared among our focus groups, to help our teams to have objective metrics on the success criteria of each of the product features that we described in Section 5, we devised key performance indicators (KPI) that will help us to ascertain the success or areas of improvement that we will need to follow (Parmenter, 2015).

Multimodal Conversational Agents to Assist Shopping Dialogues:

1. Number of transitions a customer takes in a multimodal conversation;
2. Number of items the customers are engaging with;
3. Discoverability of products (amount of apparel uncovered from the long tail);
4. Customers submit fashion photos of their interest and interact with recommended ones.

Knowledge Representation:

1. Product Catalogue has more information to support findability and discoverability;
2. New relationships between products/products and brands are uncovered by the system.

Customer journey:

1. Number of sessions where a user interacted with the bot without final action;
2. Average conversation time.

These KPIs will help us to understand what the performance is in regards to the focus groups expectations iFetch should focus on. In consequence, this first exercise will help our team to employ the necessary actions to improve and push its development towards the ambitious goals of the project.

## 7 Conclusion

iFetch encompasses 4 main work-packages (with corresponding activities to the project proposal) that will spring on a service that will allow to have closer and faster interactions on the point of purchase and therefore elevate the level of service on an increasingly on-demand market where the customer requires immediate answers to his needs. This will have a large scale impact on the CR of our marketplace visitors, on a market that shows a big potential given the low rates of online penetration. The customers are the new marketing channel of the brands and the advantage and differentiating factor comes from knowing

them, and today, with the technology power, it is already possible to re-create the personal relationship they are used to in the physical world through the investment in data analysis and technology-based tools.

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## 9 Appendix

### 9.1 Scenarios Quantification

As a result of the study for the design of the interactions of the chatbot, in this section, we outline the key episodes that support our business needs in regards to a multimodal dialogue.

#### 9.1.1 Summary

SUMMARY OF MMD EPISODES	
<p>Follows a brief description of the possible dialog scenarios that we will explore throughout this project:</p> <ul style="list-style-type: none"> <li>- <b>Cold-Start</b> (e.g., <i>I like fern patterned in trackwear but I hate striped patterned very much indeed</i>)</li> <li>- <b>Show-similar</b> (e.g., <i>Show me something similar to the 1st image.</i>)</li> <li>- <b>Show-more</b> (e.g., <i>See the 4th bermuda shorts. Show me more like it but formed of panel material.</i>)</li> <li>- <b>Ask-attributes</b> (e.g., <i>What is the material in the 2nd and 5th images?</i>)</li> <li>- <b>Clarifying Questions</b> (e.g., <i>It would help to know the gender.</i>)</li> <li>- <b>Goes-well-with</b> (e.g., <i>Will a cap that is baseball in style go with at least one of these?</i>)</li> <li>- <b>Celebrities</b> (e.g., <i>Does celebrity XX usually wear the kind of casual shoes in the 5th image?</i>)</li> <li>- <b>Alternative-product-suggestion</b> (e.g., <i>Sorry I couldn't find anything in fern but do you want to see some in other print.</i>)</li> <li>- <b>Product-description</b> (e.g., <i>To describe the 1st item, olukai nohea sport - men's casual shoes. What you see in the 4th one, ...</i>)</li> <li>- <b>Business-rules</b> (e.g., <i>Sort these by best seller</i>)</li> </ul>	<p>These dialogue states can be explored in some of the following <b>business cases</b>:</p> <ul style="list-style-type: none"> <li>- <b>Acquisition and Engagement</b> <ul style="list-style-type: none"> <li>- Pre-order:                             <ul style="list-style-type: none"> <li>- Product information</li> <li>- Size and Fit</li> <li>- Order placement</li> </ul> </li> <li>- Product                             <ul style="list-style-type: none"> <li>- Recommendations</li> </ul> </li> <li>- Marketing                             <ul style="list-style-type: none"> <li>- Campaigns</li> </ul> </li> </ul> </li> <li>- <b>Order Process</b> <ul style="list-style-type: none"> <li>- Order Placement</li> </ul> </li> <li>- <b>Post Order</b> <ul style="list-style-type: none"> <li>- Product information</li> <li>- Status of my order</li> <li>- Refunds</li> </ul> </li> <li>- <b>Account</b> <ul style="list-style-type: none"> <li>- Sales info</li> </ul> </li> </ul>

ranking.)	
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## 9.1.2 Dataset Inspection

### Type of questions

An analysis of the public dataset renders the following types, question-types and question-subtypes:

Type	Question-type	Question-subtype
greeting	-	-
Question	ask_attribute	['ask_attribute_in_ns', 'ask_attribute_in_synset_n', 'is_attribute_in_synset_n', 'ask_attribute_in_n', 'ask_attributes_in_n']
	Like_n_show_result	['like_n_show_in_attribute_complement_value', 'show_in_attribute_as_in_n', 'like_n_show_in_attribute_as_in_custom_image', 'like_attribute_in_n_do_not_like_attribute_show_more']
	Like_earlier_show_result	['like_n_show_in_attribute_as_in_m_earlier', 'show_similar_to_n_in_attribute_as_in_m_earlier', 'like_show_in_attribute_as_in_ns_earlier', 'show_in_attribute_as_in_ns_earlier', 'show_in_attribute_as_in_n_earlier', 'like_show_in_attribute_as_in_n_earlier']
	sort_results	['sort_by_bestSellerRanking', 'sort_by_price', 'sort_by_reviewRating']
	do_not_like_n_show_result	['do_not_like_n_show_in_attribute_as_in_m', 'do_not_like_attribute_in_n_show_more', 'do_not_like_n_show_in_attribute_as_in_custom_image', 'do_not_like_n_show_in_attribute_complement_value']
	like_show_result	['show_in_attribute_similar_to_what_celebrity_endorses', 'like_n_show_in_non_mentioned_attribute_value', 'like_show_in_attribute_as_in_n', 'like_show_in_attribute_as_in_ns', 'show_similar_to_what_celebrity_endorses']
	celebrity	['does_celebrity_endorse_n', 'which_celebrity_endorses_n', 'what_other_synsets_endorsed_by_celebrity']

Suited_for	['ask_if_ns_suited_for', 'ask_what_is_synset_suited_for', 'ask_what_is_ns_suited_for', 'ask_if_synset_suited_for', 'ask_if_synset_in_n_suited_for', 'ask_if_n_suited_for', 'ask_what_other_synset_suited_for_style']
go_with	['ask_if_n_will_go_with_synset_attribute', 'ask_what_will_go_with_n', 'ask_synset_attribute_will_go_with_which', 'ask_what_will_go_with_synset_in_n', 'ask_if_synset_attribute_in_n_will_go_with_image', 'ask_if_synset_attributes_in_n_will_go_with_image', 'ask_if_attribute_synset_will_go_with_any', 'ask_what_will_go_with_any', 'ask_if_attribute_synset_will_go_with_synset', 'ask_if_synset_attributes_in_n_will_go_with_synset_attribute_in_image', 'ask_if_n_will_go_with_synset_attribute_in_image', 'ask_if_n_will_go_with_image', 'ask_synset_will_go_with_which', 'ask_if_synset_will_go_with_synset', 'ask_if_synset_attribute_in_n_will_go_with_synset', 'ask_what_will_go_with_synset', 'ask_if_synset_attribute_in_n_will_go_with_synset_attribute', 'ask_if_n_will_go_with_synset', 'ask_if_attribute_synset_will_go_with_attribute_synset', 'ask_what_will_go_with_synset_attribute_in_n', 'ask_if_synset_will_go_with_any']
do_not_like_show_result	['do_not_like_show_more', 'do_not_like_show_in_attribute_value', 'do_not_like_show_in_attribute_as_in_n', 'do_not_like_show_in_mentioned_attribute_complement_value', 'do_not_like_show_in_non_mentioned_attribute_value', 'do_not_like_show_in_attribute_as_in_ns']
buy	['buy_n']
show_similar_to	['show_similar_to_n', 'show_similar_to_n_in_attribute_complement_value']
show_orientation	['show_all_orientations_of_n', 'show_different_orientation_of_n']
do_not_like_earlier_show_result	['do_not_like_n_show_in_attribute_as_in_m_earlier', 'do_not_like_show_in_attribute_as_in_n_earlier', 'do_not_like_show_in_attribute_as_in_ns_earlier']

	filter_results	['show_in_my_size']
user-info	-	-
answer	-	-
exit-message	-	-
repeat-question	(same as in question type)	(same as question type)
switch-set	-	-

### 9.1.3 Dialog States

ID	DIALOG STATES	VIEW OF THE STATES
DS.1	Cold Start	<i>Users give information about themselves and express their requirements and/or product preferences at the beginning of (or during) the dialog followed by a first retrieval by the system.</i>
		<p><b>Example ('v1/train/585_70.json'):</b></p> <pre>{   User: "<u>I am keen on looking at a few of your best natural shaped casual-shoes that my uncle would like .</u>"     "he is 47 years of age."   System: "Great to know."     "Image list: [image_1, image_2, image_3, ...]" }</pre>
		<p><b>Example ('v1/train/413_193.json'):</b></p> <pre>{   User: "<u>I like fern patterned in trackwear but I hate striped patterned very much indeed.</u>"     "<u>I am interested in looking at some of those that is green in colored that would suit me.</u>"   System: "Absolutely. Just give me a few seconds to take a quick</pre>

		<p>scan through my catalog of clothes and accessories.”</p> <p>“Image list: [image_1, image_2, image_3, ...]”</p> <p>}</p>
DS.2	Show-similar	<p><i>Users want to see similar products to a particular retrieved item.</i></p>
		<p><b>Example ('v1/train/371_182.json') - 'show_similar_to_n':</b></p> <p>{</p> <p><b>User:</b> “<u>Show me something similar to the 1st image</u>”</p> <p><b>System:</b> “Image list: [image_1, image_2, image_3, ...]”</p> <p>}</p>
		<p><b>Example ('v1/train/160_34.json') - 'show_similar_to_n':</b></p> <p>{</p> <p><b>User:</b> “<u>Can you show something similar to the 3rd image?</u>”</p> <p><b>System:</b> “Image list: [image_1, image_2, image_3, ...]”</p> <p>}</p>
DS.3	Show-more	<p><i>Users express positive or negative preferences specifically towards one, more than one, or all the retrieved products and want to see more products. It may imply attribute manipulation to modify the user's requirements.</i></p> <p><i>(user requests may refer to uploaded image products)</i></p>
		<p><b>Example 'v1/train/413_193.json' - (show_in_attribute_as_in_n):</b></p> <p>{</p> <p><b>User:</b> “<u>Show me more in the style as in the 1st image.</u>”</p> <p><b>System:</b> “Image list: [image_1, image_2, image_3, ...]”</p> <p>}</p>
		<p><b>Example ('v1/train/585_70.json') -</b></p> <p><b>'like_n_show_in_attribute_as_in_custom_image':</b></p> <p>{</p> <p><b>User:</b> “<u>I like the 5th image . Show me something like it but in color as in this image</u>”.</p> <p style="text-align: right;">“<u>Uploaded</u></p> <p><u>image</u>:https://images-na.ssl-images-amazon.com/images/I/41mvFoF0xEL.jpg”</p> <p><b>System:</b> “Image list: [image_1, image_2, image_3, ...]”</p> <p>}</p>

		<p><b>Example ('v1/train/534_259.json') -</b>  '<b>like_n_show_in_attribute_complement_value</b>':  {  <b>User:</b> "<u>See the 4th bermuda shorts. Show me more like it but formed of panel material</u>"  <b>System:</b> "Image list: [image_1, image_2, image_3, ...]"  }</p> <p><b>Example ('v1/train/413_193.json') -</b>  '<b>like_attribute_in_n_do_not_like_attribute_show_more</b>':  {  <b>User:</b> "<u>I like the brand in the 1st one but not the type. Can you show me some more</u>"  <b>System:</b> "Image list: [image_1, image_2, image_3, ...]"  }</p> <p><b>Example ('v1/train/585_70.json') - 'do_not_like_show_more':</b>  {  <b>User:</b> "<u>I do not like these. Show me more.</u>"  <b>System:</b> "Image list: [image_1, image_2, image_3, ...]"  }</p> <p><b>Example ('v1/train/585_70.json') -</b>  '<b>do_not_like_n_show_in_attribute_as_in_m</b>':  {  <b>User:</b> "<u>I dont like the 2nd result . Show me something in shape as in the 1st image.</u>"  <b>System:</b> "Image list: [image_1, image_2, image_3, ...]"  }</p> <p><b>Example ('v1/train/57_120.json') -</b>  '<b>do_not_like_n_show_in_attribute_as_in_custom_image</b>':  {  <b>User:</b> "<u>I dont like the 1st image . Show me something in tip as in this image</u>"  <b>System:</b> "Image list: [image_1, image_2, image_3, ...]"  }</p>
		<p><i>Users ask attribute-related questions regarding the retrieved products.</i></p>

DS.5	Ask-attributes	<p><b>Example ('v1/train/206_46.json') - 'ask_attribute_in_n':</b></p> <pre>{   User: "<u>What type is the sleeves in the 2nd image?</u>"   System: "The dress in the 2nd image has long sleeves" }</pre>
		<p><b>Example ('v1/train/534_259.json') - 'ask_attribute_in_ns':</b></p> <pre>{   User: "<u>What is the material in the 2nd and 5th images?</u>"   System: "The material of the bermuda shorts is canvas &amp; chino in the 5th image; comfortable in the 2nd image" }</pre>
		<p><b>Example ('v1/train/78_151.json') - 'is_attribute_in_synset_n':</b></p> <pre>{   User: "<u>Do you think is the color soft in the 1st image?</u>"   System: "Yes" }</pre>
		<p><b>Example ('v1/train/413_193.json') - 'ask_attributes_in_n':</b></p> <pre>{   User: "<u>What is the fit and style in the 1st result?</u>"   System: "the trackpants in the 1st image has comfortable style slim fit" }</pre>
DS.6	Clarifying Questions	<p><i>The systems asks for additional information about the user to constrain product range (e.g., user information, product attributes)</i></p>
		<p><b>Example ('v1/train/534_259.json'):</b></p> <pre>{   User: "I would love to shop for some back pants pocket three-quarter that my kid would like"   System: "<u>It would help to know the gender.</u>"   User: "Male"   System: "<u>Great to know. Just give me a few seconds to take a quick scan through my catalog of clothes and accessories.</u>" }</pre>

DS.7	Goes-well-with	<p><i>Users ask an opinion if the product(s)/attribute(s) goes well with the product(s)/attribute(s).</i></p> <p><i>(user requests may refer to uploaded image products)</i></p>
		<p><b>Example ('v1/train/57_120.json') - 'ask_what_will_go_with_n':</b></p> <pre>{</pre> <p><b>User:</b> "<u>What will suit the 5th image?</u>"</p> <p><b>System:</b> "It can go well with maroon color, capri type, printed fabrics trouser and with denim-casual type joggers and with duffle style, printed fabrics bag"</p> <pre>}</pre>
		<p><b>Example ('v1/train/57_120.json') - 'ask_synset_attribute_will_go_with_which':</b></p> <pre>{</pre> <p><b>User:</b> "<u>Will a cap that is baseball in style go with at least one of these</u>"</p> <p><b>System:</b> "1st product will go well with it"</p> <pre>}</pre>
		<p><b>Example ('v1/train/371_182.json') - 'ask_if_synset_attribute_in_n_will_go_with_image / ':</b></p> <pre>{</pre> <p><b>User:</b> "<u>Do you expect the product in the 2nd result to go along with the one in this image?</u>";</p> <p style="text-align: right;"><u>Uploaded image:</u> <a href="https://images-na.ssl-images-amazon.com/images/I/41mvFoFoxEL.jpg">https://images-na.ssl-images-amazon.com/images/I/41mvFoFoxEL.jpg</a>"</p> <p><b>System:</b> "Yes."</p> <pre>}</pre>
DS.8	Celebrities	<p><i>System wants to understand the relation between a celebrity and product.</i></p>
		<p><b>Example ('v1/train/585_70.json') - does_celebrity_endorse_n :</b></p> <pre>{</pre> <p><b>User:</b> "<u>Does celebrity XX usually wear the kind of casual shoes in the 5th image?</u>"</p> <p><b>System:</b> "Yes"</p> <pre>}</pre>
		<p><b>Example ('v1/train/57_120.json') - 'which_celebrity_endorses_n':</b></p>



		<pre>{ <b>User:</b> "<u>Which of the celebrities usually wear similar looking running shoes as in the 1st image?</u>" <b>System:</b> "celebrities XX, YY and ZZ endorse this kind of running shoes" }</pre>
		<p><b>Example ('v1/train/585_70.json') - 'show_in_attribute_similar_to_what_celebrity_endorses':</b></p> <pre>{ <b>User:</b> "<u>Can you show in fit similar to that usually worn by celebrity XX?</u>"; <b>System:</b> "Image list: [image_1, image_2, image_3, ...]" }</pre>
DS.9	Alternative-product-suggestion	<p><i>System's ability to recommend alternative products, when the user preferences are not available in the catalogue.</i></p>
		<p><b>Example ('v1/train/413_193.json') - 'answer':</b></p> <pre>{ <b>User:</b> "I am interested in looking at some of those that is green in colored that would suit me ."; <b>System:</b> "<u>Absolutely. Just give me a few seconds to take a quick scan through my catalog of clothes and accessories.</u>"            "<u>Sorry I couldnt find anything in fern but do you want to see some in other print.</u>"            "<u>Image list: [image_1, image_2, image_3, ...]</u>" }</pre>
		<p><b>Example ('v1/train/585_70.json') - 'answer':</b></p> <pre>{ <b>User:</b> "I like the 5th image . Show me something like it but in color as in this image"; <b>System:</b> "<u>Sorry I cant find anything in natural but i can show you some in red blue.</u>"            "<u>Image list: [image_1, image_2, image_3, ...]</u>" }</pre>
		<p><i>System's ability to describe the retrieved products.</i></p>
		<p><b>Example ('v1/train/413_193.json') -</b></p>

<p>DS.10</p>	<p>Product-description</p>	<p>'like_n_show_in_attribute_complement_value':          {  <b>User:</b> "See the 1st trackpants. Can I have more like it but in blue colored type"  <b>System:</b> "<u>Image list: [image_1, image_2, image_3, ...]</u>"  <u>"What you can see in the fourth image, add comfort and efficiency to your training sessions this season with these track pants from reebok. And about the 5th item, designed to perfection for fitness-conscious women, these navy blue track pants from fila will be a wise choice for your regular workout session."</u>          }    <b>Example ('v1/train/.json') - 'answer':</b>          {  <b>User:</b> "Can you show in fit similar to that usually worn by celebrity cel_57?";  <b>System:</b> "<u>Image list: [image_1, image_2, image_3, ...]</u>"  <u>"To describe the 1st item, olukai nohea sport - men's casual shoes. What you see in the 4th one, this is an ultimate casual,lifestyle and fashion sneaker! And about the fifth one, one of the most fashiobale sneakers meant for casual lifestyle and all time wear."</u>          }  </p>
<p>DS.11</p>	<p>Business-rules</p>	<p><i>Users want to sort the set of retrieved products by some business attributes (e.g., best seller, rating, price) to make a better decision.</i>    <b>Example ('v1/train/411_250.json') - sort_by_bestSellerRanking:</b>          {  <b>User:</b> "<u>Sort these by best seller ranking</u>"  <b>System:</b>          ['https://images-na.ssl-images-amazon.com/images/I/31Jv5rwUzYL.jpg',          'https://images-na.ssl-images-amazon.com/images/I/41Ux7RuVT8L.jpg',          'https://images-na.ssl-images-amazon.com/images/I/41ivY62NyEL.jpg',          'https://images-na.ssl-images-amazon.com/images/I/417egu4iDML.jpg',          'https://images-na.ssl-images-amazon.com/images/I/415r5TTqiKL.jpg']          }  </p>

		g] }
DS.12	SIZE & FIT	<i>System's ability to filter retrieved products by size and fit.</i>
		<b>Example ('v1/train/.json') - :</b> { User: "" System: "" }