

RECOMMENDATION SYSTEMS

Foundational pillars of Reply's framework Robotics for Customers are **Recommendation Systems** which deal with a particular form of intelligent information filtering, aimed at extracting value by finding similarities among users and/or items and generating a ranked list of proposals tailored to an end-user's preferences.

RECOMMENDATION SYSTEMS

Among the technologies which are **significantly changing peoples' attitudes towards apps and digital services**, the one provided by Recommendation Systems is acquiring growing interest.

Recommendation Systems are at the basis of many of the **services people today love**. Their presence and usage by major internet players is pervasive and sometimes it **constitutes the reason for their global success**¹. It's no secret that Spotify won against competitors such as Pandora or Deezer thanks to their majestic recommender system. Similarly, it is known by everyone that in the 90s, Google disrupted the previous

brood of search engines thanks to a clever searching filter which is now known as *Page Rank* (remarkably, in its *personalized* version Page Rank logic is actually one of the solutions available for building recommendation engines). In general, Recommendation Systems can be understood as an **information filtering tool aimed at personalizing item contents to individual users**, given a limited information set related to said users (Fig. 1)

Figure 1 - The idea behind Collaborative Filtering is that products which were bought together are more likely to be preferred by Customers who are similar to each other



1 - It has been declared that 30% of Amazon.com pages view and that 80% of movies watched on Netflix comes from their recommendations.

Based on information data related to user situations, contexts and past behavior, recommendations are supposed to filter, from a catalog of millions of items, the small number of items the user might prefer to enjoy.

Today, robotized Recommendation is crucial in several phases of the Customer journey: they can sometimes be recognized as an explicit **suggestion engine** in *e-commerce* catalogs (e.g., Amazon, Walmart, Yoox Net-A-Porter, etc.), or as a **personalized filtering engine** in digital content suggestions (e.g. Netflix, Spotify, Youtube, etc.), or in a more subtle way, their influence is hidden in the **presentation rankings** of contents, for example in social content timelines (e.g. Instagram, Facebook, Twitter, etc.).

There is no magic in the Recommendation engines: the algorithms simply **process information from hundreds of millions of events to build a predictive model capable of guessing personal interest, based on the interests of other, similar users which are scraped in real-time on a web scale.**

Today, the news is that the same techniques, which up until now were a peculiar asset of big internet players, are now available to everyone. Robotics for Customers is a framework aimed at driving customers **towards Data-Driven Customer Engagement tools**, like **Recommendation** and **Conversational Systems**.

This framework shows how data-driven recommendation principles and tools can be straightforwardly applied with remarkable outcomes in several domains, from financial services to retail, from utilities, to Telco.

This is now possible thanks to two factors: on the one hand, the **growth of data processing capabilities** and, on the other hand, the studies that carried **recommendation analytics from abstract academic theories to concrete business cases.**

However, if the availability of processing power and data is guaranteed by actual enterprise data platforms, setting up a strong recommendation engine in production still requires distinctive exercises.



When you have to design a recommendation, there are many elements that are pivotal, and they should be considered when creating a Recommendation System, for instance:

- Which **level of a product catalogue must the recommender address**. In cases such as retail it is very clear that products are definite saleable items, with standard identification codes. In other domains (e.g. insurance) products are a composition of clauses, warranties and policies, which are often composed on demand. In these cases, a recommender must be addressed to a higher level, identifying needs, or abstract product classes.
- Which point of the **customer journey are events monitored and collected**: events may be related to purchases (primary events or conversion) or related to the prior interaction (e.g. searches, read contents, campaign) or the rear one (i.e. claims, inbound calls, etc.).
- Which **category of items are the recommendations addressed**. Recommending books is not the same as recommending clothes, electronics, financial products or media content. Each product genre follows its own patterns and can be more or less influenced by personal events (e.g. marriages, relocations, birth of a child, etc.).
- To which degree can **items be related to each other**. There are severe constraints on the compatibility of products, which may emerge or not from data (e.g. smartphone accessories may vary depending on product standards and compatibility, and some guarantees in insurance policies can be irreconcilable given a commercial product, etc.). Similarly, there could be hidden patterns in a **temporal correlation** between items or items which can be bought in some hidden sequence, or sometimes the pattern is more obvious, as one may watch season 1 episodes of a series *before* season 2.
- At which point can an **item be considered within its lifecycle**. Indeed, the information about purchases is scarce when new products are launched. An event-based recommender won't recommend a product in the early stages, until enough items are sold to influence the model (those issues are called *cold start problem*).

Addressing these issues is when **the framework Robotics for Customers comes into action.**

The cross domain and network nature of Reply allows to collect practices in several countries and business domains, thus supporting a series of relevant projects that aim to achieve **Robotics for Customers as unified approach** and methodology and **to build end-to-end recommendation solutions.**

As in many examples in Machine Learning solutions, and as far as Recommendation Systems are **concerned, there is not a unique solution that fits all.**

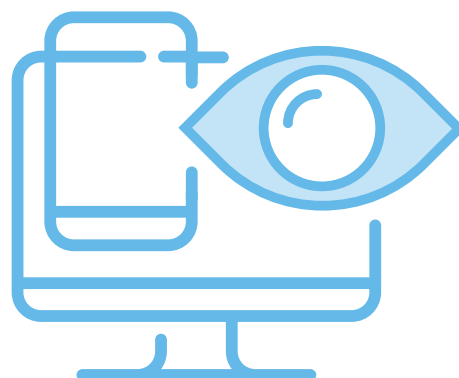
A Recommendation System is not a unique tool, nor is it a defined technology.

On the contrary, it must be approached as an **incremental development**, built on top of data which is available and heuristic processes which are effective, given the problem domain.

The framework Robotics for Customers is created for the purpose of turning data and domain constraints into value. Indeed, **constraints are never seen as a limitation or a weakness, instead they are considered as a guideline to drive the choice of a recommendation model**, or conversely a signal that a better model must be redrafted.

The design and development of Reply's Robotics for Customers framework follows an established methodology, in which crucial aspects are analyzed with a structured approach (see Fig. 2):

- In order to maximize the effectiveness of a Recommendation model, a crucial aspect is to **understand the landscape of all the available data** that are in place. Typically, principal data sources refer to **data internal** to the organization, such as a commercial data warehouse, purchases and products registries (**first party**). **Second party** data coming from **partnerships, providers** or customers can be used to enrich the model. **Third party** sources provide an additional contribution from **external** sources and enable users to consider social and media content, open data, etc.



Adoption Methodology
How to choose the proper Recommendation logic

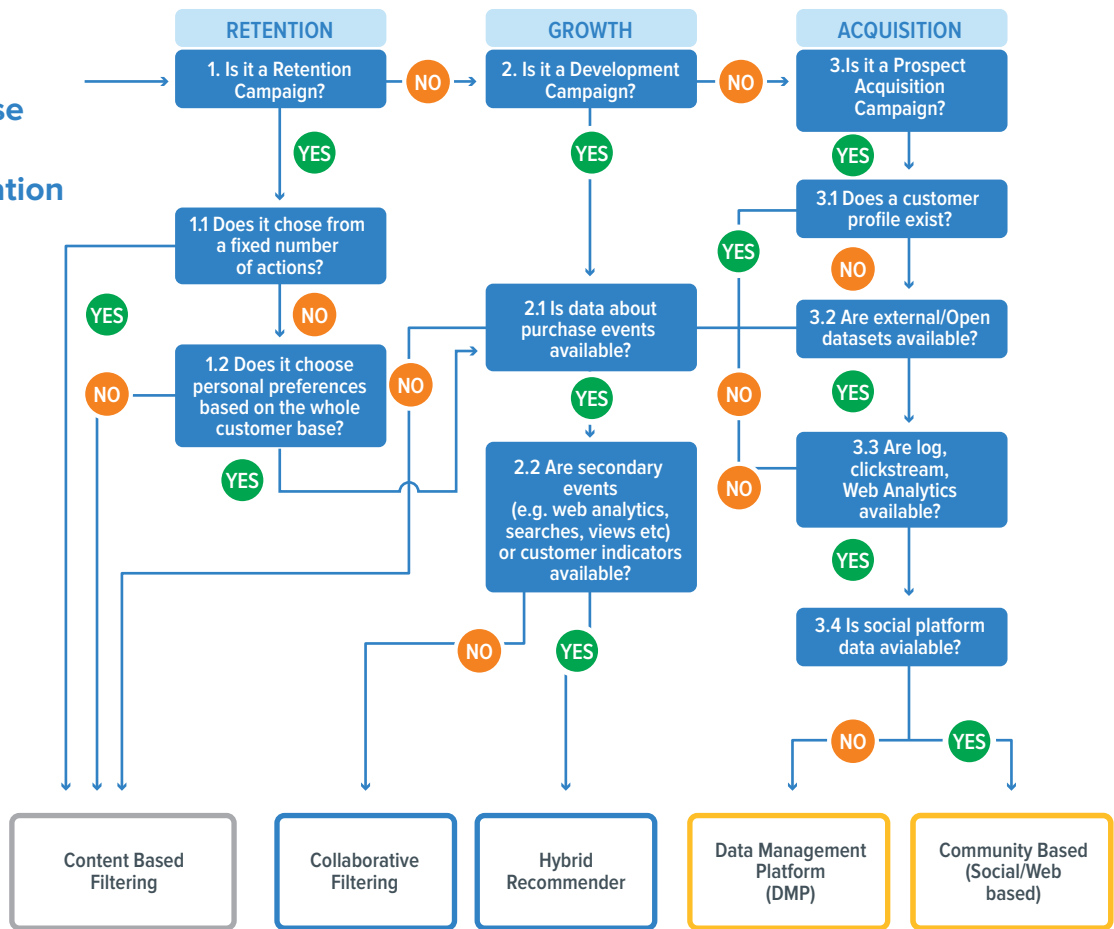


Figure 2 - Robotics for Customers Adoption Methodology conceived a scheme to select the best recommendation algorithms, given data and marketing objectives

- Once data sources are integrated, it is important to reshape the data, and possibly **emphasize those aspects which are relevant with respect to the customer journeys of interest**. This phase concerns fine grained work for engineering features and attributes.
- The choice of the right model also relies on the **business objectives of the initiative**. In the context of marketing campaigns, for instance, one may adopt different strategies based on the customer lifecycle. For instance, different recommendations can be envisaged, depending on whether the campaign is addressed at **prospect acquisition**, customer **growth** or **retention**.
- Evaluating a recommendation engine is a pivotal part of the initiative, too. In this case, Robotics for Customers defines a **structured framework by which different models are deployed in parallel and tested according to an experimental approach**. Metrics of success are then measured (e.g. precision, recall), to establish which of the models perform better in real, situated conditions.

Of course, bringing a recommendation engine in production entails a series of additional challenges and may vary in relation to the problem space, the target system and the feature of the data which must be addressed.

But, thanks to Recommendation Systems, any organization, on any scale, can now improve its business, just as Netflix, Amazon and over-the-top players do.

The technologies and building blocks, on which Recommendation Systems are based, are now available to anyone. Reply's Data-Driven Customer Engagement approach fosters recommendations within the context of Advanced CRM.

The methodology allows for easy adoption and a seamless integration in any industry and in every business context.

Developing Recommendation Systems with **Reply's Robotics for Customers framework is intended as a cross-industry approach.** It brings the idea that user engagement can be founded on refined Machine Learning engines aimed at **making user experiences as clever as making conversation with a domain expert.**

In a marketing perspective, the greatest Recommender System is the one that “replaces” your personal seller – e.g. the old book shop assistant who knows exactly what your preferences are and remembers your evolution as a reader, from the first tales of *Michael Ende* and *Stephen King* up to *Pedro Domingos* and *Cesar Hidalgo* (i.e. personal story).

This is a vision of collective intelligence, where automated help becomes cognitive-help, and it is generated for free, for everyone.

This further represents a **metaphor of singularity**, by which **added value emerges bottom up**, from community interaction and use, reflecting, at an individual level, who the user is in any given instant, as expressed by his **interests, beliefs, desires, intentions.**

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