Dynamic Search Bar for Real-Time Product Generation and Personalization

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Abstract: *In the current digital age, the Web serves as the primary information source for many users. However, the rapid and continuous growth of web content has led to significant information overload, complicating the search process and often yielding irrelevant results. To address these challenges, search engines play a crucial role, and Personalized Information Retrieval Systems (PIRS) are being proposed as a solution. This paper reviews the current state of personalization in information retrieval, detailing its present implementations and exploring relevant research in the field. Several practical case studies were conducted, utilizing various search tools on major websites to observe the application of personalization techniques and analyze their effectiveness. The findings indicate that Google is the search engine most actively applying personalization techniques, followed by Bing, while Yahoo! has yet to fully leverage these methods. The study concludes that personalization is highly significant in the realm of information retrieval, though its implementation is still in nascent stages. Future developments in this field should focus on integrating various personalization techniques to deliver services precisely tailored to users' knowledge and interests.*

Keywords: Personalization, information retrieval system, personalized information search, personalized information retrieval, user profiling, techniques, semantic web

1. Introduction and Objectives

In the last decades, the area of Personalized Information Retrieval has gained a lot of attention. To be able to offer a personalized service to the user in his search is the main goal of search engines and thus improve the user experience. The Web has gone from being static to dynamic, so apart from its continuous development and growth, the user can also produce, disseminate and use information. This results in an overload of information, making the selection of information a complex process for the user, which traditional search engines are unable to solve. This problem, plus the lack of adaptation of search engines to users, makes information retrieval a complex and obsolete procedure. A search process in a traditional search engine consists of the user submitting a query, usually consisting of a set of terms. As a result, a ranked list of results is obtained, which are characterized by being the same for different users, i. e., they are not adapted to the user's interests and previous knowledge.

The present work refers to the topic of personalized information retrieval, where personalization in the area of information retrieval can be defined as: "A technique that uses a user profile, in addition to the query itself, to estimate the user's "interests" and thus select the most relevant documents" (Vallet, 2003). The main feature of personalization is to overcome the problem of traditional web engine searches that do not take into account the qualities, interests and preferences of the user. By tracking user behavior, modeling their interests in a profile and applying a set of techniques, personalization of results in the information retrieval process is achieved. On the one hand, a bibliographic review was carried out on the characteristics and fundamentals of web personalization, and on the other hand, some practical cases of web searches were carried out in three information retrieval systems, to observe which techniques are applied.

The general and primary objective in terms of this work is:
- To know the state of the art, how it has been applied and what are the future trends regarding personalization in web information retrieval systems.

In addition, a series of specific objectives are set out, which have been developed throughout the elaboration of the work. These are:
- Bibliographic exploration and research to find information about personalization in information retrieval systems.
- Practice the use of the predominant scientific language (English).
- Exploratory study on methods, techniques and tools of personalization existing on the Web.
- Identification and description of different contexts where personalization is present.
- Analysis of practical cases.

2. State of the art

Web information retrieval systems (IRS) or search engines are used to search for information, being able to return relevant results tailored to the user's information needs.

With an ever - expanding web environment and the continuous increase of digital information, there is an overload of information, so accessing information that fits the user's needs is becoming more and more complicated.

The main drawbacks in the search for web information are (Paez, 2011):
- The information retrieved is not relevant. When performing a search on a certain topic, many of the links that are displayed as results do not have content of interest to the end user.
- The existing information is not personalized. Users have preferences on how information is displayed and organized.

Users' interests change. Just as the information present on the Web is dynamic, so are users' preferences or interests. As long as CRSs only take into account the user's explicit need for information, the search for information will continue to be a task that will require more time and dedication. In view of this situation, we propose as a solution searches that take into account the user's interests. The situation of each user is important, i. e. their preferences and knowledge prior to the

query to be made. Therefore, to provide a better service, a CRS should focus on the understanding of the information, rather than on the function of the keywords.

The main objective is to "read" and understand the users' mind, being a very complex challenge due to the fact that they limit their query to two or three terms (Lachake & Potdar, 2014). To achieve this compression of the user, the first thing to do is to focus on their interaction, with the system, moving to more interactive searches, with greater precision/accuracy, i. e. (Olvera, 2007):

- Understanding the information needs more precisely, adapting to the context.
- Understanding the content of the document more precisely, by means of an analysis.

As a solution to this problem, the incorporation of personalization techniques in CRSs is proposed, producing a process of "Personalized Information Retrieval". This gives rise to an increasing importance in personalized and customized web environments.

Personalization in the area of information retrieval is the technique that uses the user's context, in addition to the query itself, to elicit the user's interests and thus select relevant information, without having to ask explicitly (Vallet, 200?). The personalization feature in a search engine, will be of great use, being a time - saving tool in browser functions and directing the search engine directly to the information relevant to the user's query (Lachake & Potdar 2014). The intention of personalization is to provide a closer experience to the user, making the search process easier for them. This by no means implies a fully automated process, as we may encounter situations where the user is not able to express exactly what he/she is looking for, but his/her interaction with an intelligent system may lead him/her to find resources of interest. Therefore, a personalization system must infer what the user needs based on previous interactions between the system and the user (Garcia, 2009).

Personalization in web search aims to (Lachake & Potdar 2014):

- Tailor search results to the user based on their interests and preferences.
- Identify documents relevant to the query and place them at the top of the results list.
- Eliminate irrelevant search results, thereby also eliminating noise.
- Create and maintain profiles that represent users' interests.
- Make use of context.
- Facilitate the search process for the user.

User Information
User information is key to personalization. This implies a process of obtaining information about the user's wants and needs in order to prepare the right offer of relevant information at the time of future queries (Velásquez & Donoso 2010). It should be clear that an excessive amount of information does not necessarily meet the user's requirements exactly, so it is important to have the right information from the user. The information collected from the user can be explicit, i. e. obtained directly by the user, or implicitly collected by a software or system. The solution to better understand the "digital user" would be to subject him to various opinion surveys via e - mail or by filling in electronic forms. However, practice has shown that users do not like to fill out forms, answer e - mails with questions, etc. (Velásquez & Donoso 2010). Since this option is not very feasible, there are other ways to obtain information from the user. The main one is to pay attention to the searches and interactions that the subject performs with the CRS, thus obtaining a greater amount of information about the user.

The browser's search history is also an important source of information. A large amount of data can be collected for each previously visited page, such as the time of the visit, the last visit made, the number of total visits or the content of the page. Another source of data about the user, are his IP address (the geographic location of the user can be determined through it), the access method (desktop or mobile device) or the user's browser and operating system (Schneider et al.2010).

This will result in information filtering, which is inspired by the user's interests and will simplify and improve the search process. This technology believes that user needs are static and therefore do not change with the same speed as websites (Lachake & Potdar 2014). It must be remembered that the web is dynamic and is constantly being updated and modified.

Another important aspect, which in addition to helping in the analysis of user behavior, improves personalization in information retrieval, is "Web Mining". This concept groups together techniques, methods and algorithms used to extract information and knowledge from the Web (web data). Part of these techniques aim to analyze user behavior, with a view to continuously improve the structure and content of the sites that are visited (Velasquez & Donoso 2010).

Personalization is a typical example of Web Mining application, which is used to improve website usage by personalizing content with respect to the visitor's need. Personalized web content can take the form of recommended links or articles, advertisements or videos. This technology can help provide personalized interfaces and services, according to the individual characteristics of each user (Vellingiri & Pandian, 2011). It is therefore advisable to take into account the different characteristics of users to adapt the information offered to each person, according to their preferences and other relevant aspects. This is the main objective of "Adaptive Hypermedia" (AH) (Barroso, 2008).

User Profile
The purpose of all this user tracking to collect information about their interests is mainly to define their "user profile". This profile is the first step towards web personalization.

The user's personal characteristics and each of the dimensions that model and represent their context, was what led to propose a user profile, in order to create web environments that offer personalized services (Orozco et al., 2008). From the profile, the CRS can know which results will have a higher value of relevance to the user's query, thanks to the information that has been obtained. In addition, it will be able to recommend and relate the answer to other topics or expand the query, thus offering a personalized service according to the user's needs.

The main characteristics that describe the user as an individual are (Brusilovsky & Millán, 2007): The user's interests: which constitute the (and usually the only) most important part of the user profile in CRSs. Typically, it represents the long - term interests and preferences of users in a specific domain.

User knowledge: this is the user's level of expertise on a specific topic. It is an important characteristic that shapes the user profile.

User need: this is the immediate purpose for a user's task within an LIS. The user purpose is the most changeable user function.

The user's background: represents the user's previous experience outside the domain of a specific web system.

Individual user trait: which define the user as an individual. For example, these are personality traits (introvert/extrovert), cognitive and learning styles.

The extensive literature on the subject suggests that there are two types of user profiles, depending on the way in which information about the user is obtained:

Explicit or fixed profile: active participation of the user, he or she is aware of the information he or she contributes to his or her profile. It is done through questionnaires, surveys, forms, etc.

Implicit or adaptive profile: the user does not participate, there is no consent on his or her part. It is carried out through observation and analysis of the user's behavior, history, etc.

Adaptation of user profiles is a basic and essential requirement for personalized information retrieval systems, which must be able to adapt quickly and efficiently to user changes, in order to reflect the user's interests as accurately as possible. Profile updating can be done automatically and/or manually (Busquet, 2009).

One drawback of personalization is the issue of privacy. The user is not interested in providing information about himself, and this makes personalization tasks more difficult. Without the active participation of the user to provide information about him or herself, a collection process takes place that the user is not aware of.

Thanks to advanced data analysis techniques, activities such as profiling have become commonplace, carried out by personalization systems that draw on all the information that the user himself or herself provides, without being aware of the risk involved. Personalization encourages users to provide more and more information to improve their experience. The price of obtaining this web personalization is very high: user privacy, especially when there are multiple sources whose data could reveal sensitive information related to personal preferences (Estrada & Rodríguez, 2014).

It is clear that user profiles are necessary for search engines to offer a personalized and efficient service, so there is a relationship between privacy and the quality of the service offered. Currently there are tools that protect users' privacy, although these solutions are characterized either by high costs in terms of computation and communication, or because the implementation made to ensure their privacy prevents the search engine from creating a user profile, and as a consequence, a personalized service cannot be offered (Moreira & Castell, 2011).

Semantic Web
The Web has evolved since it has not always been like this. Broadly speaking, in its beginnings it was a static and permanent environment, with HTML pages that supported few updates and without any link with the user (Pérez - reyes et al., 2014). The Web has gone from being static to dynamic, giving rise to interaction with the user.

We have previously discussed the personalization and customization of web content through personalized interfaces, all these aspects are enriched through the Semantic Web. The founding objective of the Semantic Web is to develop and implement a series of technologies that allow computers to "understand" the content of web pages and to reason about it. The idea was to enable computers to understand and interpret the content of web pages in a way similar to that of a human being (Codina, 2009). In this way, if computers process, understand and reason about web content, a big step would be taken to return results that are as personalized as possible, since the web engine would be able to process, understand and reason about it (Codina, 2009). personalized as possible, since the search engine can begin to deduce the user's preferences. Two fundamental elements that enhance and drive personalization in the semantic web are ontologies and context.

An ontology can be defined as a structure of related data from a specific area of knowledge. Personalization can utilize the benefits offered by ontologies, considered as the backbone in the semantic web (Lachake & Potdar, 2014). The application of ontologies in a specific domain, allows communicating, evoking and suggesting personalized content to the user (Altun, 2012). With the use of ontologies, in web searches, a personalization process is obtained that can offer new features, such as, for example, searches related to those that the user raises in the beginning.

Another element related to the semantic web, and that helps to know user attributes, for a personalized information retrieval, is the context. Personalization and context are two values that are linked and as a result offer an increase in the quality of search results. Context - based personalized web search focuses on users' interests and preferences. Its aim is to collect contextual information, and to get to know the subject.

Context - aware search processes use ontologies that are built from a table of contents in order to answer queries and requests efficiently and refine results relevant to the user's interests (Shafiq et al., 2015).

3. Personalization Techniques

Users will use a search engine, which is able to provide what they are looking for and show it to them in real time, rather

than one that does not take into account their preferences and the search for information is more complex and time - consuming.

Personalization of search results is fundamental to the success of any web search tool. For this reason, techniques are being developed to implement this service in information search. It can be stated that the key factors for the success of searches are, on the one hand, reliability and, on the other hand, the ease/quickness of using this service (Quipp, 2008).

The context of the user, together with his/her profile, allows the development of personalization techniques that facilitate and improve the quality of searches in web engines, locating documents relevant to his/her information needs and enriching the results. The following is a review of a set of techniques necessary to achieve personalization, although most of them are not being implemented in current CRSs.

Personalization techniques based on geographic location
The geographic location - based technique is one of the most common and pioneering in the application of personalization techniques. They started to be integrated into search engines to offer a more tailored service to the user. By default, the search engine identifies the approximate location based on the IP address. Based on this information, the search engine can now offer results tailored to the user, depending on where they are, saving them time in the queries they submit to the system. For example, if you are on vacation in Granada and search with the keyword "zoo", the search engine will return as the first results in the list of answers, zoos that are in your geographical location, i. e. Granada.
In Google the user's location is not only used for personalization of search results, but also to improve their experience in Google Maps and other Google products (Sullivan, 2012).

History - based personalization techniques
This technique uses search history to personalize results based on what the user has searched for in the past and the websites he or she has visited. The objective is to save time when performing the query, since if a user visits the web page of a particular newspaper every day, the search engine will detect this "pattern" of searches and will place the web page of the newspaper that the user visits regularly at the top of the list of results.

This technique cannot always be carried out since the user has control over the search history, i. e., he can activate or deactivate his use of the history or delete certain items that the web search engine will not be able to access.

In the case of Google, even if the user is not logged in, personalization of search results is allowed based on the activities performed in 180 days (Horling, 2009).

Personalization techniques based on previous or recent searches.
This technique takes into account whether a specific query followed in the footsteps of another query. Recent search activities provide important context for understanding the meaning of searches. This technique is used to personalize

results whenever possible by saving the most recent browser queries for a limited time (Garb, 2008).

For example, if first "hotels" and then "new york" were searched, the search engine relates these searches, thinking that what the user really wants as results are hotels in New York.

Personalization techniques based on social searches
Thanks to Web 2.0, this technique is gaining more and more strength, due to the continuous and daily development of social networks. It is believed that information related to queries raised by users can have a strong correlation with relevant information in their social networks. In order to gain insight into users' preferences, it is proposed to exploit their social networks and the activities they encompass (Shafiq et al., 2015).

Search engines have improved results by relying on the context of the user's friendships, as well as co - workers and all the people he/she may relate to across the Web. Sometimes the user gives some preference to the results, considering their relevance based on their social connections (Singhal, 2011).

Social search personalizes the user's search, offering them web pages that their friends have frequently visited, shared on Facebook or Twitter, or even created themselves. Imagine the search engine knowing who the user's friends are (perhaps through Facebook, Gmail, or any other social network), this would result in a search engine that can (Quipp, 2008):

Aggregate friends' reviews of particular sites and rearrange the search results, giving preferences to those with the highest number of positive reviews.

Incorporate the behavior patterns associated with sites that appear in the results, and then reorganize the results according to the behavior patterns of their friends.
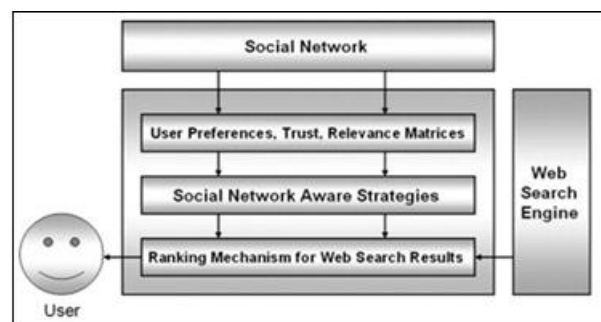

Illustration 1: Layered model for the personalized web search community (Shafiq et al.2015).

This technique is related to the well - known "Social Browsing", this approach refers to software that helps users leave useful traces on websites, such as reviews of comments or votes used by other users while browsing (Lachake & Potdar, 2014).

Some examples of tools encompassed by this technique, is Google's "+1" option, which serves the function of "Like". When using this tool, the content or web page on which this option is located is recommended. Another tool is the linking of Bing with the user's Facebook account, allowing that when

the user performs a search, Bing will offer comments and content published by their own contacts in the social network, which are related to the query raised.

All this is aimed at improving the user's experience, taking into account their social habits.

This technique provides personalized results based on the time in which the user normally performs the search (Quipp, 2008). For example, the search engine detects the usual search hours, so if "trains" is searched, the user could be referring to the train schedule, since he/she is at work time, on the other hand, the meaning of that search could be different than if performed when the user is at home with his/her children. The search engine identifies a pattern, where in the above case, most queries are business oriented between 9: 00 am to 3: 00 pm, and child oriented in the other hours.

Personalization techniques based on the previous queries of a group of users.

Provides personalized results, based on the actions of a group of users, who have previously made similar queries. This results in the system refining the query based on the actions and preferences of the group. This technique works in a "collaborative" way, using the actions performed by a set of users with a similar profile.

For example, if 90% of the people who accessed a result of a given query left this site after 5 minutes (while the rest of the users stayed longer) then there is a high probability that this result is not relevant to the search and these results should be reorganized (Quipp, 2008).

Personalization techniques based on input and output mode

The techniques also depend on the functionalities that the search engine can offer. This technique personalizes the way in which the user receives the answer to his query. For example, if the user enters his search query, via a voice command, he will probably also want to receive the results via voice (or at least a combination of voice and graphical output) (Quipp, 2008).

This technique is being studied for future applications, aiming to facilitate activities where the search for information is more complex or needs some kind of assistance, for example while driving. With the use of speech recognition, the search engine can perform searches and return the results in the same way it receives them, giving rise to a conversation between the user and the retrieval system.

Recommendation - based personalization techniques

Personalization can be seen as a type of recommendation, which aims to provide a tailored experience to the user. Recommendation and personalization are therefore interrelated concepts. A recommendation can be considered "non - personalized" if it does not depend on a user profile. In these cases, the system considers that all users have the same characteristics, providing also the same recommendations. In

contrast, personalized recommendations are those based on user profiles (Busquet, 2009).

These techniques, which allow learning from users' behavior and discovering their preferences, have provided users with a useful tool in the face of the continuous development of information to which they are exposed. Recommendations can be found in the environments of books, music, social networks, tourist destinations, movies or simply news (Cleger, 2012).
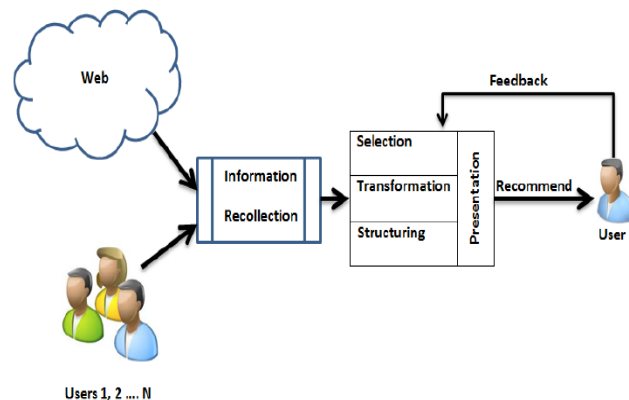

Illustration 2: General outline of the recommendation process (Cleger 2012).

The objective of a recommendation system is to guide the user, through recommendations, to those products and/or services that are most attractive to him. In this way, the user will spend less time finding what he/she needs, will do it in a faster and more convenient way, and will possibly find other products and/or services of interest to him/her (Olvera, 2007). Recommendation techniques are usually classified into two main categories according to their algorithmic technique (Cleger, 2012):

Content - based: provides recommendations based on the existing relationship between items, being very "predictive", as it works with information from the system and not from the "real" user. In this way, items that are highly related to those accessed in the past in terms of their characteristics will be recommended to users, this being one of the main known disadvantages of the system. one of the main disadvantages known as "over - specialization".

Collaborative filtering: also called social filtering, they rely on a large number of ratings from users. They recommend items to an (active) user, based on the opinions of other users with similar tastes, i. e. with a similar user profile. Which means, that the main task of this technique in SRI, is to predict the usefulness of items for a particular user, based on the ratings of other users.

Other recommendation techniques:

Knowledge - Based Recommendations: unlike other types of recommendations, knowledge - based ones do not rely on large amounts of information about scored objects (content - based), and particular users (collaborative), but can work only with having informal knowledge of the user's needs and general knowledge about the set of items being offered.

Demographic Recommendations: this type aims to classify the user according to their demographic characteristics.

Utility - based recommendations: they work by calculating the utility of each of the services offered to the user. The advantage of this type of recommendation comes from the fact that it can take into account for the calculation of utility, characteristics that are not directly related to the services, such as, for example, trust in the seller or the availability of the product.

Hybrids: the different types of recommendations seen so far have their strengths and weaknesses, so it is logical to think that by hybridizing two or more recommendation techniques, performance will improve. For example, the merging of recommendations between content - based and collaborative, saving the user's preferences and combining them with the most relevant objects to make recommendations.

Personalization techniques based on query expansion and refinement

In order to better target the user's need for information, this technique allows the search engine to identify other related results in order to expand "on the fly" the current query. The user's search context plays an important role, since the information provided by the user in the queries is basic to be able to reorient it.

Query refinement is the simplest technique, consisting of adding terms or keywords to the original query made by the user. The terms added must identify the user's preferences in order to provide a more complete and accurate result (Paez, 2011). For the refinement to be performed correctly, it is common to use thesauri, terms that share the same root, terms that are directly related to the query or synonyms.

Another option is relevance feedback or re - ranking. In this technique, users are asked to provide information about the relevance of the documents that make up the result. The search engine will analyze the documents and modify the query accordingly to the information provided by the user. The new query is then used to retrieve documents similar to the positive examples, or filter out documents that are similar to the negative examples. Relevance feedback is characterized as an interactive process between the system and the user (Ghorab et al., 2013).

Different approaches in the application of web personalization

In recent decades, personalization has been used in different contexts, increasingly diversified, taking advantage of the usefulness and benefits it provides. Very different programming techniques try to deal with the challenge of personalization (Serrano, 2011).

The main objective of web personalization is to know the user through his behavior. In this way, any website can take advantage of the collection of user data, which is considered a very valuable tool for personalization, since it allows the website to be adapted to users, according to their expectations and preferences, improving the service offered.

Personalization can be carried out in different ways, in different contexts and with the application of a set of techniques. In previous sections, we have shown the state of the art of personalization in the task of information retrieval and the main personalization techniques, then we review different contexts in which web personalization is currently present.

Personalization in e - commerce

Online commerce or business, is a service that has increased nowadays, allowing the customer to make purchases from anywhere and at any time. As in information retrieval, users have different tastes and preferences and with the personalization of their searches, it facilitates and improves their navigation and use of the Web. The same has happened in online commerce, not all users have the same needs and it is necessary to find a solution, so if each user is served in a personalized way, this will have an optimal shopping experience and a final loyalty.

Personalization in this context, aims to assist the user in their buying process, offering products and services that may be of interest to them. This saves time and prevents the user from feeling overwhelmed by a wide range of products, so that the consumer experience changes, since the user does not have to look for the product or service that interests him, but it will find him. That is to say, a personalized attention is offered, offering services and products tailored to the customer's personal needs, getting involved in order to offer a unique experience.

Web personalization works by understanding the preferences of users through their shopping and browsing history on the website, adapting the content based on it. It is therefore becoming increasingly clear that offering a personalized online shopping experience to users is the key to success. Personalization can be used at any point of communication between the system and the customer. To mention the most common, these are the main channels through which we can personalize (Vialcanet, 2013):

Email marketing: this is one of the most common cases of personalization. Users have different needs, so there is no point in receiving the same content in their emails.

Cart abandonment: it is estimated that more than half of all shopping carts are abandoned. These can be recovered through reminders and dynamic recommendations.

Retargeting: this is advertising aimed at users who have already visited the website and did not buy anything, encouraging them to return through targeted advertising on pages they visit later.

Behavioral Targeting: this is a user segmentation technique, based on their browsing behavior. The objective is not to analyze the user, but to identify them within a group well segmented by homogeneous profiles and target them more closely to their interests.

But one of the main techniques in e - commerce is that of recommendations (see 2.3.8 "Recommendation - based

personalization techniques"). The objective of this tool is to provide personalization in the presentation of its contents, through suggestions and recommendations of other items that may be of interest to the user. The assessment and evaluation of the product by previous buyers is basic to this technique, as is the user's data, for grouping based on their behavior or how the user arrived at the site.

Depending on the segment in which the user is placed, he will be offered one content or another, which will be of more interest to him and which will usually be different from that of other users (Grande, 2014). Recommendations are able to restrict a set of alternatives and provide the user with those that probably best fit his needs (Barranco et al., 2008).

Currently, these recommendations are used as a way to achieve and offer personalization on websites. It is very common in digital environments to recommend which products to buy or acquire, as well as help in the face of uncertainty, which in a high number tends to convert these users into potential customers (Cleger, 2012). One of the clearest examples using recommendations is Amazon or EBay.

Personalization in web content and management

Nowadays, the rapid development of information technologies has given rise to great competition, due to the great variety of web pages and sites, where user access is becoming more and more omnipresent. For this reason, they have to try to stand out and differentiate themselves from the rest. This is achieved through the personalization of the web content offered, filtering information to adapt the web pages to the user and not the other way around.

Through personalized content or "smart content", it will be possible to offer the right content to users, according to their needs and interests. This content is personalized in a logical way, changing dynamically according to the interests (or past interactions) of the users. This is why it is also known as dynamic content (Rodriguez, 2015).

Websites that use web personalization or behavioral targeting, take into account all the available data of a user to categorize them into a specific segment based on their behavior. Depending on the segment in which the user is placed, he will be offered a type of content, which will have more relevance for him and will usually be different from what other users see (Grande, 2014). Therefore, we offer content tailored to the user's needs, which will vary depending on the time they are and other content that will be common to all visitors to the website, without forgetting the elimination of information overload.

To offer personalized content through our website, a series of minimum requirements are necessary (Rodriguez, 2015):
Centralized database: where user information is stored along with their download history and interactions within our website. This is the basis on which content personalization is based.

Personalized content generator: This is the logic implemented to show/hide dynamic content, depending on the user who visits us.

Integrated email system: Integrated with the database, to send personalized content to users, as is done through the website.

There are many tools that offer this personalization service on their websites, some of them are (Grande, 2014):

Personyze: it is one of the most important tools in terms of web personalization. It allows you to segment visitors to a website in real time and offer them personalized content. It offers user segmentation based on their geographic characteristics, social profile, behavior on the Web in question, system from which they connect, as well as user data that the company itself has, which can be easily integrated into the tool.

BTBuckets: One of the most famous real - time web personalization tools currently available. It automatically segments users (based on frequency and duration criteria) that enter the website, based on behavioral patterns, demographic factors and user connection information. This tool mainly uses information from cookies, the user's IP address, as well as the links accessed by the user.

Monoloop: This web personalization tool works according to the drag and drop system. It allows you to navigate through the Web that you want to customize, modifying parts of it, changing the existing content or inserting new content in order to direct the page to the user, that is, it allows you to customize texts, images, offers, the navigation of the website or the design, creating a personalized place for each user.

The user profile is defined according to parameters such as location, frequency and duration of the visit to the website, interaction with the page and products that attract the user's attention. It is an easy to use and intuitive tool, where no specific software installation is required. Once the registration is done, a tracking code is received and the tool is ready to be used.

Another approach to content - related web personalization is the concept of "Adaptive Hypermedia" (HA). In addition to taking into account the different characteristics of users to adapt the information offered, there is also web adaptability, which has achieved great value due to the transition from a static web to an adapted one. The HA has the function of managing personalized views of information, helping to organize the information in a personalized way, where the user will preferably find items related to their interests.

In HAs, customization is carried out implicitly (it is the most normal and the system changes without our telling it to) or explicitly (the system changes because we ask it to) (Serrano, 2011).

The user's knowledge is a variable characteristic, since the user does not have a fixed knowledge. This means that the HA has to recognize the user's changes, i. e., the user's state of knowledge and consequently update itself. Web adaptability has two phases (Vera, 2013):

Personalization: allows users to obtain information that is tailored to their needs. The user profile defines the main parameters for selecting and adapting the presentation of information for the individual user.

Contextualization complements personalization, so that the user's social status or context can also be taken into account.

One example of personalized view management is My Yahoo! where, based on the user's preferences, an interface with relevant and personalized content is offered. The website can be organized and designed according to the user's preferences, for example with sports news, current affairs, fashion, etc.
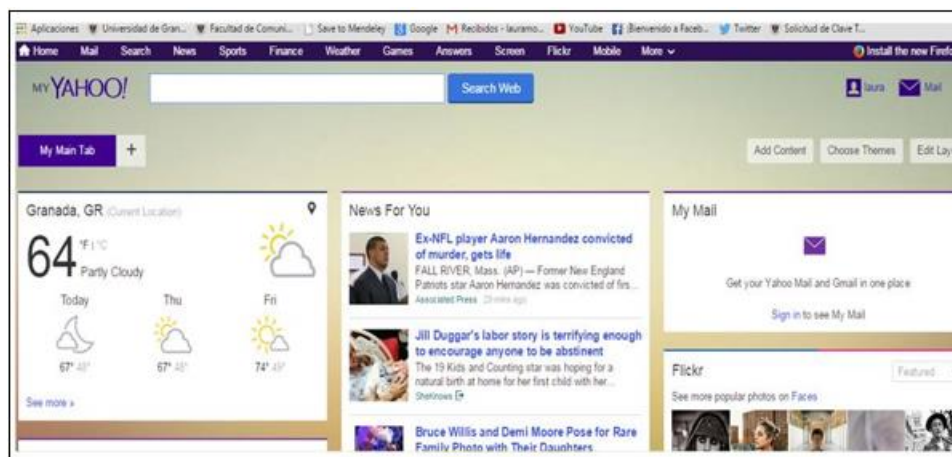

Illustration 3 MyYahoo! custom interface

In conclusion, through the personalization of management and web content, a better experience for users is created, becoming a necessity, since each user has a different profile and requires personalized information.

Personalization in the educational context.

The emergence of new paradigms on the Web and the great development of communications technology make it possible to make available to students a wide range of educational tools and resources, which allows the personalization of learning and makes it possible to carry out a set of training activities from anywhere and from any device (Durán et al., 2012).

With the emergence of e - learning, new fields emerge where the user is the main protagonist and where their needs are not always the same. For this reason, personalization is sought in an educational context, in order to facilitate the task of the student/user. This has contributed to the development of

learning or educational web systems. But they have a main problem: information overload.

The development of e - learning environments requires taking into account the needs of the user, and thus, having the ability to adapt to the different characteristics that they present. In this sense, techniques from the field of Artificial Intelligence and the Semantic Web offer tools that can be used for personalization purposes and appear as alternatives to eliminate information overload (Durán et al., 2012).

Another educational area in which personalization is gaining strength is in digital repositories. Due to the large amount of academic resources in digital repositories, it is proposed to offer intelligent searches within virtual platforms and provide personalized results. To achieve this, the user's characteristics and preferences will be used, also taking into account its trajectory through the activities carried out within the educational environment (Díaz et al., 2014). This personalization in searches, serves as a basis to favor the retrieval of resources to be used in educational activities, based on the characteristics of the student/user.

Moodle, in particular, is a virtual learning environment that offers a wide variety of tools to assist teaching and course management. This tool has the disadvantage of not taking full advantage of the implicit information it contains, such as, for example, the trajectory of the student, the tasks performed within a course, and the activity log within the platform. Therefore, with personalization, it is possible to use this information and offer complementary or additional resources, also taking into account their trajectory through the activities performed within the educational environment (Díaz et al., 2014).
Therefore, personalization is a powerful means to improve the efficiency and quality of information searches, providing an improvement as seen in educational contexts.

Other contexts

Other contexts that are starting to work with personalization are healthcare, where personalized search engines can be a tool that helps to improve access to various medical content resources that have been previously selected. The aim is to avoid a large number of irrelevant results that only provide "information noise". As a result, the search process is improved in an easy and fast way (Mayer & Leis, 2009).

Another area in which these techniques are beginning to be applied is tourism. Tourism involves making a series of choices, such as the destination, means of transport to be used, accommodation to be used, etc. This is because tourism is an activity that does not take place every day and has a limited duration. Because of this, tourists must make a choice about their options, and what better than a system that advises them which are the best activities in each destination, the most interesting visits for tourists or the best restaurants, all adapted to the preferences of each user. An example applied to tourism can be the recommendation of Restaurants in Jaén. The system makes recommendations to tourists about which restaurant to go to when they visit Jaén or any town in the province according to their own tastes, as well as their

location. In this way, it is intended to improve the user experience (Álvarez, 2014).

4. Conclusions

The continuous development of the Web and its problem of information overload (expecting this information to double every year), have resulted in a complex information search process, where you do not always get the information you want. The Web is changing along with the users, who are becoming more and more demanding in terms of their needs and interests. As a solution to this problem, personalization in information retrieval systems is proposed.

For this reason, personalization in web searches has become the focus of great interest in recent years. The aim of personalization is to provide exact answers to the user, focusing on the user's interaction with the system, analyzing his behavior to obtain a user profile and thus, finally to be able to respond to queries by adapting to his needs. The objective of personalization is the exploitation of the user's context (depending on the knowledge he/she has at the time of making the query), the contents visited and the way he/she navigates. And finally, based on this information, to simplify the search process, improving accuracy and reducing the user's waiting time for this process.

As mentioned in the paper, personalization does not only exist in the field of information retrieval, it is gradually being applied in contexts such as e - commerce, so widely used today, or in educational, health or tourism fields.

In all these contexts, a series of personalization techniques are used, which have characteristics that facilitate the user's experience and search process. In this work, a list of techniques is presented, but as it has been observed in the case studies, most of them are not yet applied in information retrieval.

In conclusion, this paper shows the importance of personalization in the web community, and the important studies that have been carried out. But, despite this attention, few techniques are actually present. The idea of returning "traditional" results has become obsolete, and little by little search engines are seeking to apply personalization techniques when resolving a query, which, however, have not been fully implemented as we have seen.

However, as we have seen, these techniques are not being put into practice. Therefore, personalization in the area of information retrieval is still in an "early" stage, which must continue to solve problems and inconveniences that arise on the Web.

The novelty of this field of personalization suggests that for future information retrieval systems, these personalization techniques should be bundled, exploiting user information and offering a service that accurately matches the user's knowledge and interests.

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