

SmartSocialMarket: A Social Commerce Architecture

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Abstract—The evolution of the approach users have with the World Wide Web - particularly towards social media - has led to the need of e-commerce platforms aimed at user interaction. Offering a service focussing only on online shopping is no longer satisfactory. In order to provide a successful user-seller interaction, further Web 2.0 tools need to be offered. This development of electronic shopping - which provides new business opportunities - is called social commerce. This paper aims at describing the SmartSocialMarket architecture, which is based on e-commerce components and, at an upper level, on social components. Social components allow for the provision of tools that can improve the user interaction within the platform, and can also offer new market opportunities to sellers.

Keywords—Social commerce, Collaborative commerce, Collaborative shopping, Social shopping

I. INTRODUCTION

Social media - also called consumer-generated media - play a key role in Web 2.0. These internet applications can be virtual communities, blogs, wikis, photo and video sharing, networking sites, social bookmarking and other social applications [1]. In particular, the use of social networking websites has recently increased significantly. This tendency seems not to be going to stop any time soon, and in fact, it will improve over time [2]. On a daily basis, users communicate with their friends and share information on social networking platforms such as MySpace, Facebook and YouTube [3][4]. Practically, consumers turn into active content writers starting from being clients with no chance of interaction [5]. Such social activities lead to the creation of stable trust relationships among stakeholders, which, according to a wide number of researchers, could guarantee an increase of the economical power of business transactions [6][7]. This phenomenon, which can be considered relatively new, has been developing over time. Many researchers are focussing on it, as it is able to offer numerous research opportunities, both theoretical and practical.

The name “social commerce” comes from the combination of “social networking” and “e-commerce”. Users can carry out business transactions or simply browse for selling/purchasing opportunities within a highly collaborative and social environment. More in detail, users can generate contents such as reports, ratings, photos and videos to be shared with others [8][9]. Both sellers and purchasers can take advantage of this new business method. Sellers improve their income thanks to the advice and suggestions coming from purchasers, which help companies know their customers’ taste about brands and products of their interest [10]. At the same time, these opinions can attract new potential buyers. Through this shared information, customers are more aware of the quality and features of the products they like. This ensures they have more power within the whole business interaction.

The aim of this study is describing social commerce architecture.

This paper has the following structure: Section 2 introduces the concept of social commerce; Section 3 shows the architecture of social commerce and analyses the modules that build it; Section 4 shows the SmartSocialMarket in practice; Section 5 draws the conclusion of this work.

II. BRIEF VIEW OF THE SUBJECT

Social commerce can be defined as internet-driven and social media-mediated business. This fosters the word of mouth through Web 2.0 and thus the exchange of information, opinions and ratings between purchasers and sellers.

This definition derives from studies made by many researchers who have provided different other definitions and insights on this phenomenon themselves.

Dennison defines social commerce as word of mouth applied to e-commerce [11].

A significant number of researchers shares a wider definition of social commerce. It is described as a social media-mediated form of trade where a more creative and collaborative approach is used by both sellers and purchasers [12][13]. In other words, social commerce is considered to be the execution of business transactions through social media and Web 2.0 in general [14]. Therefore, social commerce consists in the evolution of e-commerce and in the use of social media as tools to support purchasers during the different stages of the purchasing process.

Other professionals provide a definition of social commerce that comes from the concept of social network. These represent social commerce as the whole of collaboration and shopping activities carried out by customers in an environment which is similar to the social network one [15][16].

Finally, starting from the seller point of view, other researchers describe social commerce as a collaboration among those, which ensures they gain money out of it [17][18].

Despite the different definitions of social commerce provided, researchers agree on defining the main difference between social commerce and e-commerce. Whereas in e-commerce users mainly carry out individual activities that keep them isolated and not connected to the community, social commerce customers interact with it thanks to the use of the services and tools provided. For example, they can express their preferences and opinions, and also get to know the other community members’. As Huang and Benyoucef suggest, implementing such kind of commerce leads to the analysis of many disciplines, such as marketing, computer science, sociology and psychology [19]. With regards to marketing, social commerce represents the tendency to implement marketing tools during the online trading stages. These tools influence the customers’ purchasing decisions [20]. Technically speaking,

social commerce is described as the implementation of tools as referral schemes, purchasing groups and social wish lists to support business activities [12][21].

About the social relevance of social commerce and its psychological component, the implementation of this technology encourages users to actively enter the Web community so that they are influenced by relevant contents shared by other users. These entail shop reliability and product quality [22][23].

III. SMARTSOCIALMARKET ARCHITECTURE

A. Architecture description

The SmartSocialMarket architecture is a modular type architecture (Figure 1), whose system is divided into two macro components: the e-commerce management and the social relationship management.

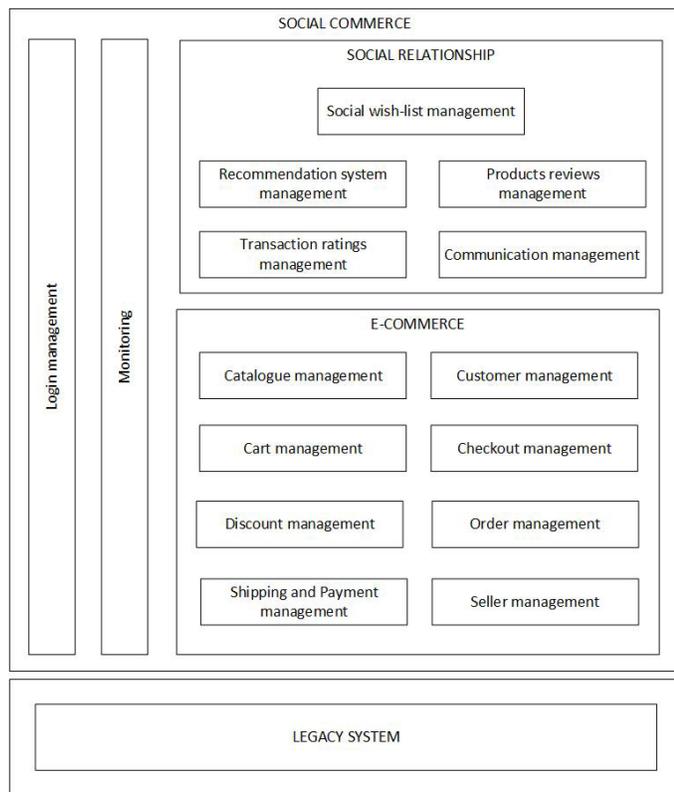


Figure 1. SmartSocialMarket Architecture

The first represents the e-commerce basic and usual components about the system itself, whereas the social management is the advanced part. This enables the management of the customer-customer and customer-seller social interaction.

This second component will be described thoroughly, as it represents an innovative architecture area. It entails all the management components of the social relations among e-commerce customers. Thanks to such functionalities, users can interface with other consumers so to create some sort of community. The exchange of information creates social presence in the community and trust relationships that convince users to buy more. This is because such purchases are believed to be safer in terms of shop and product trustworthiness. Moreover, the recommendation system component allows to provide users with advice tailored to their future purchases via

dedicated algorithms. This advice takes into account the user's relationships with other consumers and their link to products. Beside these two macro components, other two core areas are represented by the monitoring and login management, which embrace both the business and social parts of the architecture.

At an inferior layer we find the legacy system, which consist of the already existing company infrastructure and information about products and customers, represents an inferior level of the structure.

More in detail, the two macro components present several parts. The e-commerce management component is composed by the catalogue, cart, discount, customer, seller, checkout, order, shipping and payment management. The social management component consists of social wish-list, recommendation system, transaction ratings, product reviews and communication management.

B. Analysis of the individual components

The most important stakeholders who interact with the platform are the customer and the seller.

The customer takes advantage of all the potential social and purchasing functions that the platform provides, whereas the seller represents an active user who is able to take advantage of the all potential dealer features. This last stakeholder is interested in the sale process in order to increase their profits and visibility; they also need to increase their customers knowledge in order to gather new products. Some architecture components regard the customer activities, others are related to the seller and others to both.

As concerns the e-commerce macro component, it embraces the catalogue, customer, seller, cart, checkout, order, discount and shipping and payment management.

The **catalogue management** component, which applies to both the customer and the seller, has to organise the activities related to the products and categories. It allows the seller to insert and update new categories in the system and relate the products to these features: price, title and description. This component also manages the product stock. With regards to the customer side, the catalogue management component allows them to view the product information and its features. This component is linked to the discount management component - because a discount might be applied to a product or to a category - and to order management components in order to provide the details of other products the customer ordered. Finally, it is worth mentioning that this component is synced with the legacy system so that the company and the social commerce data are aligned.

The **customer management** component has to manage the commerce accounts, the accounts group, the customer data and its shipping addresses. In particular, the commerce accounts consist of the customers e-mail, username and password; the accounts group consist of a list of accounts which have been created for a particular aim, as making the account easier to be found or managing discounts in a quicker way. The customer data are usually their name, last name, fiscal code, phone number and residence address. Finally, about the shipping addresses, this component has to allow the customer to insert, delete and update their address. Another task of this component consists in showing the customer information to the seller who, in this way, gains a total view about them.

The customer management component is linked to the checkout and order management components to which it provides the customer address and commerce account information. It also interfaces with the discount management component because a discount can be applied to a customer or to a group of them. Finally, it is connected with the login management component in order to transmit the customer login data.

Another important task is that it syncs the information with the legacy system which consist in the already existing company customer, in order to manage the customer both offline and online.

The **seller management** component organises the accounts of sellers who can work in the system using a seller profile. This component links with the login management component in order to transmit the seller login data.

As regards the **cart management** component, it allows the customer to add products in the basket, update the already ordered quantity and delete an item from the user cart. This component is linked to the catalogue management component. As a matter of fact, it has to know some product information too, for example, their stock level or their base price. It also interfaces with the discount component to calculate that specific product discounted price. Finally, this component has to give the cart information to the checkout component so that this knows what products have been ordered by the customer.

The **checkout management** component organises all the customer order configurations. Some tasks of this component regard the managing of the shipping and payment type, the customer address where the ordered products are to be shipped and the billing address. This component is linked to the customer management component, from which it is possible to retrieve the customer information, and the cart management component, in order to know what the products ordered by the customer are. In addition, it interfaces with the order management component in order to communicate when an order is confirmed. Finally, it connects with the payment and shipment management components to know the payment and shipment type and the price related to the order.

The **order management** component allows sellers to organise the already confirmed orders. Sellers can view and modify the details that concern the order status, the ordered products, the shipment and payment methods, the customer data and the address where to ship the items and the billing address as well. In order to obtain these details, this component has to interact with the catalogue, shipment and payment and customer management components. This component is also linked to the checkout management component because it needs to know when a customer confirms an order to save it in the order list. Finally, it connects to the transaction rating management component because the consumer can express a personal opinion and give a vote about their confirmed order.

The **discount management** component allows sellers to organise the discount that can be applied to a particular product or to a specific product category; on the other hand, it can be associated to a customer or to a set of them. The discount can be applied in percentage or as amount. This component is linked to catalogue management component, because a discount can be applied to a product or to a category, and it interfaces with the customer management component because

a discount can be applied to a customer or to a group of them. Finally, it is important that the discount management component can sync its data with the legacy system data in order to guarantee the same discount both in offline and online shopping.

At the end of the process, the **shipping and payment management** component organises all data related to the shipping and payment method. The seller can set the shipping type and price that can vary according to the order destination country, weight, price or size. This component interfaces with the checkout management component to provide it with information on the payment and shipment type and price related to the order. It also interfaces with the order management component to provide the information concerning the order shipping and payment.

With regards to the social commerce macro component, it embraces the social wish-lists, the recommendation system, the product reviews, the transaction ratings, and the communication management.

About the **social wish-list management**, the aim of this component is to organise all customer and seller activities related to the wish-list in the social context. It allows the customer to manage particular products lists called wish-lists. More in detail, the customer can add or remove a wish-list where the desired products can be added or removed. Wish-lists can be used for the customer's own tracking of their desired products, but at the same time, they can be shared with other purchasers, being those also searchable and accessible to any user of the platform. Furthermore, sellers can view the customer social wish-lists and monitor their preferences. This component is linked to the catalogue management component, because it needs the product details in order to add them to the social wish-list, and to the recommendation system component in order to give it the desired products list to influence the creation of product recommendations.

The **recommendation system management** is composed by two activities: data collection and data extraction. The aim of the first activity is to collect the relationship between customer and customer, and between customer and item. Furthermore, the seller can decide what degree of priority to give to a product in order to influence the algorithm that generates the recommendation. Then, during the data extraction phase, this component selects some items in order to meet the customer tastes and suggests them to buy these products. In order to generate advice, the recommendation system uses sentiment analysis algorithms so that it can interpret comments left by consumers and guess if they are satisfied or not with a given product (polarity classification). The recommendation system management interfaces with the social wish-list, products review, chat and order management in order to extract the customer data related to their tastes and preferences. In addition, this component interfaces with the newsletter management component in order to send the product to be suggested.

About the **product review management component**, its aim is to allow customers to write reviews based on a 5-star scale and related to a particular product. In this way, user create a so called "usergenerated content". Another task of this component is to allow customers to read reviews written by other purchasers. The reviews represent an important

tool because they are capable of exerting influence on other consumers in their purchasing decisions. This component is linked to the recommendation system component in order to give it information on the user preferences, which are useful to generate product suggestions. It also interfaces with catalogue and customer management components because it needs to know who the customer who created the review is and to what products the review is associated.

The **transaction rating** component allows customers to generate reviews and vote about a shopping transaction. In this way, customers can express their personal views about seller reliability, shipment velocity, payment safety and product quality. Customer reviews are useful to encourage other shoppers to buy on the social commerce platforms. It also allows sellers to inspect customer reviews in order to accept or reject them as purchasers. Moreover, it allows sellers to view the transaction ratings written by consumers in order to know what the consumer satisfaction rate towards social commerce is. This component is linked to the order management component because when the customer inserts a personal opinion and votes, they have to relate it to a specific order.

The last social commerce management component is the **communication**. The aim of this component is facilitating information sharing among customers and sellers during the online purchasing activity, making it similar to a joint (offline) shopping trip to a shop or a shopping centre. In this way, customers can communicate regarding product profiles, ask suggestions, exchange opinions, compare experiences with others and find the desired products more efficiently.

In addition it organises all seller and customer activities related to sending marketing emails. Practically, it allows customers to sign in the mailing list and allows sellers to manually insert new customers in it. Thanks to this component sellers can also create a new marketing email and send it to all contacts in their mailing list. In particular, sellers can communicate with customers about new discounts, special sales or the arrival of new products. About chat management, this component links to the customer management component because the consumer needs to know what the other available clients are, in order to use the chat tool. As regards the newsletter, this component is linked to the catalogue management component because it allows sellers to automatically insert the product details and their related Web pages in the email. It also interfaces with the discount management component, in order to know what products are discounted, and with the recommendation management component in order to know what products the email alerts need to suggest.

As mentioned above, beside these two macro components, there are two independent elements: the login management component and the monitoring component.

The **login management** component allows users to authenticate into the system inserting their own username and password. After a successful authentication, they can access as “customer” or “seller” and perform only the operations that have been enabled for their relevant profile. If the authentication fails, the system informs the user with a warning message containing an error description, and allows them to insert their credentials again. This component links to customer and seller management components in order to receive the customer’s login details and the seller’s data. The authentication step is

required for the customer to confirm the order, to view the confirmed order list, to use the chat, to submit a transaction rating and a product review and to manage the social wish-list, therefore this component is linked to the components that provide such services. Regarding the seller, the login is a fundamental step in order to perform almost all administrative tasks: managing other sellers, customers, catalogues, discounts, newsletters, shipping and payment methods, orders, chat, transaction ratings, recommendation system, social wish-list and performing monitoring tasks.

About the **monitoring** component, it represents the main component of the infrastructure that is related to the seller stakeholder. It allows the seller to monitor the customer preferences and needs. This activity makes the seller aware of their potential customers and potential needs, predicting the market trends and maintaining a valuable relationship with them. This component is essential for the trust infrastructure, as it ensures transparency and safety. Social commerce and social networking websites are frequently exposed to social engineering attacks. Therefore, activities such as disclosing confidential and sensitive information on publicly accessible or even internally shared workspaces may end up in security breaches and invasion of privacy. This component links to almost all other social commerce and e-commerce components, because it is used to supervise the social commerce activities.

IV. SMARTSOCIALMARKET IN PRACTICE

The graph in Figure 2 represents the activity diagrams explaining the above described architecture. The grey background boxes show the social activities, while the white background ones show activities that are linked to ordinary business operations.

Following the flow of operations conducted by a said user within social commerce is made possible by referring to this graph. Such social commerce has been implemented according to the architectural features of SmartSocialMarket.

At the beginning of their operations, users can view comments and ratings given by other customers who have already purchased goods through social commerce. Understanding how influential the meaning of this information can be on the path customers are walking is a key element. This function is carried out by the transaction rating management component of the architecture. Users can choose to view a category of products managed by the catalogue management component or a list of products supplied by the recommendation system management component without the need to check comments and ratings.

Practically speaking, consumers can browse the social commerce freely, viewing the specific product categories they have selected. Alternatively, they can opt for a guided browsing, resulting from the tips the system provides about the products that are considered to be most appropriate for that user. The user can subsequently view all the features of a product, such as title, price and description. The management is carried out by the catalogue management component.

The client can perform three different operations during this phase.

The first one consists of viewing the comments and ratings other users have left about a given product, so that it is possible to evaluate any potential purchase at best. This activity is managed by the product review management component.

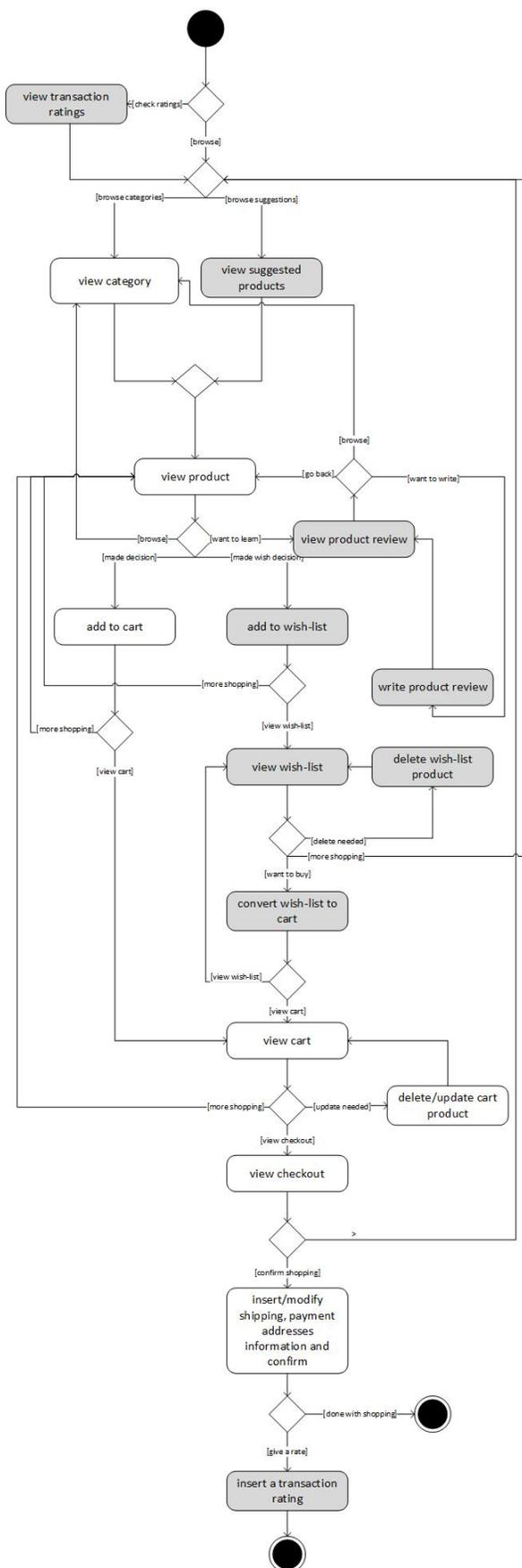


Figure 2. SmartSocialMarket Activity Diagram

During this phase the user can write their own report on the product and go back to view the others', or go back to viewing the product or the product category without leaving any comment or vote.

The second operation a user can carry out is buying a product following a simple and immediate method: adding the product to their cart and staying in the product view page. This activity is managed by the cart management component. In this way they can keep on browsing the social commerce and make further purchases or view their cart (this function is also performed by the cart management component).

The third operation consists in adding the product to their personal wish-list, thanks to the support of the social wish-list management component. Once this operation has been completed, the user can go back to viewing other products so that they can make more purchases or gain information about their wish-list and the products that have been added to it. When viewing the list, users can cancel orders that they have previously placed, viewing details of any products on the wish list or make their wish list turn into a real cart. In this way, clients can buy products in which they have been particularly interested over time and which, therefore, have been added to the wish-list. Once such "conversion" has been done, users can go back to viewing their wish list or their cart. While checking the cart, they can edit the quantity of products they want to order or go back to view them again, so that they can make further purchases. Users can view checkout information, which is managed by the checkout management component, and go back to viewing wish lists or input and edit their purchase data as shipping and billing addresses, and shipping and payment modes. Finally, they can confirm their order.

If they wish, users can rate and comment the transaction they have just completed, so that they can advise other users before their purchases. This is a key activity, as the comments users have made about their transaction can be read by another potential buyer and can condition their purchasing decision about that product.

V. TECHNOLOGY

Table I summarizes all the comparison factors among the major e-commerce platforms available for the CMS Umbraco, implementing an e-commerce managing system, without providing any social service. However, these platforms can be considered as a basis for possible social commerce developments.

The Umbraco platform has been chosen thanks to its features and potential. This CMS has proven to provide more ease of development when compared to other CMSs as Joomla! and Wordpress when it has been examined carefully and after practical applications. It also provides the platform administrator with an excellent management support. The advantages of the use of Umbraco are related to the possibility of extending its administration panel widely and easily. This can be done by using Umbraco's own structures or by writing specific back-end modules. Other advantages are related to the possibility of immediate integration of portions of codes written and defined by the developer (the so called "macros").

To achieve our purpose, the elements regarding the development of a social platform have been taken into account. Specifically, for each platform it has been verified if they use

TABLE I. MAIN E-COMMERCE PLATFORM FOR UMBRACO

	uCommerce	uWebShop	Tea Commerce	Merchello
Use of external database tables	YES	NO	NO	YES
Easy management of many products	YES	NO	NO	YES
Customization level	HIGH	LOW	MEDIUM	HIGH
Stability level on Umbraco 7	YES	NO	YES	NO
Open Source	NO	NO	NO	YES
Price	Free with restriction	from 299	1299 Ex. VAT	Free

Umbraco database tables or external ones. We also verified if the management of several products might create problems about the platform performance and usability for the user. Finally, we focused on the level of platform customization, its stability degree in relation to the latest version of Umbraco, price and license (open source or not).

Between the analyzed e-commerce platforms, Merchello represents a good choice to develop social commerce on Umbraco 7. Although this platform presents low stability, because of its youth, Merchello possesses the highest improvement level.

Alternatively, the uCommerce platform can be considered more complete and more stable than Merchello. However, uCommerce is not open source so it could not result suitable for an extended e-commerce implementation.

VI. CONCLUSION

The social commerce phenomenon has attracted researchers and business managers’ attention more and more. Its implementation - which implies researchers have to steadily face challenges - is nowadays a warranty of business opportunities for sellers and of innovative and more stimulating purchasing modes for consumers.

This paper aims at showing the SmartSocialMarket architecture of a social commerce, describing it both in its complexity and in its single components. In particular, a detailed analysis of the single activities each module carries out has been introduced, together with an explanation about how each of those interfaces with the others. Starting from this description, it was possible to show how this architecture can be executed in practice.

An Activity Diagram has been built and it includes all the activities users can complete in order to place an order in a potential social commerce that is implemented as this architecture describes. The activities that describe the social interaction among consumers have been shown in such diagram, so that they can highlight the added value of a social commerce as opposed to an e-commerce.

This implementation provides many services that are able to allow a strong social interaction among consumers and among these and sellers. An example of this is the possibility to leave comments and ratings about products and completed transactions.

Implementing social commerce is also beneficial to sellers. A deeper knowledge of the consumer tastes and interests guarantees the chance to foresee the market demand and gain monetary growth.

Finally, this article has provided a description of the activity diagram flow, showing how a generic user can create a purchase process within social commerce. Thinking about the future, the aim is to apply this architecture to a real social commerce, so that it is possible to compare the actual benefits that this implementation causes. Consequently, it will be possible to focus on the behaviour of those components that, for their wide variables and implementations challenges, represent a harder research effort. Such research will need to be applied to the solving algorithms.

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