Lorca, & Beydoun, 2015), and others. This article focuses on recommender systems for designing appropriate products in online stores, so we will now discuss recommender systems in this area. 2.1. E-commerce/e-shopping recommender systems Recently, there has been an increasing number of online stores offering goods to their online customers. The global pandemic COVID-19 has significantly reinforced this trend, and a large number of new online shops have been established in the last year. Online shops are an essential area of the e-commerce sector. In online stores, the most common element to determine the popularity of a product is its rating. The rating is often used in the form of stars or similar visual methods, and the user gives feedback to the internet on the specific product purchased. Typically, a scale of 1 to 5 is used. Product ratings can then be used to generate recommendations and are a standard input to recommendation systems. Some of the largest online stores use recommender systems to recommend suitable products relevant for customers to purchase (Huang, Chung, & Chen, 2004; Schafer, Konstan, & Riedl, 2001). In these online stores, products can be recommended based on the product's overall popularity, the type of products that the customer is browsing, or by analysing previous purchases to suggest relevant products for future purchases. Different types and variations of recommender systems are proposed in research articles. These recommender systems are also validated for different types of online stores. Wasabi Personal Shopper (WPS) is an example. It is a domain- independent tool for browsing electronic product catalogues (Burke, 1999). However, this system includes rather a basic way of recommending products since it is a general tool for browsing product catalogues. Cao and Li (Cao & Li, 2007) developed a fuzzy recommender system for products made of different components. For example, when purchasing a laptop, customers often intuitively compare different laptops based on the performance of each component, such as CPU, motherboard, RAM, etc. The proposed recommender system recommends the best product candidates based on the weights of each component determined by the customer using a fuzzy similarity measure model. The advantage of this system is recommendation based on weights of individual components and the use of a fuzzy recommender system. However, a limitation, compared with our system and other systems, is the need to work with products containing different parameters (components). The system then recommends suitable items based on the combination of these components. Mooney and Roy (Mooney & Roy, 2000) proposed a content-based book recommender system using information extraction and a machine learning algorithm for text categorisation. A naive Bayesian text classifier is used to train data extracted from the web to generate features of books and user profiles and find the best matching books for the target user. This system effectively works with content-based recommendation. A disadvantage is the absence of work with other users (readers of similar or other books) and the use of the collaborative- filtering approach. Users often want to be informed about what suitable product is available for them or why the recommender system suggested that particular product. To provide relevant explanations for recommendations of why a given product is better than another, McCarthy, Reilly, McGinty, and Smyth (2004) developed a web-based shopping assistant called Qwikshop.com, on which compound critiques were used as explanations. Compound critiques are product feedback from users. This user feedback is used to generate a set of behavioural patterns, and then based on this feedback, recommendations of relevant products are made to the user. The advangate of this system is

the use of explanations of why a given product has been recommended. A disadvantage is the absence of other standard approaches, e.g. CB, CBF or hybrid approach. Another area is the sale of bundles of items or bundle promotions.