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SERVice Oriented **I**ntelligent **V**alue Adding n**E**twork for Clothing-SMEs embarking in Mass-Customisation

D2.8 Final Version of the Recommendation Engine

Identifier

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Summary

In this deliverable we present the architecture and the functionality of the Recommendation engine which has been developed to provide style recommendations to customers. The recommendations are based on rigid or dynamic user stereotypes and support both product specific and generic style advice. The recommendation engine has been implemented as a Web Service.

Relation to other deliverables: D2.5, D2.7

Contributions

Content	Partner
Style Advice Rules	LCF, DEMETRA
User interaction Data	Customax

1. Introduction

The aim of the recommendation engine is to aid a customer to decide which clothes are pertinent to him. A user provides information regarding **body type**, **facial features** and related characteristics relevant to their physical appearance as well as the **occasion** for wearing the garment; this information forms the input to the recommendation engine, while the output is one or more garments. The inner workings of the recommendation engine are performed by three modules: the *generic style advice*, the *product specific style advice* and the *dynamic style advice*. All three modules are based on **if-then rules**, whereas the major difference is the provenance of the rules. In the generic style advice, the rules are procured from fashion experts and they refer to generic garments; in the product specific advice the rules are also procured by experts but the advice refers to garments of specific manufactures. Finally, the dynamic stereotypes are constructed automatically form users' interaction with the system and they represent users' preferences.

All types of style advice are provided upon request from the user, and in particular the generic style advice is available when the user interacts with the Servive portal (SPO), the product specific is available when interacting with the Servive platform (SPL). Finally, the dynamic style advice is available at the SPO.

2. Recommendation Engine

The recommendation engine has been developed as a client application to the PServer. PServer is a general purpose personalization server, accepting http requests and returning XML documents with

the results. Moreover, it can be used by many different applications concurrently. PServer greatly facilitates the personalization of existing applications by separating user modeling from the rest of the application and features a flexible, domain independent data model that is based on four entities: *users*, that are represented by some identifier, *attributes*, that represent persistent user-dependent characteristics, *features*, that are application-dependent characteristics, which may or may not attract user preference and *user models*. PServer offers three types of user model: *personal*, *communities and stereotypes*. The latest type of user models are exploited by the Recommendation Engine.

The Recommendation engine has been implemented as a Web service and can accept requests from either SPO for generic or dynamic style advices, or SPL for product specific style advice. A pictorial view of the recommendation process with all the related components is depicted in Figure 1.

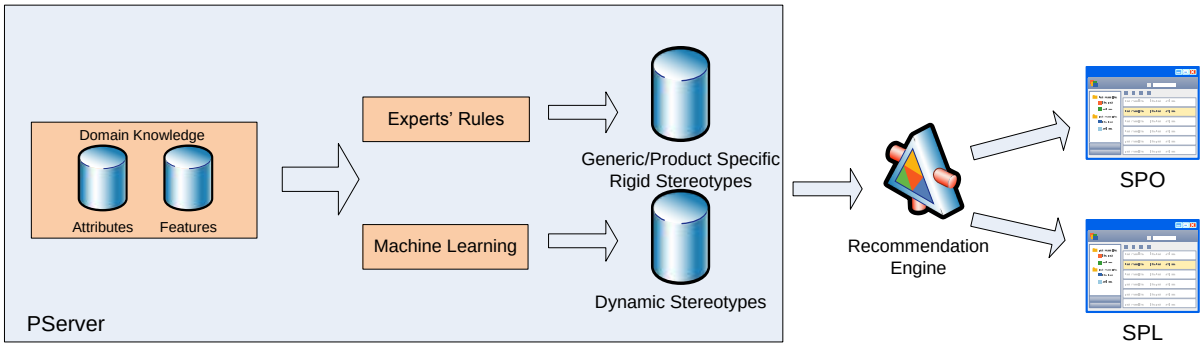

Figure 1: PServer & Recommendation Engine

The various types of recommendations provided by the Recommendation Engine are described in the following sections.

3. Generic style advice rules

Generic style advice rules, associate customer attributes to garment features. The attributes which are stored on the PServer are *overallBodyType, humanColourStyle and occasion*. The values that are valid for each attribute are given in the following tables:

overallBodyType							
description	average	Inverted triangle	triangular	hourglass	Oval/round	straight	square

Table 1: Body Type Attribute values

humanColourStyle	Spring	Summer	Autumn	Winter

Table 2: HumanColourStyle Attribute Values

occasion	officeWear	executive	interview	cocktailHour	dinnerParty	officeParty

	luxury	weddingGuest	cityBreak	country	creative	sportswear

Table 3: Occasion Attribute Values

A generic style advice rule provided by the recommendation engine to SPO is given below, which suggests a set of garment features for three attribute values. The numerical values in features suggest the degree of recommendation. Thus, 1.0 stands for highly recommended, 0.5 for medium recommendation, and -1 for negative recommendation.

```
Attribute1: overallBodyType= hourglass
Attribute2: humanColourStyle= spring
Attribute2: occasion= executive

Feature1:  garment.overall.dress.Flared =1.0
Feature2:  garment.overall.dress.Princess =1.0
Feature3:  garment.top.jacket.fittedSB =1.0
Feature4:  garment.colour.bright =1.0
Feature5:  garment.colour.light =1.0
Feature6:  garment.colour.warm =1.0
```

4. Product specific style advice rules

Product specific style advice rules, associate customer *overallBodyType* attribute to specific garment features. The values that are valid for the attribute are similar to those in Table 1. A product specific style advice rule provided by the recommendation engine to SPL is given below:

```
Attribute1: overallBodyType= hourglass
Attribute2: humanColourStyle= spring
Attribute2: occasion= executive

Feature1:  jacket.numberOfButtons = 2
Feature2:  jacket.backVent = middle
Feature3:  jacket.hem = round
Feature4:  jacket.laper = notchRound
Feature5:  jacket.pocket = no
...
...
...
```

5. Dynamic style advice rules

Dynamic style advice rules are created using machine learning techniques. The methodology is described in D.2.7 document. PServer stores a set of rules which correspond to groups of garments. The input to the recommendation engine is a set of customer measurements such as *Neck, Chest, Waist, Wrist Left* and *Wrist Right*, as well as a set of garment purchased by customers. The data set upon which the rules were derived was provided by Customax. The data form, and consequently the rule form is not entirely in accordance with the previous expert derived rules used in SPO and SPL. The reason is that there were not yet any significant amount of user interaction data with SPO, and consequently the Customax data set could serve as a proof of concept. That said, the methods we have developed for dynamic style advice are general enough and can applied to any customer data set. The output rules are as follows:

Rule 1

if Measur.1=40.402709 [+-10%] ➔
MD Slim Waistcoat|MD Slim Blouse|O Trend Trousers|O Trend Jacket|MD Slim Top|MD Waistcoat|O Overcoat|

Rule 2

if Measur.3=105.474909 [+-10%] ➔
MD Slim Waistcoat|MD Slim Blouse|O Trend Jacket|MD Slim Top|O Trend Overcoat|MD Skirt|O Overcoat|

Rule 3

if Measur.1=40.402709 [+-10%]➔
MD Slim Waistcoat|MD Slim Blouse|O Trend Trousers|O Trend Jacket|MD Slim Top|MD Waistcoat|O Overcoat|

6. Conclusions and future work

The Recommendation engine has been implemented as a client of the PServer. The final version of the Recommendation Engine supports three types of style advising, i.e., generic, product specific and advice based on dynamic user information.
As a future work, the Recommendation Engine could be evaluated by real customers in order to compare the various style advising techniques. In particular, the expert derived style advice rules could be compared to the dynamic stereotypes, which are data derived.