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# Combining Configuration and Evaluation Mechanisms to Support the Selection of Modular Insurance Products

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# Combining Configuration and Evaluation Mechanisms to Support the Selection of Modular Insurance Products

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***Abstract*–The predominant mechanisms for helping users find products in electronic catalogs are hierarchical navigation and text-based searches. Advanced electronic product catalogs also offer support for feature-based search or interactive product configuration. However, these search mechanisms are only appropriate if the space of products to be presented conforms to a number of simplifying restrictions. In this paper we describe an experiment in which we explored how the product space of Swiss health insurance offers, for which these simplifying assumptions do not hold, can be made accessible by combining mechanisms for feature-based search and interactive product configuration.**

**Keywords:** e-commerce, buyer decision support, product comparison, configuration, complex products, mass customization.

## I. Introduction

The number of Internet users and the amount of goods sold over the Internet are increasing rapidly. An important factor for the success of online shops is the breadth of their portfolio and the support they give to customers in finding suitable products [1,2]. New mechanisms and solutions must be developed to support the growing complexity of customer and market needs. Today a number of support mechanisms are offered by online shops to fulfill shoppers' needs for searching product information. The most common mechanism is hierarchical product listing in combination with text-based search mechanisms. For example, a shopper visiting a hierarchically organized online computer shop like PC-Zone (www.pcZone.com) might see links labeled 'Hardware', 'Software', etc. on the home page of the shop. These links lead to HTML pages, which further specialize the product types. Finally, at the leaves of the navigation tree, shoppers will find the actual products offered by the shop. Shoppers who know exactly what they are looking for are sometimes better served if they use text-based search mechanisms. In that case, shoppers can type in keywords, submit their search, and then receive a list of pages that contain the specified keywords. Pure text searches, however, will seldom return satisfactory results [2].

Two mechanisms that go beyond hierarchical and text-based product searches are feature-based product retrieval and interactive product configuration. Examples of sites that offer feature-based product retrieval are Exite (www.exite.com) and ZDNet (www.ZDNet.com). At Exite, shoppers can specify through menu selection the product feature constraints they desire. For example, a person looking for a PC might enter that the desired computer should at least have a 9 GB hard disk and a 400 MHz processor. The response to such requests is a list of offers matching the query. The ZDNet catalog (based on technology by PersonaLogic, www.personalLogic.com, as of April 1999) goes a step further in that it allows shoppers to specify not only "hard" feature constraints (i.e. required criteria), but also "soft" evaluation constraints, which are used for ranking the products according to how well they match the specified constraints.

A quite different type of electronic catalog is the interactive product configuration catalog, such as the one operated by Dell to market their computers (www.dell.com). Here users do not compile queries and receive lists of results, they configure 'their' computer by selecting components. Thus, to select a laptop computer with a 9 GB hard disk and 400 MHz processor, the shopper will first select a laptop as the base unit, then add a hard-disk drive of the desired size, and finally add a processor with the appropriate speed.

The main problem with the above-mentioned search mechanisms is that they are appropriate only if the space of products to be presented conforms to a number of simplifying restrictions. In this paper we describe an experiment in which we explored how the less restricted product space of Swiss health insurance offers can be made accessible by combining mechanisms for feature-based search and interactive product configuration.

## II. Insurance: A Complex Product Space

The problem with current mechanisms for interactive product selection is that they do not scale to marketplaces with configurable offers from multiple suppliers.

Insurance is a good example of just such a product space. It is often purchased as a result of a comparison of offers from more than one suppler, in many cases with the help of an independent adviser. It is also typically the case that the insurance products offered are modular, with a core base product and a set of selectable options which have often been selected or configured based on a combination of the requirements and risk characteristics of the customer.

For insurance products, pure product configuration mechanisms are not satisfactory because for each configuration

selected there are products from multiple suppliers that satisfy the stated configuration constraints. Current configuration catalogs are designed in such a way that they always only display *the* single configuration that satisfies all the requested features. This is a problem if offers come from multiple suppliers, where there is likely to be a need to display several offers, perhaps from different suppliers, each of which equally satisfy the customer's requirements.

The use of a purely feature-based retrieval catalog for insurance products is also problematic. As these products are configurable, each supplier can respond to a request with a potentially long list of similar configurations. Currently, sites such as ZDNet handle this by including only a small number of configurations in their product list and letting users deal manually with the added costs of potential upgrades. This works satisfactorily in the computer domain because modules (e.g. computer memory) and product features (e.g. memory size) coincide and the modules for different computers are available at very similar prices.

This situation tends to be different, however, with insurance. Let us consider the area of health insurance product selection in Switzerland as an example. The Swiss health insurance market was liberalized in 1996 and since then, insurance providers have begun to market their offers as collections of modules that can be added, omitted and combined quite freely. Compared with computer products, health insurance offers are more complex for the following five reasons.

1. In the computer domain, modules are quite standardized and have comparable prices for similar functionality. Health insurance modules are not standardized, differ from provider to provider, and are difficult to compare.
2. In the computer domain, modules have a most significant feature that can be used for module selection (e.g. hard disks are selected by their size). Modules of health insurance policies often cannot be characterized by a single product feature. For example, a "Plus" module might include coverage for services as unrelated as alternative medicine and eye glass replacement.
3. In the computer domain, product features are determined each by exactly one module. For example, the hard-disk size of a computer is determined by the size of the built- in hard disk. Contrary to this, one feature of a health insurance policy might be influenced by multiple modules. For example, the level of hospital coverage can depend on multiple modules.
4. In most consumer computer online shops, prices do not depend on who the shopper is. In the insurance domain, policy modules are almost always individually priced and some modules or combinations of modules might not be available to all customers. For example, it is not surprising that the gender and age of a person will have a significant influence on the price and availability of a module that includes maternity coverage.
5. In the computer domain, prices of modules cannot be influenced by the buyer. Contrary to this, insurance policies often provide the possibility of reducing the price of modules by choosing a higher deductible.

As a result of the structured complexity of insurance products, neither today's product configuration catalogs nor today's feature-based product retrieval catalogs are appropriate for supporting consumers to decide among insurance offers from various suppliers. Pure product configuration catalogs do not work because of the above-mentioned problem of hiding all but one configuration. Moroever, pure product retrieval does not work because the free combinability of modules in combination with multiple deductible options results in a very large number of possible offers to a client. Displaying all these variations in a long list can be confusing, and the exact differences between offers are difficult to communicate. Furthermore, product information for each configuration has to be transferred to the user's machine, which results in long waiting times for the user.

Based on these observations we decided to combine mechanisms for product configuration and feature-based retrieval for prototyping an electronic health insurance catalog. For this we built on existing components for feature-based product scoring and extended them to manage configurable products. Below we first briefly describe the interactive product scoring components we used, and then describe how we extended them to handle configurable health insurance policies from multiple providers.

### *A. PSC: Feature-Based Scoring of Simple Products*

PSC (Product Scoring Catalog: [3,4]) is a Java-based application framework for the rapid development of interactive, feature-based product scoring catalogs. The core of PSC is the product scoring catalog component, which serves as an active database of product information and associated scoring information. The scoring catalog evaluates products according to an additive value utility function [5]. The scoring catalog assumes that products are described by a set of features with associated values. To score a product the catalog computes the weighted sum of the scores reached by each product feature.

The scoring catalog component can be plugged together with components that retrieve product information (cf. Fig. 1, "Product Retriever") and with components that display the information in the scoring catalog to the user for interactive manipulation ("Catalog Explorer" cf. Fig. 2). The mechanism we use for enabling plug-and-play between these components is the javax InfoBus framework.

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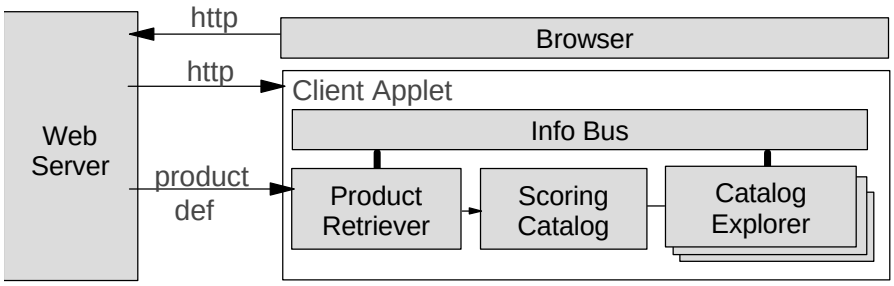


Fig. 1. Basic PSC components.

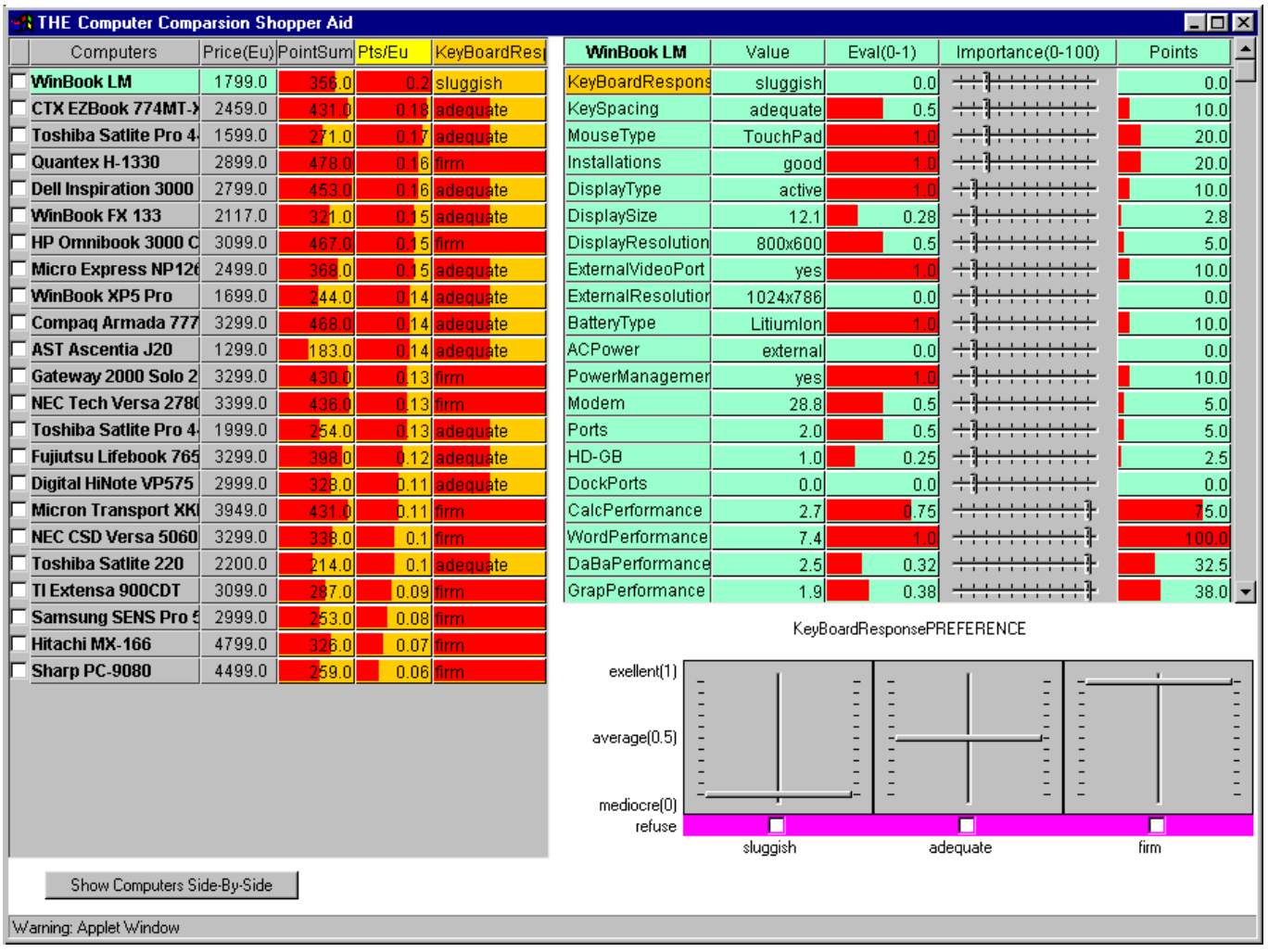


Fig. 2. Example user interface of a PCS Interactive Explorer for evaluating a catalog of laptop computers. The list on the left contains the evaluated computers with columns for price, points, points per price unit, and the values for the attribute selected in the left-hand table. The table on the right shows the attributes of the laptop computers with columns for the attribute values of the currently selected product in the left table, the associated evaluation, the importance of the attribute, and the total points of the product for that attribute. The table also provides a slider for manipulating attribute importance. The area at the bottom right provides sliders to change the evaluation rule of the attribute selected in the table above.

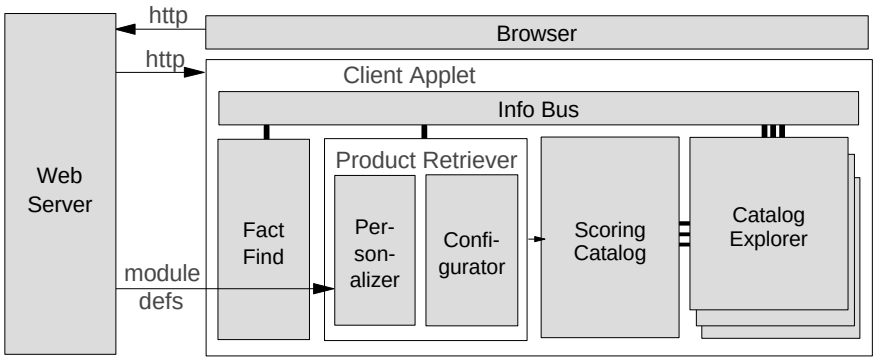


Fig. 3. Extended architecture of PSC+ to handle health insurance products.

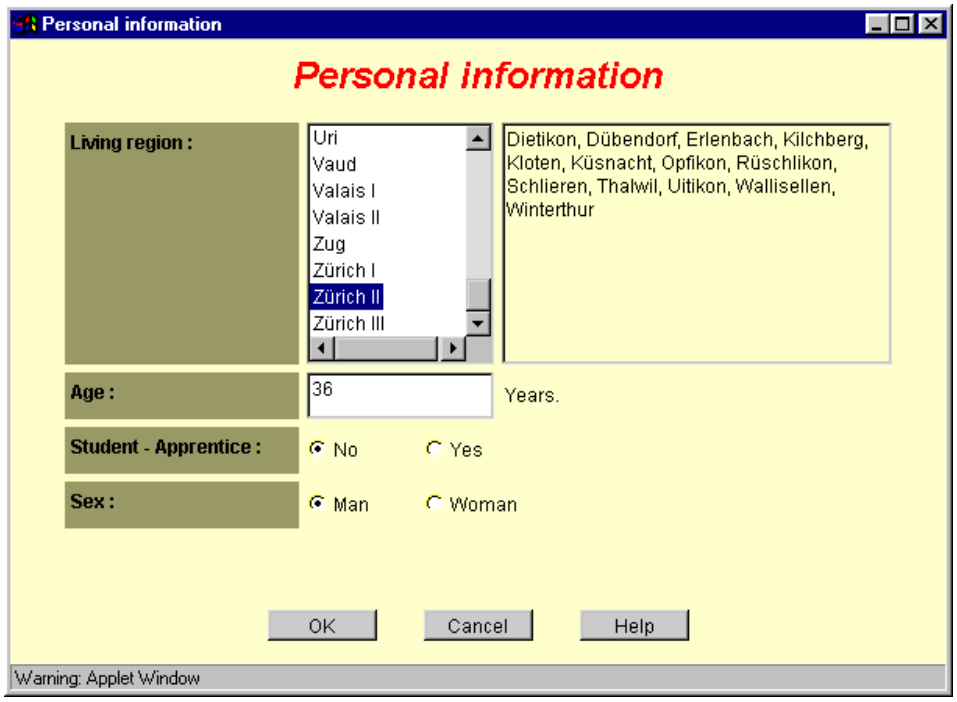


Fig. 4. User interface of the "Fact Find" for collecting profile information from the client.

### B. *PSC+: Scoring Configurable Products*

For the PSC components to work properly in the health insurance domain we extended their capability to cope with the complexity of products in this domain. First we introduced a *Fact Find* component that requests initial profile information from the user (cf. Figs. 3 and 4). The *Product Retriever* component was extended to contain two subcomponents: the Personalizer and the Configurator. The *Personalizer* component reads the product module definitions stored on the server in a heath insurance-specific RosettaNet-based (www. rosettaNet.org) XML format. To read the information we use the IBM XML 4 Java Parser. The Personalizer uses the module definitions together with client information collected by the Fact Find component to determine the price and availability of insurance modules with various deductibles.

The *Configurator* component prompts the user to supply information about which offer features the user requires and which features will be used for evaluating the offers (cf. Fig. 5). This information is used to filter and score offers, and to personalize the evaluation interface to display only those offer features that are of interest to the user. The Configurator then uses the information about available modules to create an active scoring catalog with all valid offers. Here we decided to have each offer represent a set of offers that have the same module composition, but with a different deductible for each module. This decision also

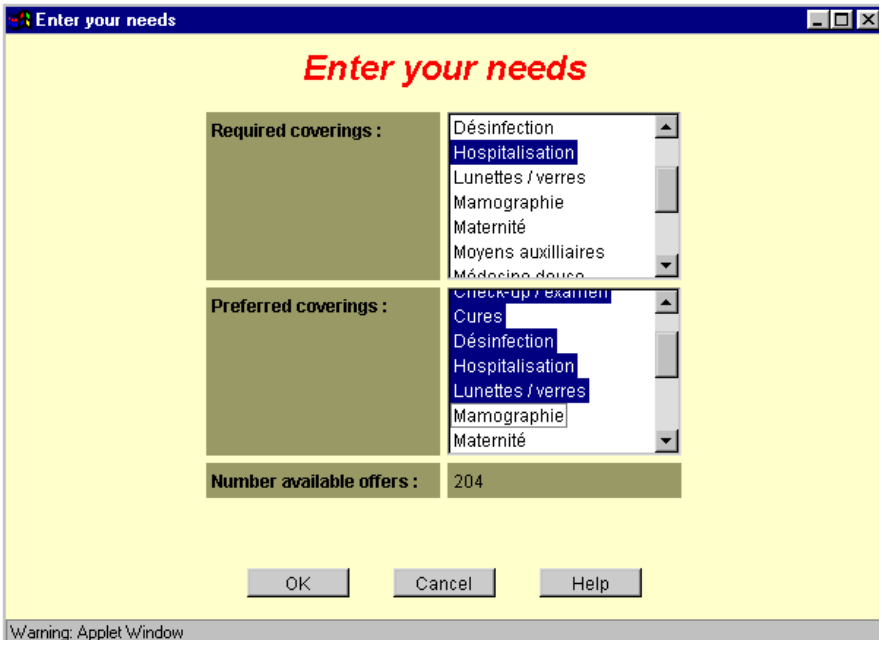


Fig. 5. User interface of the "Configuration" component to determine attributes for filtering and evaluation.

affected the *Scoring Catalog* component, which we extended to be able to deal with the selectable deductible levels.

The *Interactive Catalog Explorer* component (cf. Fig. 6) was extended in two ways. First, we provided mechanisms for users to select interactively the desired deductible for each module. The second extension was triggered by the fact that despite the reduction of offer configurations into offer sets with equal module composition, the number of possible module compositions from each supplier still turned out to be quite large. We therefore decided to display in the interface only the ten best offer sets from each supplier.

## III. Discussion

In the previous section we presented how we extended the PSC framework for building product evaluation catalogs with mechanisms for individualization and configuration. Such product catalogs provide support mechanisms for buyers to identify the most appropriate health insurance policy. Although the domain of such goods as computer products is less complex than that of Swiss health insurance policies, we did not have to increase the complexity of the selection interface dramatically. Apart from the selectable deductibles we were able to keep the interface for selecting the laptop computers in PSC (Fig. 2) and the user interface for selecting health insurance offers (Fig. 6) the same. We achieved this by transforming the buyer's task of parallel composition of modules from multiple providers into a comparison task in which configuration is performed automatically for the buyer based on his or her stated preferences. From the perspective of the buyer the offers presented for comparison are different policies to choose from. The fact that some of them have been created by combining some of the same building blocks is only visible to the buyer who investigates the name of the offered policies in more detail to deduce the way a policy has been composed. The only "configuration" task left to the buyer is to choose the deductible for each of the modules offered.

Qualitative user tests of the PSC catalog explorer user interface in the computer selection domain [3] indicate that the use of an interactive scoring mechanism increases the confidence of users in the correctness of their buying decision. Confidence in a decision is also an important factor in the area of health insurance selection, as health insurance premiums make up a sizable part of an average household's expenses.

This result supports the use of the PSC scoring in the domain of health insurance. However, in the same study we also found that people who had never used scoring schemes before for making buying decisions need guidance to understand the underlying mechanisms at work. The current Explorer interface is most useful for brokers who use such an interface more frequently. More testing and refinement of the current Catalog Explorer interface is necessary to ensure ease of use and buyer confidence for "walk-up-and-use" self–service buying over the Internet.

Apart from the possible improvements in the area of user interfaces we also identified some performance limitations of

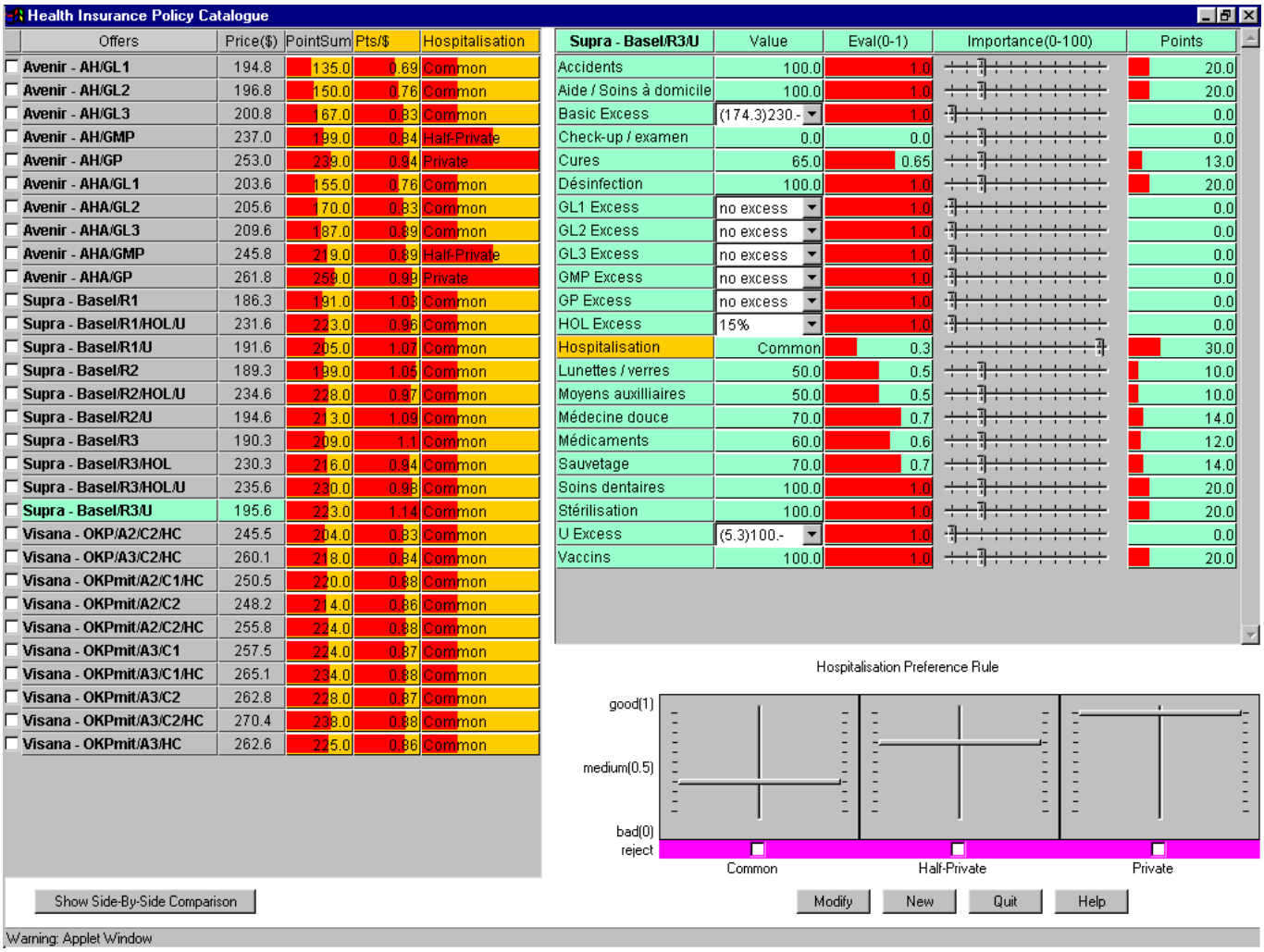


Fig. 6. User interface of the "Interactive Explorer" component for insurance offer evaluation. Note that values for "Excess" attributes (i.e. deductibles) are in drop-down menus and can be changed by the user.

the chosen architecture. The main point here is that the loading of the complete module definitions by the Personalizer component is too resource-intensive. Currently the complete pricing tables are transferred as XML documents to the client. However, most of this information is discarded and only the pricing information relevant to the current customer profile information is used. The overhead increases transfer time and memory requirements for parsing the large XML structures. The obvious solution is to use instead of the client-side "Personalizer" component, a distributed electronic market- place infrastructure, such as the ViMP framework [6,7] for server-side pricing of product modules.

A further limitation we identified is that the selection of the ten best products from each supplier is currently done only once directly after the offer configuration step. However, when the user changes the evaluation function, the set of top-ranked products from each company is likely to change. One possibility is to re-evaluate the complete set of offers dynamically each time the user changes the evaluation function. But it is still unclear what will be the implications of this approach on system performance and ease of use. Ease of use can be a problem because users have to become accustomed to seeing offers appear and disappear dynamically from the list when they change the evaluation function.

The resolution of the above-mentioned issues will provide us with a scalable solution for supporting buyer decision making in the complex area of health insurance. The added advantage is that the underlying components, mechanisms and product representations are very flexible. We therefore expect that the solution can be easily adapted to deal with other classes of insurance that exhibit similar complexities to the domain of Swiss health insurance products.

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## IV. Related Work

PSC supplies visitors of a Web shop or a Web marketplace with an interactive GUI driving an underlying scoring engine. This enables a prospective buyer to determine interactively which product best matches his or her weighted preferences. PSC+ adds configuration and personalization of offer components. To reduce the combinatorial explosion of offer configurations families of similar offers can be represented as single offers with selectable options.

From the perspective of a prospective buyer a site running PSC will seem similar to sites that provide access to information collected by shopping robots. Examples of such sites are Exite (www.exite.com) which provides access to information collected by the Jango shopping robot [8]. Shopping robots with similar information harvesting abilities are also used by mySimon (www.mySimon.com) and by CompareNet (www.compareNet.com). PSC is different from these systems in that it only provides components for interactive offer scoring and assumes that the product information is already available at a central location in a structured format. Thus PSC could collaborate with web-harvesting components like Jango that retrieve product information and place it in structured format into its central data base.

PSC is quite similar to product comparison systems like those developed by PersonaLogic (www.PersonaLogic.com) and Frictionless (www.frictionless.com). These systems let users state their preferences in terms of feature preferences and importance. PSC differs from these systems in that it offers shoppers a more flexible and interactive Java-based interface for exploring the space of available offers. PSC assumes that shoppers want to do more than just state their preferences and then receive a list of products sorted by performance. Instead PSC encourages shoppers to interactively modify their preferences and thereby to improve their understanding and confidence in their selection. PSC+ further extends PSC's functionality to be able to handle personalized and component offers. To our knowledge such functionality is currently not supported in the tools of PersonaLogic and Frictionless.

The high interactivity of PSC makes it similar to direct manipulation product data exploration systems like the Dynamic Home Finder [9], the Attribute Explorer [10], InfoZoom (originally called FOCUS: [11]), and TableLends [12]. These systems, like PSC, allow users to interactively explore a space of product information. The difference is that these system (while being graphically more elaborate) only allow shoppers to apply "hard" filtering constraints and not to express "soft" prefe rences which are used for scoring [3].

The ability of PSC+ to supply shoppers with personalized and configured offers makes it also similar to configuration systems like Dell's PC configuration system (www.dell.com) and general configuration tools like Selectica's ACE (www.selectica.com) and Trilogy's SC Config (www.trilogy.com). PSC+ model of offer components and offer configuration constraints is not as rich as the model used by the general configuration tools, but PSC+ also goes beyond what is offered by these systems in that it supports shoppers in comparing in parallel multiple configuration from multiple providers.

## V. Conclusion

In this paper we have presented PSC+, a decision support tool which helps the customer find the personalized, configurable offer that fits, or comes closest to fitting, all of his or her requirements, while still supporting the browsing and comparison of alternatives. More expensive offers which are richer in features will often be presented to a customer as the top recommendation when the customer's preferences include those features which are not present in cheaper products.

This is a considerable advance over today's *first generation* electronic insurance product catalogs, which tend to present all offers as if they are similar in all attributes except one — usually price. This situation does not encourage the customer to explore other differences among offers, and focuses their attention on the cheapest offer.

We believe that PSC-based systems can help to improve customers' confidence in their purchases, while encouraging a richer variety of offers across the insurance market, and reducing the role of price as the principal, and often sole feature upon which purchase decisions are based.

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