Service Classification versus Configuration*

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Abstract: We briefly review service classification schemes, originating especially from marketing research work, and analyze to what extent they are useful for ontology-based service configuration over the Web.

1 Introduction

Product classification schemes for doing e-business have so far focused on physical goods. Suppliers enable customers to configure a complex good (e.g. a PC) out of more elementary components and to order such a good online. Such scenarios require a component-based ontology of *goods*, specifically suited for *classification* (to allow customers to find goods) and *configuration* (to facilitate the composition of complex goods). Examples of such ontologies are UNSPSC and eCl@ss.

However, services — not goods — make up the major part of advanced economies today. As soon as the information systems (IS) tools and methods are ready (but we still have quite some way to go here), we therefore would predict that business over the Web will predominantly concern service offerings and delivery. Service management and marketing research [Grö00, ZPB01, KvHdVj99] defines services as acts, deeds or performances of a mostly 'intangible' nature. This is in contrast to physical, 'tangible' goods, i.e. the normal products that — popularly speaking — you can drop on the floor and then make a sound.

According to the service literature, many services are sold as packages, either with other services or as a combination of services and goods. As a consequence, the (economic) notion of 'service bundling' becomes important. Together, these bundled services (and possibly goods) present the value that a customer seeks [Nor01]. Hence, a service is to be seen as an activity which is about an exchange of objects of economic value (benefits) between customers and supplier. For example, a travel insurance is a service in which a customer pays money in return for the *capability* to obtain support if a predefined situation

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occurs. In our view [ABG+04], any ontology of services over the Web should include these economic facts of life; it is also our view that most don't, biased as they are to a (too) narrow computer-systems oriented perspective on Web services.

The growth of the service sector and of Internet use results in a need to automate the service bundling process, so that it can be performed online. In [ABG+04] we have described how service bundling can be reduced to a configuration task, so that existing configuration techniques can be used. This is supported by a service ontology that describes services in terms of value exchanges: a customer typically pays for some benefit (value).

A wealth of research has been conducted by researchers in marketing and management, resulting in a variety of service classifications (complementary to product classifications). The question we consider in this paper is whether existing service classifications can be used to support online service bundling, or service configuration.

2 Service Classifications: Review

In this section we briefly review service classifications. For a more elaborated literature review the reader is referred to [Lov83, CYUL04]. As early as 1983, [Lov83] published a review of existing service classifications. Two decennia later [CYUL04] found that in spite of the limitations of classifications from the 1970's and 1980's [Hil77, Sho77, Kot80, Lov83], they are still broadly being used and referred to. Various authors proposed their own classification schemes, incorporating a number of classification criteria (or: dimensions) in each scheme. Prominent examples are outlined below.

[Hil77] suggested a matrix, resulting in nine groups of services based on the following criteria: (1) the service affect goods or persons; (2) the service provides a permanent or a temporary change (to goods/persons); (3) the effect of the change is reversible or not; and (4) the nature of the mental or physical effect. This classification focuses on the nature of the benefits of a service, and was created for economic analyses. A fifth criterion is given but not included in the matrix: a distinction between individual and collective services.

[Lov83] was the first to suggest "to group services other than by current industry classifications", namely by relevant *marketing* characteristics. Instead of offering *one* classification scheme, he offered five classifications, based on five marketing characteristics of services. Every classification, consisting of 4 or 6 groups, would offer different marketing insights. The service marketing characteristics, serving as grouping criteria, are: (1) *The nature of the service act*. Services directed at people or things; tangible or intangible act. (2) *The type of relationship that the service organization has with its customers*. Formal relationship or not; continuous service delivery or delivery at discrete intervals. (3) *The amount of room there is for customization and judgment*. High/low degree of customization; degree of service personnel's judgment in meeting individual customer needs (high/low) (4) *The nature of demand and supply for the service*. Wide/narrow demand fluctuations over time; demand can be met at peak time vs. demand exceeds capacity. (5) *Service delivery*. One vs. multiple service outlets; and nature of interaction between customer and supplier (customer goes to the supplier, supplier comes to the customer, or transaction at e-distance).

In their study, [CYUL04] selected a set of eleven widely used managerial classification dimensions, and investigated how they are perceived by customers. The result is a demand-side service classification scheme, as opposed to all other supply-side schemes. Their analysis shows that two service dimensions account for 78-82 percent of the total variance in service perceptions and classifications by customers, leading to the conclusion that these two dimensions are of greatest importance for service classification: (1) personalization versus standardization of the service, and (2) presence of goods as part of the service.

We mention in passing here that it is a very different matter to what extent or even whether an ANOVA account of explained variance (the typical form assumed by many business and social studies) has to say something relevant or useful to the IS approach to services over the Web. A successful computer systems approach to services, in our view, really involves a quite different (and much more detailed and sophisticated) scientific perspective.

3 Service Classifications: Analysis

In spite of the shared understanding within service management and marketing research, there is no consensus on how to classify services. Service classifications from the 1970's and 1980's have several drawbacks. First, many schemes use only a small number of classification dimensions, failing to cover the broad scope of differences between one service and another [CYUL04]. Second, most of them have been designed from a supply perspective, rather than from a demand perspective. Third, while various authors [Rat66, KvHdVj99] acknowledge that classification dimensions should be viewed as a continuum, classification schemes typically opt for a simplified discrete approach. This might perhaps be reasonably adequate for human, managerial understanding. But, it is less clear that this might be good enough for computerization of services over the Web. From our point of view, all these classification schemes share a fourth drawback, namely their goal. They were designed for economic analyses by marketing departments, to gain strategic managerial insights into services. [Hun76] describes the goal of classification schemes: "Developing a classification scheme for services... is used for building up theories in research areas and explaining various phenomena. Classification schemes... are primary means for organizing phenomena into classes or groups that are amenable to systematic investigation and theory development." [DOH$^+$01] were thus right to notice that this work from the field of service marketing does not explicitly take into account service automation and service composition. Service automation was still in a very immature stage when these classification schemes were developed, and service composition was simply not the goal of these schemes.

Designed for marketing goals, existing classification schemes differ substantially from a — computationally adequate — service ontology for service bundling. Important conceptual differences between the two are captured in Table 1. A major difference is the level of abstraction: classification schemes facilitate reasoning on the level of abstract classes of services, whereas a proper service ontology should enable reasoning on the level of service instances, such that concrete bundles of service instances can be designed.

Table 1: Existing service classification schemes versus service ontology for service bundling

	Economic service classifications	**Service ontology for service bundling**
Function	*Divide* whole spectrum of existing services into smaller groups	*Combine* services into groups
Grouping rules	*Global rules* (hold for the whole service industry)	*Company- and domain-specific* business rules
Nature of grouping rules	Classification criteria that *differentiate* one service from another	Any type of dependency between services (e.g. difference, similarity)
Abstraction level of reasoning	*Abstract classes* of services (e.g., insurance services)	*Instances* of services (e.g., ABN-Amro private unemployment insurance)

4 Discussion and Conclusion

To support service configuration, whereby services are considered as (economic) value exchange transactions between customers and suppliers, an ontology has to (1) be designed in accordance with computational configuration theory (cf. [MF89]); (2) describe the value exchange that takes place in a service; and (3) include both customer and supplier perspectives, so that actual offerings can be matched with customer needs.

Service classifications in business studies focus on *predefined* marketing-related similarities. They do not provide a mechanism to describe a service in sufficient detail, except for grouping criteria [CYUL04]. Nor do they provide a mechanism to define relations between services (independent of their belonging to a category), since defining such relations is not required for performing the economic analyses for which they were designed. These relations are in fact configuration constraints, a required element in an ontology for supporting service configuration.

Due to their abstraction level (reasoning about service groups, rather than instances of services), service classifications lack descriptive information on value exchanges within service instances. Hill's classification [Hil77] in fact uses the nature of service benefits —the value— as a grouping criterion. Yet, also this scheme does not provide information on the actual value of a given service, but only information on the nature of value (e.g. affecting people or things; permanent or temporary, reversible or not) of a group of services.

[CYUL04] maintain that a good service classification scheme "should be based on consumers' perceptions" — i.e. use a demand-side perspective — "because it is used in explaining and understanding their behaviors about services". They offer a demand-side classification, based on customer perception of services. Yet, most schemes use supplier-

oriented grouping criteria: services vs. goods, industry, consumer services vs. industrial services and the service delivery process. None of the existing classification schemes uses both perspectives or distinguishes between two perspectives.

Consequently, existing classifications (1) do not demonstrate the configurable nature of services (for automated service configuration) because they do not cater for constraining relations between services; (2) do not describe the value exchange that takes place in a service (to select services based on desired benefits, or values); and (3) do not include both customer and supplier perspectives, to match available offerings with customer demands. We therefore conclude that they cannot facilitate the online configuration of service bundles. Hence, this is a contribution that *has* to come from the IS/CS disciplines [ABG$^+$04].

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