

# Consumer personalization technologies for e-commerce on the Internet; A taxonomy

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**Abstract.** The commercial demand for personalized information and services is increasing on the Internet. Therefore, the need for tools and methods to rationalize the information screening process arises and one solution is the use personalization methods. This paper aims to elucidate and structure the concepts, methods and technologies that are related to personalization for commercial purposes on the Internet. A taxonomy of personalization methods and technologies for electronic commerce on the Internet is suggested. The taxonomy defines three domains: Actors, Action, and Awareness. Different technological methods for personalization are described.

## 1. Introduction

Personalization, customization, individualization, adaptation, etc. are popular concepts in the commercial parts of the Internet community. According to a GartnerGroup report, the demand for personalized information is increasing rapidly and will by the end of year 2000 be “the most dramatic trend in corporate publishing”. [1]

With an increasing information supply [2], the use of personalization gives a consumer promises of timesaving and better matching of given service or product to desire. Businesses see the opportunity to increase the consumer’s satisfaction and the effectiveness of marketing efforts by learning their behavior and being able to pinpoint each individual’s preferences and adapt their offerings accordingly.

Therefore, the need for tools and methods to rationalize the information screening process arises and one solution is the use personalization methods. This paper aims to elucidate and structure the concepts, methods and technologies that are related to personalization for commercial purposes on the Internet.

The question at issue is to define and structure the conceptions of personalizing methods and technologies in order to establish a taxonomy of personalizing technologies for commercial purpose on the Internet.

The following areas are not considered in this paper:

- How personalization is effected by different types of commercial situations.
- Privacy and integrity issues.
- Level of consumer satisfaction of the personalized information received.

## 2. Definition of personalization

In this paper, the term personalization is used to describe the computer-supported process of adapting an information flow and its presentation in real time according to each consumer's characteristics or predetermined preferences.

## 3. A taxonomy for personalization of commercial information

The proposed taxonomy is divided into three different areas:

- Actors, a description of the participating parties
- Action, which actor is actively performing the personalization and which actor is passively receiving
- Awareness, which actor is aware or unaware of the personalization

### *Actors*

Below is the definition of the different roles in personalization at a given time and in a specific situation. Participating actors can have different roles in different situations.

#### 1. Provider

A part, which provides personalized information to the information consumer. Is responsible for delivered products toward the consumer. Provides information and/or products with or without monetary compensation.

#### 2. Consumer

An individual who receives and consumes personalized information. In general a human being but possibly a computer based system, e.g. an autonomous agent [3].

#### 3. Facilitator

A part who provides a service which adds value to the personalization. E.g. brokers, interest groups (virtual communities [4, 5]), government, verification services [6, 7, 8, 9], financial services, mediators.

**Provider**  $\longleftrightarrow$  **(Facilitator)**  $\longleftrightarrow$  **Consumer**

In situations with more than two actors, the model can be used either to specify interfaces between actors or to specify how one actor, at a certain time, perceives the situation. By examining two actors at a time, complex systems with many actors involved can be classified using this taxonomy.

If one or more facilitators are involved, they can either take the consumer's role versus the provider or vice versa. E.g. from the provider's perspective the receiving part can be seen as the consumer either if it is a facilitator or the actual end consumer.

In the following parts, the consumer or provider can be exchanged for a facilitator.

### *Awareness*

Which actor is aware that a personalization of information is taking place and which is not?

In this model aware means that the actor is attentive that he receives personalized information, even if the consumption process in itself is passive.

Four different personalization-awareness situations originates:

1. Provider and consumer collaborates

The provider and consumer are both aware of the personalization process. E.g. services based on consumer consent using membership or preference profiles [10, 11] such as My Yahoo! or Excite [12, 13].

2. Provider deludes consumer

The provider personalizes the information without the consumer's knowledge. E.g. banner advertisement direction (DoubleClick [14]) based on consumer characteristics such as internet domain or ip-number recognition [15] or cookies [16].

3. Consumer deludes provider

The consumer obstructs information from the provider by the use of filtering mechanisms. E.g. cookie cutters or banner filters [17]. A consumer can, with the aid of a facilitator, personalize the information without the knowledge of the provider. E.g. PICS [18] supported rating services, which filters out information.

4. Censorship or fraud

Situations where neither the provider nor the consumer are aware of, that the information has been personalized. A [malicious] party (a facilitator) could intervene and alter the information. E.g. censorship performed by an organization or government could block out or alter information.

		Provider	
		Aware	Unaware
Consumer	Aware	1 Provider and consumer collaborates	3 Consumer deludes provider
	Unaware	2 Provider deludes consumer	4 Censorship

*Action*

The assumption is made that if an actor is aware, he can be either active or passive in the process of doing personalization and if the actor is unaware he is passive.

Active

The actor is requesting and performing the personalization himself (by aid of computerized system).

Passive

The actor is receiving adapted information and only consumes.

Applied on the awareness grid the following cases emerges:

1. Personalized pull

The consumer is actively requesting personalization of information and the provider participates.

- I. The consumer identifies himself and requests personalized information.
- II. The provider assembles the information according to the consumer's request.
- III. The personalized information is presented and consumed.

2. Provider personalized push

The consumer is unaware that the received information is personalized.

- I. The consumer is discovered by the provider either by identification (e.g. cookie or membership) or the provider figures out the characteristics of the consumer (e.g. IP-number).
- II. The provider assembles the information accordingly.
- III. The personalized information is presented and consumed.

3. Consumer personalized pull

The consumer personalizes the received information. The provider is unaware of the consumer's action.

- I. The consumer requests information.
- II. The provider sends information to the consumer.
- III. The information is personalized by the consumer and consumed.

4. Unaware personalization (e.g. censorship)

Nor the consumer neither the provider is aware or active in a personalization process. A third part intervenes.

		Provider	
		Active	Passive
Consumer	Active	1 PULL	3 PULL
	Passive	2 PUSH	4 Censorship

## 4. Technology

The following methods and technologies are important when performing personalization. A personalizing system is not constrained to use only one method. Most of the existing personalizing solutions are using hybrids of one or more of the below mentioned methods. This presentation is not complete, other methods exist.

### 1. Operational method

Generation of basic data (e.g. the consumer's preferences) by letting the consumer answer a set of questions (e.g. filling out a form) and then performing a statistical analysis according to predefined models. The result is a consumer preference profile that is used for personalization.

### 2. Rule based systems

A set of predefined rules based on formal logic governs the personalization process. The rules decide how the information is to be adapted depending on the consumer's actions. Ranging from simple mail filters [19] to complex expert systems.

### 3. Data mining

A set of tools to perform operations on large amounts of existing data to find patterns and correlations. Using the found patterns and correlations in conjunction with, for example a rule based system, the information to the consumer can be personalized.

Log file analysis is an example of data mining. E.g. IBM and National Hockey League's Interactive Cyber Enterprises (ICE) project, which allows on demand data mining in player and game statistics. [20]

### 4. Artificial neural network

Artificial neural networks are constructed on the basis of the neural pattern of the human brain. A neural network consists of simple units coupled together where the wiring schemata decide the function of the network. According to the DARPA Neural Network Study [21]: "... a neural network is a system composed of many simple processing elements operating in parallel whose function is determined by network structure, connection strengths, and the processing performed at computing elements or nodes."

By using artificial neural networks for learning (or at least parts of) the consumer's commercial behavior personalization can be done.

### 5. Social filtering

A form of data mining where the consumer's preferences and history are compared with other consumers' preferences and history. A social filtering system has the ability to identify users with similar interests. Corresponding interests and correlations are sought for and are used for personalizing the information. The personalization process is depending on the activity and size of the user base. [11].

Personal integrity is an important part of personalizing. The provider has the opportunity to collect information about the consumer and use after will. Organizations and standards such as TRUSTe [9], PICS [18], and P3P [10] provide tools and platforms that can ensure the individuals integrity.

The PICS specification enables labels (metadata) to be associated with Internet content. The PICS labels can be used for filtering information.

P3P is a standard for trusted and informed on-line interactions. For personalization purposes P3P can be used for providing a standardized preference profile, which doesn't only contains the consumer's preferences concerning information content but also privacy and accepted use preferences. Parts of the process of choosing and negotiating can be delegated to a P3P system and by so providing personalization in it self. P3P can also work as identification for individuals. P3P depends on XML [22] and RDF [23].

The HTTP state management mechanism [16], known as cookies, plays an important role in personalization because it gives the provider an ability to identify the individual consumer over time. The process; the provider writes an identification tag to the consumer's computer. Every time a consumer request information from the provider, the provider checks for the identification tag and can use the knowledge to learn the consumer's behavior to use it for personalization.

## 5. Conclusion and industrial benefits

There are opportunities for businesses to increase the consumer satisfaction and the effectiveness of marketing efforts by learning the consumers' behavior and/or by being able to pinpoint each individual's preferences and adapt the offerings accordingly.

A major benefit and a driving force for buyers and sellers who use personalization technologies is the saving of scarce resources, such as time, that are spend to find information for conducting business.

The use of the proposed taxonomy increases the understanding and facilitates the process of choosing and developing the appropriate methods and technological systems for business by providing the opportunity to compare and benchmark different systems in a structured and efficient way.

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