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# Personalization/Computer-Tailoring in Persuasive Technology: Tailoring Ingredients Target Psychological Processes

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**Abstract.** Personalization or computer-tailoring refers to the adaptation of the output of a persuasive technological system to the individual. To be able to produce the tailored persuasive output, individual characteristics must be known to the computer system, for example, through sensors, data-bases, or self-report questionnaires. This information is used to compose a personalized output on the basis of decision rules that determine what pieces of possible output in the message library are needed to compose a complete personalized output. To compose messages for individuals that are effective, it is essential that in this procedure psychological processes are targeted. This is done using tailoring ingredients. At this moment 5 classes of tailoring ingredients are distinguished: Personalization, feedback, content matching, source matching, and exposure matching. Each of these classes contains 2 or 3 tailoring ingredients that will be explained and illustrated in this article.

## 1 Introduction

Persuasive technology can have many different faces but one unique possibility is to personalize its persuasive output: Personalization or computer-tailoring refers to the adaptation of the output of a persuasive technology to the individual. Instead of treating populations of people as homogeneous or composed of some large segments, personalization acknowledges differences between individuals that may be relevant for the effectiveness of the persuasive attempt.

To be able to produce the personalized persuasive output, individual characteristics must be known to the computer system, for example, through sensors, data-bases, or self-report questionnaires. This information is used to compose a personalized output on the basis of decision rules that determine what pieces of possible output in the message library are needed to compose a complete personalized output.

To formulate and compose messages for individuals that are effective, it is essential that in this procedure psychological processes are taken into account. The combination of technological possibilities and how these are used to target specific psychological processes are called tailoring-ingredients [3]. These are the observable elements in the output of persuasive technology that take into account the individual. Thus, tailoring ingredients are the core elements of personalization, and, thus, of the possible higher effectiveness of personalized persuasion compared to general or only segmented persuasion. To further increase effectiveness, these tailoring ingredients

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must be developed and studied further. In this paper a renewed taxonomy of tailoring ingredients is presented, based on our earlier work [1,2,3,4].

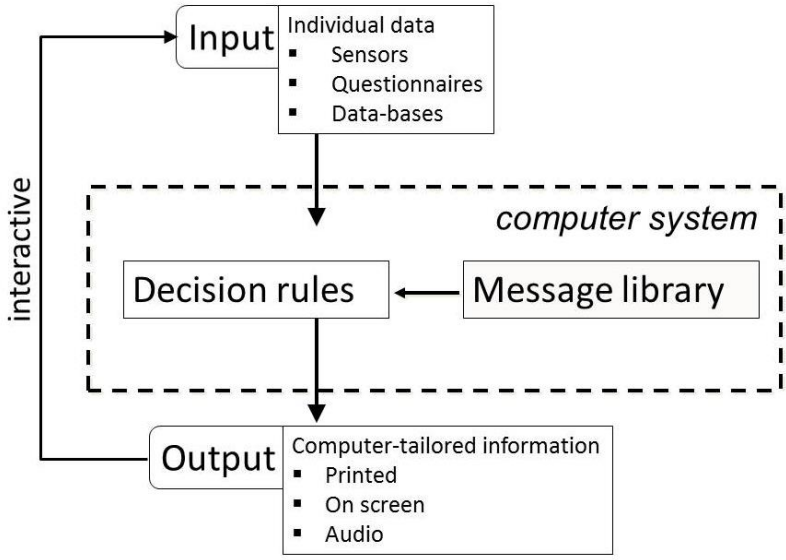


**Fig. 1.** The process of computer-tailoring

## 2 Tailoring ingredients

At this moment 5 classes of tailoring ingredients are distinguished: Personalization, feedback, content matching, source matching, and exposure matching. Each of these classes contains 2 or 3 tailoring ingredients that will be explained and illustrated in this paper. As displayed in Figure 2, the content information of a persuasive message can lead to cognitive changes, and subsequent behavior changes. Tailoring ingredients activate "extra" psychological processes that further support this persuasive process. For some ingredients the plausibility and evidence of effectiveness is high, while others need further development and testing: Testing of the relations to psychological processes, of the technological possibilities, and of the integration of different ingredients in a persuasive technological system.

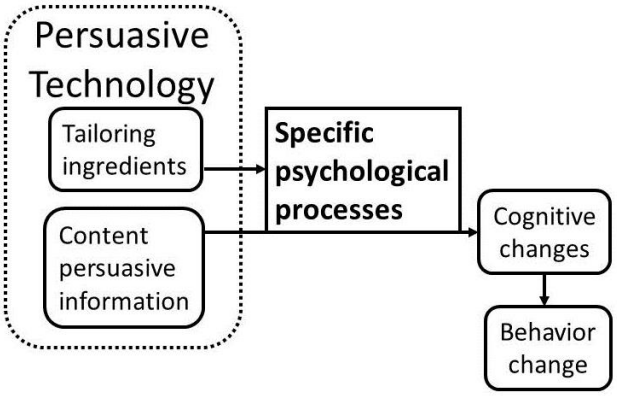


**Fig. 2.** Tailoring ingredients induce "extra" psychological persuasion processes

### 2.1 Personalization

Personalization is sometimes used to refer to the general idea of individualizing, tailoring or adaptation of persuasive messages. But not here; here it refers to one specific type of tailoring messages. At least three ways of personalization are defined: *Identification* refers to mentioning the recipients' name (e.g., dear John) or a composite of recognizable individual features, that together describe the recipient. This can be effective in stimulating persuasion because it induces self-referent encoding [2]. This is the processing of the incoming information "as if" it is especially relevant for the person, which can lead to more elaboration and longer lasting effects. A second means of personalization is *raising expectations*. This tailoring ingredient installs the expectation in the recipient that the presented information, again, is especially meant for the recipient. This will only work when the recipient understands how this "personal information" was composed. Therefore, it can only be used in the context of a plausible procedure, such as having answered some questions on a website. Another way of personalization is *contextualization*. In contextualization the context of the information, like the wording, photos, logos, colors, styles, are based on personal characteristics or preferences. For example, for a person living in a rural area a persuasive text on outdoor physical activity may include another picture than for a person living in large city. This contextual feature in the message may attract attention, may influence the attitude towards the message, and may relate to the recipient's identity.

Importantly, all personalization items in messages are not about the content arguments or recommendations; personalization items do not have any persuasive power on their own, they only embed the content information in a more personally relevant or recognizable context. General arguments and recommendations can be experienced as highly personal when personalization is applied correctly.

### 2.2 Feedback

There are various types of feedback that may be used to persuade people and influence their behavior. The concept of feedback can be understood in the context of the control theory [5]: People set themselves goals (e.g., not gaining body weight) and behave according to these goals (avoid fast foods). The effects of the latter behavior (e.g., on body weight) are fed back to the person; this is feedback information. This information is compared to what is expected and desired (the standard), and given meaning. When the feedback indicates that the effects of the behavior are not up to one's standard, the evaluation is negative or discrepant and the behavior is adjusted to try to reach the standard.

The most basic form of feedback is to provide *objective feedback*, for example, on the number of steps taken on a specific day: "You made 2358 steps today". *Comparative feedback* might state: "Compared to yesterday [or to other people] you made 280 steps more". Whether objective or comparative feedback will have behavioral effects depends on additional psychological factors. Firstly, objective feedback can only lead to behavior (change) when people understand that the fed back information is an indicator of something they value, for example, they know that making steps contributes to good health. Second, people should have knowledge

about what is a relevant level of the indicator; how many steps are healthy? It is possible to combine the objective and comparative feedback with more information: In *evaluative feedback* the feedback is given meaning: "You made 2358 steps today, that's ok [or that is near to your goal]", while in *action feedback* people also receive a behavioral recommendation: "You made 2358 steps today, that's ok, you should go on like this". In the latter case, the meaning as well as the behavioral consequences are not left to the person. Other theoretical foundations are available for the formulation of the feedback [6].

Feedback by definition is personal and might have a personalization effect; it indicates that the information is especially about the person and it might lead to self-referent encoding. In addition, feedback works because it provides information on the extent to which a person attains his or her personal goals, and the related desired outcomes. This has motivational effects.

### 2.3 Content matching

The core of persuasion is the arguments and recommendations: Why should one engage in a certain behavior, and how can this be done? Content matching is about the matching of this content information to individual characteristics or preferences. In *objective matching* only arguments and recommendations are provided that are objectively relevant or possible for the person. For example, when a person has no car, the argument "to save money for fuel" is not appropriate. Similarly, when a person does not have a partner, the recommendation "to ask one's partner for support" should be avoided.

*Value matching* is about matching the arguments to peoples' values. The idea is that values determine what outcomes in arguments people are motivated by. When people find their social identity important [7], the argument to buy healthy foods "as many others of your community already do" may be seen as a good argument. There are several ways to assess peoples' values and multiple mechanisms have been proposed [3]. Matched arguments lead to stronger motivations to change the behavior. That is, people define themselves largely by the values they endorse, and arguments that are related to these values come close to their person.

*Recommendation matching* refers to matching the recommendations to peoples preferences or style [8]. For example, in the context of making a health decision we might recommend to "Think about this yourself and you decide what you really want". However, when a person normally depends a lot on what others think this recommendation might not be realistic. Instead, thinking along with the person might be more effective, like: "Talk about it with the person you trust the most on this". This matching might work as it focuses on what the person is good in and feels confident in doing, instead of teaching the person to behave in a "new" way. This also increases the probability that the person will follow the recommendation in the first place.

These ways of matching content information may change behavior because they are related to the basic causes of behavior: Expected outcomes and perceived control [9]. Tailored messages that only use these matching principles may not be recognizable as tailored [2]: They do not need to be explicit about the matching; they can be written "as if" they are for a general audience. Thus, recipients may not be

aware that a message is matched, although they may feel that the information "does fit".

### 2.4 Source matching

The tailored information is provided by a source, in the background or on the fore front. The background source is the actual organization that is responsible for the persuasive information, for example, the ministry of traffic or the cancer society. Matching this might be effective, as some people may have negative attitudes towards some sources, but disguising the actual source may not be ethically sensible. On the other hand, the front source is the source in the persuasive message who provides the information, who is communicating to the recipient. Although it is possible to present a "neutral source" by just not mentioning or suggesting a specific source, it is probable that the persuasive message might be supported by a matched front source [10].

In *testimonial matching* the characteristics of a witness who gives his or her testimonial on a topic - including arguments and recommendations - may be adapted to the recipient in several ways. The effects of this matching may be the activation of social comparison processes. Social comparison is a very common psychological process in which a person compares oneself on relevant dimensions with another person. For social comparison processes to be initiated there must at least be some basic comparability. For example, a 22 year old woman might not start comparing health behaviors with an older man. Thus, comparability must be present on some relevant dimensions, not necessarily gender or age, but also possibly on a common religion or belief, the place of living or one's past experiences (e.g., having traveled to India). By shaping the witness of the testimonial similar to the recipient on specific dimensions, the social comparison may take the form of identification or assimilation with the witness. The recipient may find the information that is provided by the witness relevant and reliable, which supports persuasion. One specific way to match the testimonial is to present the witness as an "in-group" member [11].

In *messenger matching* the tailored information is provided by a source but not about the source, as in the case of a testimonial. Various sources may be used with their own characteristics. For example, one source may be one's avatar. This avatar might "talk" to the recipient, might provide arguments and recommendations and mimic "self-talk" [12]. Another source might be "a computer" that might be expected to be very objective or neutral, with or without a name. The source might also be an expert talking to the recipient and telling about arguments and recommendations, for example, a doctor, a psychologist, or another appropriate person. Matching the source of the content information may make the information seem more reliable, or trustworthy, more true or relevant to the recipient, thereby supporting persuasion. Little is known yet about people's preferences for such sources but it is probably well possible to assess preferences reliably.

### 2.5 Exposure matching

Exposure matching is about taking into account recipient's characteristics to decide about the timing, intensity and the changing experience with the computer-tailored system. Little is known yet about the exact effects of this type of tailoring. In *matched timing* the recipient is contacted or provided with specific information at a specific moment in time. For example, when tomorrow is the first day of going to the gym, the night before the person might be reminded to prepare. Thus, the contact might be based on an assessment of the near-future occurrence or planning of happenings. This may support persuasion as it may prepare the psychological state that is needed at a very moment, very close in time, instead of hours or even days before with the risk of being distracted or the information being dissipated. Similarly, also the assessment of characteristics, for example, right after a happening, might be more valid.

In *matched intensity* the contact frequency, length or intensity is matched to the reported or presumed needs of an individual recipient. Individuals may differ in how much support they want in general but also around specific moments in behavior change. For example, when changing dietary behaviors some people may prefer only low frequency contact, other may want more intense support, while still others need more support in specified situations.

In *matching engagement* system features are matched to the users' experience with the computer-tailored system, with the goal to stimulate the user to use the system, return to it, and adhere to its recommendations. The essence is that the system interface is designed in such a way that it either leads to direct positive experiences with the system, caused by engaging experiences from game-like features, or to goal-related positive experiences, caused by the users' experiences that the system indeed helps to reach the desired goal of behavior change. The needs and preferences of users, and changes in needs and preferences of users may be assessed and the system may be matched to these.

## 3 Using the taxonomy

The above taxonomy may inspire developers of computer-tailored or personalized technological systems to think beyond what is technologically feasible and think more carefully how to make use of the psychological laws that govern psychological and behavioral change. Although the taxonomy of tailoring ingredients brings some order in how we can develop a system, once it is possible to gather information from an individual, in practice, the operationalization of tailoring ingredients will often be brand new. Firstly, this means that we have to rely on a specific measurement that will be used as the basis for a system decision rule. For example, we might assess a person's preference for a source. However, there is a basic uncertainty we have to cope with about whether this measure is indeed able to assess what this individual needs. As with most psychological measurements, there are substantial proportions of false-positive and false-negatives. In addition, when using a new operationalization of a tailoring ingredient, this means that only in theory it might be effective. Therefore, to build effective computer-tailored systems, new operationalizations of tailoring ingredients should preferably be tested experimentally before being applied and

integrated in a system. It is possible that a new operationalization is not effective, demanding system room that might be used by an effective element, but it is also possible that the new operationalization has negative side-effects, for example, that it leads to resistance and lowers the chance on behavior change. This is ethically very undesired. Because the tailoring ingredients relate technological possibilities to psychological laws, "pushing the right button", using tailoring ingredients means that we "play" with human psychological processes, of which many are unconscious or involuntary. Therefore, tailoring ingredients should always be used with respect for individuals' autonomy.

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