

Personal Services: Debating the Wisdom of Personalisation

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Abstract. Personalisation has been seen as the answer to the vast quantity of information now available digitally. Information is tailored to meet each user's apparent needs, whether making use of Web-based learning materials, purchasing from online sites, accessing entertainment products or any other potentially-personalisable facility. Yet before rushing headlong into personalising everything, including online learning systems, we need to consider the threats posed by the capture of so much data about individuals, the implications of personalised information delivery, and whether the benefits of personalisation justify the costs. In this paper, we look at both the issues and benefits of personalisation, and consider how to steer our way to a safe and valuable use of personalisation.

Keywords: personalisation, adaptive hypermedia.

1 Introduction

Technologies are not inherently good or bad, but are only good or bad depending on how they are used. Obvious examples include nuclear power and television, but even technologies we generally think of as "good" can be misused, such as medical advances being exploited for biological warfare.

Personalisation is one such technology whose use determines its value. Its aim is to identify and promote information most suited to the user's current needs, and is generally aimed at tailoring information and presentation to the user, rather than to the context (such as device). It does this by keeping information about the user in a user model, either persistently (where the user's details can be retrieved from previous sessions) or pseudonymously (in short-term user models where details are collected during a session but cannot be corroborated with prior sessions). This information is often voluntarily entered by the user but also is very frequently inferred from their interaction with the site, not necessarily with their explicit permission. This information includes not just personal details such as name or last item viewed, but also behavioural data, such as sequences of pages visited and purchase history.

However user models are not necessarily provided for the benefit of the user, but often aid the personalised site in its marketing. This is evident in the use of commercial recommender systems whose primary aim is to encourage the user to purchase more items by exposing them to items that other users bought, based on similar purchasing or viewing patterns.

Personalisation appears in different application areas, with e-learning one of its early application areas and the favoured demonstrator for adaptive hypermedia systems. In such systems, the benefit to the user was a priority, based on a reduction in personal interaction with the teacher. Adaptive hypermedia systems could provide specific, personalised feedback at a time when class sizes are growing and distance learning becoming more commonplace.

However e-learning personalisation systems are largely experimental, and have not achieved much market penetration or influence on mainstream teaching and learning. This is especially so when compared to e-commerce personalisation. Recommender systems are one key example of personalisation in e-commerce, very well-developed and evidently very successful, judging by their continuing development.

This paper is presented in the classical debating style: the *thesis* in section 2, where we propose that personalisation is harmful and detrimental to users and the community, the *antithesis* in section 3 where we propose that personalisation has so many benefits we cannot afford to ignore this bright new technology, and finally the *synthesis* in section 4 where we draw together the arguments and point to a middle way of sensible, considered application of personalisation.

2 Thesis - Personalisation Considered Harmful

The thesis states that personalisation is dangerous and harmful for a number of reasons: it is detrimental to security and individual privacy; it is an inherently unreliable; it has various potentially negative cognitive implications; and it creates inconsistency and disparity in outputs which can lead to an inequality of opportunity. Finally, it has no place in e-learning, its value failing to be manifested in user trials.

2.1 Security and Data Privacy

One problem that is only going to get more challenging is what happens with the increasing amount of personal data accumulating in all those user models.

Consider privacy and personal data ownership. Who keeps and owns the record of personal preferences? Can we see our own records and what right of reply do we have if that information is wrong (e.g. hypertext visionary Ted Nelson had difficulty convincing the Wikipedia moderators of his true birthdate [19])? What happens if it is released either deliberately, such as with the AOL500k query logs [1], or is breached by hackers? While these might not seem of immediate relevance to student user models, they all have consequences for students and for any personalisation that relies on user models.

Other than the obvious concerns about confidentiality, there are more insidious issues at stake. Think about how personalisation systems make assumptions and inferences about the user, what Brusilovsky called "implicit" user model data [5] derived

by recording the user's behaviour and inferring characteristics about them. These assumptions can be particularly worrisome if the user does not know the data is being collected, how accurate they are or what inferences are being made on that basis (buying a child's toy doesn't mean the user has children). Too often, there is no transparency about the inferencing rules, which may themselves be flawed.

There are implications of such inferencing rules, in particular, political and social implications, whether correct or not. This could be especially in a changing political climate. As noted in [12]: "*A particularly worrying example is that of the Morgan Stanley Dean Witter bank who "collect", among other things, details about an individual's race, religious beliefs, sexual preferences, union membership, etc. As this information is never required as part of the credit application procedures, it is most likely inferred by analysing the individual's subsequent spending pattern. This is similar to the way supermarket chains infer such things as marital status, number and age of dependents etc. using their "loyalty cards" to analyse purchasing patterns. Morgan Stanley Dean Witter also claim the right to disseminate this information*".

This exemplifies the real concern about privacy in the 21st century. 1984's Big Brother will be in the hands of corporations, not the government [12]. For students, it is generally their educational institution that holds their student records, but with educational IT increasingly being outsourced to private enterprise, student user models will end up in corporate hands, perhaps even deemed to be owned by the company providing the personalised resources. Users are becoming wary of providing data to unknown sites or for unknown purposes, and as Nielsen says "*A lot of privacy concerns have to be addressed before users will be willing to give out as much personal info as is necessary for good personalization*" [20].

A related side-effect of personalisation is that it creates associations, even where not explicit, generally by focusing objects implicitly around an entity, such as text alerts to a mobile phone, or purchase interests in "my ebay". All these things may have little importance individually, but taken together can be used to build up a "big picture" of a person and their activity. In a time of political unrest and fear, even student records can contribute towards a case against an individual, as shown by McCarthyism in the 1950s in the USA.

2.2 Reliability

Exactly how personalisation works varies wildly between different implementations. However, most of these involve the adaptation of the user experience for the individual user. This may consist of the adaptation of the presentation of content, or the navigation within that content. In order to do this, information about the user is gathered by the system and a profile is constructed from a record of the users behaviour. The generic template for constructing this profile is the "user model", which describes various features of the user, and a user model of some type is at the heart of all automated personalisation systems. There are many approaches to user modelling, but they all work by categorising the users' knowledge, interests, goals, background and individual traits in some way [8]. Many of these techniques are highly regarded by personalisation practitioners and they have been demonstrated to work well under many conditions. However, none of them is perfect. People are extremely complex, and any attempt to model human behaviour is always likely to be somewhat approximate. Any

automated personalisation system can only be as good as its underpinning user model, and any failure of the user model can have significant consequences.

Personalisation algorithms are becoming more and more reliable nowadays, yet large volume of research and studies are required to make them right. It is not surprising that a convincingly-looking *personalisation* algorithm with reasonable theoretical background may simply fail to produce desired outcome or even make the situation worse. However, even in case of most reliable personalisation algorithms, which tested and improved over many studies, the result of personalisation may be wrong due to errors on user modelling side, which result in incomplete or distorted user profile. If a system presents a user with incomplete or inappropriate information, then that system has failed in its primary objective – which is to communicate that information. If a user realises that they are being given unreliable information then that can become very disempowering, and can damage their trust in the system. This is already an issue of some public concern, and it has received coverage in the press.

Jeff Bezos, CEO of Amazon.com, once demonstrated the Amazon recommender system to an audience of 500 people, and it suggested that the movie he would most like would be “Slave Girls from Beyond Infinity” - the system had been skewed by his purchase of the cult 1960s movie “Barbarella” the previous week [11]. Shortly after this, The Wall Street Journal published an article on the perils of user modelling gone awry, entitled “If TiVo Thinks You Are Gay, Here’s How to Set It Straight”:

Mr. Iwanyk, 32 years old, first suspected that his TiVo thought he was gay, since it inexplicably kept recording programs with gay themes. A film studio executive in Los Angeles and the self-described “straightest guy on earth,” he tried to tame TiVo’s gay fixation by recording war movies and other “guy stuff.”
“The problem was, I overcompensated,” he says. “It started giving me documentaries on Joseph Goebbels and Adolf Eichmann. It stopped thinking I was gay and decided I was a crazy guy reminiscing about the Third Reich.”
 [27].

2.3 The Human Implications of Personalisation

Most computer interface designers view user empowerment to be a vital aspect of the Human Factors of software design. It is important that users feel to be in control of their own experience. Whether or not this is an issue with personalisation, depends upon how it is implemented. However, this can be an issue with many adaptation systems that aim to be transparent to the end-user. Even some recommender systems are not immune to this if the recommendations are core to the navigation of the information space. When Hypertext pioneer Ted Nelson was on a panel about “the next big thing” in Hypertext, his reaction to a presentation on adaptive hypertext [10] was to shout “*How dare your software tell me what I should be reading!*”. There are circumstances under which he has a very good point – users have the right to make their own decisions, and need to feel in control of their experience.

One of the aspirations of many personalisation systems is to make appropriate information more easily accessible for the user, given their current context and goals. However, although this seems superficially very reasonable, it presupposes that making information more easily accessible is always a good thing. While in some areas of application, such as e-commerce, this is undoubtedly true, there are some important applications, such as education, where this is not necessarily the case. In an

educational system, the ultimate goal is always to help users learn and learning is about far more than the access, reproduction and retention of information. It is about the internalization and reflection that leads to genuine understanding, and in order for effective deep learning to take place, learners should be actively involved in the design of their own learning experiences [18]. If a user is to develop real understanding of the subject matter, then sound pedagogy is critical and the user needs far more than easiest possible access to the subject matter. In a very real sense, learners need to work at learning if they are to retain information and develop deep understanding. The likelihood of serendipity is one of the great benefits of a rich information universe, and this encourages learners to “think outside of the box”. Personalisation, without careful thought about the pedagogy underpinning the instructional design, can make information too easily accessible and this could undermine the learning process. Indeed, the entire intent of personalisation is to render information into constructs that are already understood and preferred by the recipient. This removes many of the challenges involved in understanding the material and can reduce opportunities for cognitive development.

We live in a complex world, and the acquiring the ability to synthesise knowledge from disparate sources is a vital skill. Because personalisation effectively attempts to do this for the user, there is a real risk that the learning process might, to some extent, become “de-skilled” – with the system synthesising knowledge rather than the learner having to do it themselves. It also creates an unrealistic expectation of how information will be available to them once outside the educational environment.

There are other aspects of personalising that need rethinking - what becomes of serendipitous exposure to alternative beliefs, lifestyles and culture? If users filter out information that does not meet their immediate needs or wishes, they are exposed to fewer alternative belief patterns. Not only is restricting one's information diet in this way promoting an insular way of thinking, it reduces understanding between different ways of thought and might even be argued to be divisive. It is critical to apply personalisation without losing serendipity and communication between beliefs.

2.4 Inconsistent Presentation and Outputs

Many personalisation systems, especially those that utilise dynamic data, provide inconsistent results. It is often difficult, if not impossible, to see exactly the same information as another user. This is well illustrated by all of the web sites that deal with volatile information such as currency. For example EBay personalise items by showing the actual price in the original currency, alongside an italicised converted price, and many other information providers (such as weather forecasting services and search engines) filter their content according to the inferred geographical location of the user. Although this can be helpful on occasion, it does mean that the information provided is inherently inconsistent, and this could potentially give rise to inequality and inequities of opportunity. Although this might be only a minor inconvenience (if even that) with currency conversions or weather forecasts, the potential equity problems are far more serious in areas such as education.

A good example here is the research on matching learning content to student learning styles. A number of style-adaptive hypermedia system were created with an assumption that students with specific learning styles may benefit most from specific

kind of content, for example, visual learners will need more content presented as pictures. Yet, almost no success reports based on post-production user studies have been published yet. In contrast, other research indicates that students may learn better when they start with least beneficial form of content [15].

Is personalisation actually being misused in the educational context? Yates [26] hints that the classifications of learning styles are being misapplied since they were intended "to help educators recognize the broad range of human achievements, not [attempt] to restrict student instructional practice opportunities to specific domain tasks". Also he notes that it is not necessarily helpful to simplistically categorise students in this way, in fact not only is it difficult to match individual students to a learning style but that it is just as difficult to match an instructional method to a learning style. Mismatch is inevitable.

The answer is not to enforce and restrict access according to the user model but rather to make it a recommended course of action that the student can override. But even then, the "recommendation" may be more harmful than helpful if the style, individual and instruction are mismatched.

2.5 Without Personalisation

So what happens if we don't have personalisation in our computer systems? Does it really matter? Certainly in some cases it seems not, and indeed we seem to get by well enough without personalisation. Even Web and hypertext usability expert Nielsen is quoted as saying [24] that "*There's always been a lot of discussion about personalisation and the web but it has never really taken off, probably because it's not that useful. The only time online retailer Amazon has recommended a book that I really, really want is when it's a book I've already bought*". In an earlier article [20] he went so far as to say that "*Web personalization is much over-rated and mainly used as a poor excuse for not designing a navigable website*". This is not an encouraging analysis from one of the world's leading usability experts.

In some areas, such as AEH (Adaptive Educational Hypermedia), where personalisation has been widely touted as an important technology of the future, it has yet to have much impact on mainstream implementations. The reasons for this are beyond the scope of the current discussion, but this does serve to illustrate the point that whatever its possible benefits, personalisation is not absolutely needed in order to build effective educational systems. Since there are serious concerns about the wisdom (and indeed safety) of personalisation, there is a case for avoiding it entirely.

When we acquire information from any source – online or otherwise – we all get by. The information may not be in the perfect form for us, but we develop coping strategies to allow us to make effective use of it. Indeed, to do so is one of the most important skills that people need to learn to be able to function effectively in an information-rich society. Although there are a lot of anecdotal accounts, there have not been many scientific studies conducted on the effect that personalised information systems have on their users. One of the few that has been done looked at the effect that e-learning systems, personalised according to the users' learning style preferences, had upon their achievements. This work found that both for University undergraduates [3] and 8-10 year old children [4], the personalised systems had no significant effect upon learning (as measured in a number of ways). While there are

many ways of interpreting these results, a likely explanation is that even by the age of 8, people are already well-practised at extracting information from a wide range of sources, including ones that are sub-optimal for the individual. Therefore, although they might prefer to have information presented to them in one particular manner, it ultimately makes little difference to how effectively they learn. If this is really the case, then it is quite likely that, at least for education, personalisation could well be doomed to have little effect upon how people learn. However if personalisation is genuinely effective, then it is possible that the learning process could actually be damaged if presenting people with information in their preferred styles prevented them from getting practice at dealing with information in other forms.

Where personalisation has been most effective (such as in recommender systems) it has been quite small-scale and is generally little extra functionality added to an existing system. This is probably a useful thing, but the large-scale incorporation of personalisation into educational systems that make wholesale modifications to content or structure is of unproven efficacy, and has serious cognitive, ethical, and even legal ramifications and as such should currently be treated with extreme caution.

3 Antithesis - Personalisation Considered Essential

The antithesis is that personalisation is essential if e-learning is to fulfill its potential in mainstream education. It has major pedagogic benefits, it provides a cost-effective means of facilitating the uptake of appropriate information from the Internet, and it has a humanising effect upon educational experiences mediated by technology.

3.1 Pedagogy

Personalisation is very well established in the world of e-commerce. Recommender systems, usually using some form of collaborative or hybrid filtering, have been widely used for well over a decade and many commercial web sites now provide product recommendation and other forms of personalisation. Major e-commerce players such as Amazon.com, Netflix, Last.FM pay a lot of attention to personalisation because it produces a reliable result measured in dollars. The stakes are high. Netflix, for example, is offering a million dollar prize to a team, which will be able to deliver a 10% improvement in the accuracy of personalisation. Yet, the domain where personalisation is most vital is not e-commerce, but education. It is also in education that personalisation can provide its major impact, although it may be hard to measure it in dollars.

The key rationale for personalisation is that education is a very personal experience. We all have different goals, expectations and backgrounds, and we learn in many diverse ways. In conventional teaching (i.e. pre-computer), this was largely addressed by small group teaching. A teacher with a small group of students, or an individual, will generally tailor the material to the current needs of those students. This is often a dynamic process, in which a teacher will explain a concept and then encourage the learner to reformulate it and explain it back. This will expose the depth of understanding (or indeed misunderstanding) of that concept, and the teacher can then personalise subsequent explanations accordingly [17]. Large group teaching

offers much less scope for personalisation, but this was not generally a problem, because large-group teaching scenarios were generally supported by various forms of small-group teaching. However, without personalisation, e-learning generally follows the pedagogical model of lectures far more closely than it does that of tutorials. If there is no personalisation, then the learning experience can only be of a “one-size-fits-all” nature that will never be able to take into account the diversity of individual learners, or even their changing levels of understanding.

It is not surprising that the need for personalisation was recognized in early days of computer-based education. Moreover, the earliest dynamic user models were created in 1970s for so-called intelligent computer-assisted instruction systems (ICAI). Nowadays, e-learning has emerged as one of the leading application area for personalisation [5], yet it is not as widely accepted or implemented in the real-world e-learning as it is in e-commerce.

3.2 Efficiency of Information Presentation and Uptake

One of the major problems facing education in the modern world is the sheer volume of information that learners are faced with, and this issue is compounded by the fact that information on the Internet is of wildly variable quality. Finding information has never been easier. Finding appropriate information for the task at hand is often quite hard. Finding appropriate information and reifying it into knowledge is a learned skill, and if e-learning is to provide a significant component of education, then it is vital that this skill is actively fostered. This is the area where e-learning personalisation can provide a major impact. By modeling the current state of user knowledge, personalisation techniques such as course sequencing or adaptive navigation support [6] are able to guide students to the right information item or educational activity in the right point of their learning. Multiple studies demonstrated that both sequencing and navigation support can improve learning outcomes [7] and decreased time required for mastery learning.

Further impact can be achieved by adaptive presentation of content – once a proper information item or educational activity is selected, personalisation can customise its presentation to the user. Existing user studies indicate that it can increase both the speed and the quality of learning [2]. Therefore, personalisation provides a cost-effective means of filtering information that is presented to users.

3.3 The Humanising Effect

Effectively personalised systems are likely to be perceived by learners as providing a more “humanised” experience. The users should feel that they do actually matter and the “computer as teacher” is providing them with a personal touch in the whole experience. E-commerce companies that utilise personalised systems, routinely use this humanising effect very successfully as a selling tool. A major motivator for the use of educational technology is that modern class sizes are getting bigger and more students opt for external (or distance) education and therefore anything that can combat the dehumanization of this mass produced education is likely to be valuable.

Many user studies demonstrate a positive student attitude to personalised e-learning systems. Through questionnaires, the students typically rate their experience

with personalised systems higher than with non-personalised ones. Does the student positive attitude matter? In modern e-learning it certainly does. As both distance and traditional education become more student-driven, the student willingness to work with pedagogically-efficient content is vital. A number of educational innovations tested in research labs fell short of expectation in a real classroom due to the lack of motivation to use it from the student side. It seems this motivation can be significantly increased by providing personalisation. Long-term user studies of ELM-ART, one of the first adaptive e-learning systems, demonstrated that students working with the adaptive version of the system are willing to spend twice as much time learning with the system with no additional incentives [25]. More recent semester-long studies both this motivational effect and its magnitude [9]. Students working with an adaptive version of e-learning portal were willing to put in two to three times more work with educational content than those using a non-adaptive system.

3.4 Without Personalisation

The relevance of the majority of educational experiences is dependent upon the use to which those experiences are to be put, which is in turn dependent upon the goals and backgrounds of the individual. Without personalisation we miss opportunities to smooth the information flow, and the development of understanding within these varied contexts. Ultimately, without personalisation, e-learning is only ever going to be a generic “mass produced” experience and will tend towards a model of teaching that makes the computer a virtual lecturer, rather than a virtual personal tutor.

Tapscott [23] even goes so far as to say that the entire pedagogical model of learning must change with the new technologies, and that “Net Generation” teaching requires *“shifting from a broadcast style and adopting an interactive one”* and that teachers *“need to tailor the style of education to their students’ individual learning styles. Because of technology this is now possible. But this is not fundamentally about technology per se. Rather it represents a change in the relationship between students and teachers in the learning process”*. We have the necessary personalisation technology to do this, and we need to use it in order to educate and engage the new generation of learners. Without it, the university as an educational entity becomes increasingly redundant and archaic.

4 Synthesis - No Silver Bullet But Hope for the Future

The main take-home message from this discussion is that the community needs to better understand where personalisation is useful, where it is harmful and when it is justified by the benefits. There is not at present a strong case that personalisation works in e-learning, in fact some evidence that it does not, but there is some hope for it, given the evident success of personalisation in the recommender systems of e-commerce. Personalisation can improve information access in so many ways but we need to be wise in its application so that we do not encounter the issues in section 2.

This is now starting to happen, with for example Kobsa [16] mapping out requirements for privacy in personalisation. Kay [14] looks at how to empower the student by giving them scrutability and control over the system-held data about them. We are

also starting to see guidelines on designing for personalisation in website, presumably driven by corporate need [21]. We need the same experience-driven guidelines and principles in personalisable e-learning systems so that we do not inadvertently disadvantage our students in subtle ways.

The lessons do not only extend more widely that in e-learning. For example, attempts to create adaptive menus which re-order menu items according to the system's perception of relevance to the user [13] should be considered by those who aim to re-order search engine results sets according to relevance, e.g. [22].

What we need now is more scientific evaluations in different contexts, generating the hard evidence we need to determine where personalisation works and where it does not work. We know that personalisation can be useful but need to discover where, when and how. To paraphrase Bilbo Baggins, that discrimination is "what this [community] needs to decide, and all that it needs to decide". Personalisation is valuable as long as we think through the implications and know when it is beneficial. As with any technology we should not mindlessly embrace it but carefully analyse it for where it can be useful, so that the full promise in personalisation can be realised.

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