Article

Encouraging organic food shopping through visualization of personal shopping data

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Received: date; Accepted: date; Published: date

Abstract: Although food retailers have embraced organic certified food products as a way to reduce their environmental loading, organic sales only make up a small proportion of total sales worldwide. Most consumers have positive attitudes towards organic food, but attitudes are not reflected in behaviour. This article addresses consumers' attitude-behaviour gap regarding their purchase organic food and reports on how visualization of personal shopping data may encourage them to buy more organic food. Through the design of the visualization tool, the EcoPanel, and through an empirical study of its use, we provide evidence on the potential of the tool to promote sustainable food shopping practices. Sixty-five users tested the EcoPanel for five months and interviews were made with ten of these. The test users increased their purchase of organic food with 23%. The informants used the EcoPanel to reflect on their shopping behaviour and to increase their organic shopping. We conclude that the visualization of food purchases stimulates critical reflection and the formation of new food shopping practices. This implies that food retailers may increase sales of organic food through using a visualization tool available for their customers. In this way these retailers may decrease their environmental impact.

Keywords: Organic food; sustainable consumption; visualization; personal shopping data; reflection; feedback

1. Introduction

The global food system is in dear need of a transition to sustainable production and consumption practices. Our present food system holds far-reaching problems, from the degradation of ecosystems and contribution to climate change, to fragility of farmer livelihoods and persistence of hunger and diet-related diseases [1]. Organic agriculture emerged as a grassroots movement during the last century as a reaction to environmentally degrading and socially unjust food systems [2]. Since then it has developed into production and processing practices based on standards and certification, embraced by policy makers as one way to introduce environmentally benign production methods [3]. While critics question that organic agriculture is always more sustainable than conventional farming, e.g. [4] and while other scholars argue that organic agriculture is developing into being only a slightly modified version of conventional farming [5], there is ample evidence that organic agriculture delivers in terms of e.g. increased on-farm biodiversity [6], mitigation of and adaption to climate change [7], improved soil fertility [8], and reduced exposure to pesticides [9]. Since approximately 80% of environmental loading or climate impact in the food system happens in the production phase [10], and since organic agriculture is a specific method that can be traced and labelled, food retailers have embraced organic certified food products as a way to reduce their own environmental loading [11]. However, although the number of organic products sold is increasing, organic sales only make up 9.6 % of total sales in Sweden [12]. Nevertheless, this is high compared

most other countries. Only Denmark has a higher proportion of organic sales [12]. The grocery chain analysed in this paper pioneered organic sales in supermarkets in Sweden and has the highest percentage of organic sales (10%), and holds 18% of the retail market value [12].

Most consumers have positive attitudes towards organic food, but attitudes are not always reflected in behaviour [13,14]. In an accompanied shopping interview study of 10 young consumers with positive attitudes towards organic food, the researchers observed that although high price of organic products was a main obstacle this was only temporary. The informants argued that they would postpone organic purchases to a later stage in life when they presumably would have more money to spend [14]. The current article addresses consumers' attitude-behaviour gap regarding their purchase of organic food. Our study explores the role of feedback in the form of visualization of personal shopping data for overcoming the gap. Our focus is on the formation of sustainable food shopping practices, eliciting reflection among consumers. The article describes the use of visualization as an intervention in people's food shopping practices, and as an approach to encouraging their purchase of organic food. Before we describe our research study and discuss its results, we summarize some relevant work on practices involving the purchase of organic food, and on visualizations to promote sustainable practices.

1.1. Forming practices involving purchase of organic food

Practices are generally conceived as "embodied, materially mediated arrays of human activity centrally organized around shared practical understanding" [15]. Applying a social practice theory framework helps us to understand how different dimensions in society contribute to both the stability of practices and the emergence of new practices. Using this framework, also guides us in identifying and locating where changes are needed to facilitate the formation of sustainable consumption practices and for these to become normalized. Theorists usually refer to 3-5 dimensions in conceptualizing practice entities. For instance, Shove and colleagues [16] use a framework consisting of materials (e.g. things, technologies, infrastructures, and stuff of which objects are made), competences (e.g. skills, know-how and techniques), and meanings (e.g. symbolic meanings, ideas and aspirations). Sahakian and Wilhite [17] challenge social practice theory in that it so far has emphasized the theoretical and analytical aspects. In order to generate change and transitions to a more sustainable society, though, there is also a need to address the practical implications of the framework. Actual changes occur when more than one dimension provides an opening – when "agency is distributed across people, things and social contexts" [17] (p. 25). Also, the difficulty in changing habits depends on how deeply rooted the habits are in relation to these three dimensions. In the present article we address the formation of sustainable food practices in targeting mainly the dimensions of competences and materials.

The purpose is to study how visualization of personal shopping data may play a role in the formation of sustainable food shopping practices, eliciting reflection among consumers. The article describes the use of visualization as an intervention in people's food shopping, and as an approach to encouraging their purchase of organic food. The major value of the article lies in its twofold focus of both visualizing shopping data made available for customers of a leading grocery chain, and the study how these data were used for shaping organic shopping behaviour. Before we describe our research study and discuss its results, we summarize some relevant work on behaviour regarding organic food consumption, and on visualizations to promote sustainable behaviour.

1.1. Motives for buying organic food

Several factors contribute to consumers' motivation to buy organic food. There is a large body of literature concerned with trying to pinpoint the reasons why consumers choose organic food. A recent review of factors affecting the change in the consumer behaviour towards organic food concludes that health-conscious consumers show a growing preference for organic food over the conventionally grown food [18]. In fact, their review shows that health consciousness has been considered the best predictor of consumer attitude and behaviour towards organic food. Environmental concern is found to be another motivating factor. Other reviews have come to similar

conclusions, e.g. [19]. Food safety issues and animal welfare were also prominent themes. The two most important deterrents from buying organics are high prices and lack of products to buy [19] [20] [14]. Other deterrents are scepticism of certification, insufficient marketing, cosmetic defects, and satisfaction with conventional food choices [19]. Welsch and Kühling [21] found that consumers are more likely to buy organic food if people they compare themselves with also do this, illustrating the importance of social norms and the dimension of social context for the purchase of organic food.

In terms of actual organic shopping behaviour, fewer studies are available. In an Australian study, familiarity with organic products was the only variable found to have a significant relationship with organic purchase behaviour, while health consciousness, quality and perceived norms influenced purchase intentions [22]. In a qualitative study, Hjelmar [23] interviewed 16 Danish consumers in depth about their actual food purchasing behaviour. He divided organic consumers into two groups: the convenience shoppers and the reflexive shoppers. Important for the convenience shoppers were pragmatic issues such as availability of organic products in local supermarkets and that the price difference between organic and conventional foods was not too big. Reflexive practices on the other hand were prevalent among shoppers that were more ethically and politically minded (e.g. health, environment, animal welfare, and taste).

Thus, awareness of environmental, ethical, and health issues in combination with reflection seem to be factors which motivate consumers to buy organic food. But how can favourable conditions be provided to encourage this type of behaviour and how can digital media play a role in this? In fact, interactive technologies already exist which may promote more sustainable food consumption [24]. For instance, the technology may be used for tracking the origins of foods. Consumers may find this important and it may also be crucial for organic farmers. Leading grocery chains nowadays use digital media to communicate with their customers regarding, for example, special offers and recipes and personal information such as bonus points and shopping lists. These existing communication platforms could advantageously be used for communicating information regarding environmental implications of shopping behaviour. The food retailers may, thus, offer a platform where customers may become aware of and reflect over their own purchases.

1.1. Visualizations to promote sustainable practices

Visualizing data to consumers in different settings has been shown to provide feedback on consumers' behaviour. For instance, there is a vast area of research on visualizing electricity use in order to reduce people's electricity consumption. The ease of measurement, e.g. of electricity use has been integrated into digital media in different forms of feedback with the aim of visualizing for users what is otherwise hidden and to encourage a decrease in electricity use [25–30]. Even though a great deal of visualizations to encourage sustainable practices has focused on electricity, there is also a growing interest in the area of sustainable food [24,31,32]. In [33] we list examples of some digital attempts to visualise information regarding food related behaviour. These include the use of technology for visualizing food-miles [34], and helping users to reflect on food waste [35–37]. Also, a recent systematic literature review analysed digital behaviour change interventions related to sustainable food consumption, including visual interventions promoting organic food shopping [38]. The review concluded that the included studies had major quality issues when evaluated from a behavior change perspective and that there was a lack of evidence regarding whether the digital behavior change interventions examined worked or not. Other studies on interaction design for promoting organic grocery consumption has directed attention towards the reflective need in grocery shopping [32,39,40]. The design prototype "The Food Planner" focused on the planning phase and the choice of different meals [41]. Finally, the Nutriflect system used tracking of food consumption to encourage reflection on the nutritional content of food [42].

The study presented in the current article draws on the above research. Moreover, it takes the research further in that it visualizes real consumer data, based on informants' actual purchases from an existing grocery chain. The visualisation of the shopping data is, thus, personalized in a design aimed towards reflection and increase of the purchase of organic products. The design intervenes with consumers' food shopping and our study evaluates the results of this intervention.

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2. Methods

The methodology consisted of designing a prototype visualizing real shopping data and studying potential consumers using this prototype. In the first phase, the web-based prototype "The EcoPanel" (EP) was designed and developed. In a second phase – the user study - we monitored change in consumption for 65 test users over five months; we carried out a survey on food consumption practices among test users; and we interviewed ten test users. The purpose of the user study was to observe how the EP's visualization of the test users' purchase of organic food affected their motivation to buy these products and actual purchases of these products.

The development of the EP as well as the user study was carried out in collaboration with one of the leading grocery chains in Sweden, in the future referred to as "The Store". The Store supported the process by providing real shopping data from individual households, which they collected via customer membership cards. The data collected indicates the actual products bought, their cost and whether they were labelled as organic or not. As The Store registered customers' shopping data, this data could also be fed back to them. A second type of data collected to inform us about food consumption practices was survey data from 63 test users. Interview data from ten informants were collected to deepen the emerging image of food practices even further. Thus, we gathered data from three different sources: actual shopping activities (N=65), a survey (N=63), and interviews (N=10).

Table 1 provides an overview of the research methodology and the following sections describe details of phases of the research method - the design process of the EP, the final EP and the user-study.

Table 1. Overview of the research process.

Phase	Method	Outcome
1 Design	Design of EP	The prototype the EcoPanel, using real shopping data provided by The Store
2 User study	Monitoring change in consumption for 65 EP test users	Data of percentage of organic food purchased for each user and for each month of the period of EP use (5 months) compared to a year prior to introduction of EP; and compared to a reference group not using EP
	Survey given to all EP users	Overall image of motives driving the EP users' food consumption
	Interviews with 10 EP users	Qualitative data on users' backgrounds and practices related to food shopping, their views of organic food, and their reactions and thoughts of the EP.
3 Analysis	Analysis of user study	Conclusions relating to the sustainable shopping practices

1.1. Design of the EcoPanel

The design process of EP is described in detail in [33] and a summary is given below. The process was iterative through loops based on ideas, tests and revisions. The target users for the EP are customers of the The Store. The design process was carried out along the five phases in Table 2.

Table 2. Design process of EP.

Design phase	Description
1. Design of concept	Based on information on food purchase specified on customer receipts

2. Design of paper prototype	Based on workshop within interdisciplinary project team (computer science, graphical and industrial design and HCI) and with The Store
3. Focus group	Discussions with selected potential users on their views on issues regarding food purchase practices
4. User evaluation	Potential user groups evaluate paper prototypes. Evaluations are combined with individual interviews to further inform the design
5. Functional prototypes	Iterative process where prototypes are user evaluated and revised

1.1. The EcoPanel - the final prototype

The EP prototype is a functional web application. It was available online and users could log in using their membership ID of The Store. EP visualizes the user's purchases at The Store during the last twelve months based on the purchases registered using their membership card. As mentioned above, this data is at a product level and includes for each item: date, product, category, price, and whether the product has an organic certification or not. The data updated automatically every day and new purchases were normally shown the day after the actual transaction. The prototype is a single page "dashboard" presenting information about the purchases and the share of organic calculated by money spent. For more details, see [43] and [33]. The different parts of the visualization are:

- A total view presenting the total amount spent and the organic percentage during the last twelve months
- A monthly view presenting month-by-month information with two alternative views: in absolute money spent, or in relative organic percentage (Figure 1).
- A category view that visualizes the purchases of the latest month divided by category: meat, fish, dairy and eggs, fruit and vegetables, pantry items, snacks and candy, bread and cereals, and frozen food. The categories are visualized using a "donut chart" with the size of the chart representing the amount spent and the percentage of organic food as a sector of the chart with higher opacity. The user can navigate between different months and see detailed information of all the products in a given category. (Figure 2)
- A challenge showing five specific products or categories (potatoes, bananas and grapes, meat, dairy) that are especially important to change to organic. The visualization presents the user's performance (percentage of organic purchases in those categories) and the user's current trend (Figure 3).

The visualization also contains information about the benefits of buying organic food, and links to explore more on the topic of organic food.

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Figure 1. Screenshots of EcoPanel (translated from Swedish): Total view (left), monthly view (middle) and challenge (right).

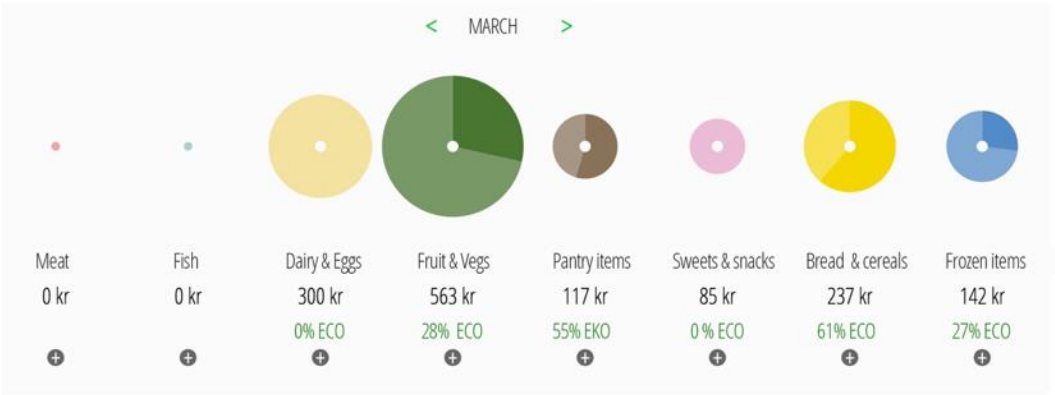

Figure 2. Screenshot of product category view for one month (translated from Swedish).

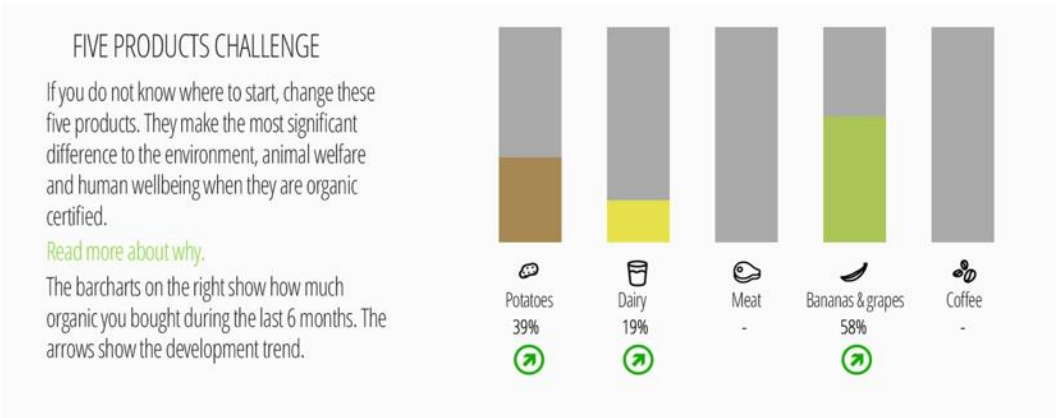

Figure 3. Screenshot of "five products challenge" (translated from Swedish).

1.1. User study

A user study of the EP was carried out in order to identify significant aspects of users' interaction and reasoning in relation to the dimensions of social practices. We collected data from three different sources: actual consumption, survey, and interviews. When the 65 test users logged in the first time they were given a survey focusing food consumption practices. Then, interviews were carried out with 10 of the test users. Finally, shopping data (N=65), survey data (N=63) and interviews (N=10) were analysed.

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1.1.1. Monitoring change of users' food shopping

65 test users responded to invitations from The Store. The test started in March 2015 and lasted for five months. Through their intranet, The Store invited all their Swedish employees to be part of testing the EP. Amongst the potentially around 5000 employees, 65 employees from across the country logged in to test the prototype. The test was confidential, and therefore we could not reach out for a wider test group than 65. However, since the user selection spanned over potentially 5000 individuals, this was not considered a major limitation regarding representation.

To compare this group with other consumers we created a reference group out of a randomized sample of 47765 households. From this sample we selected 2587 users with similar purchase behaviour to the EP users. The selection was based on the amount of money spent at the The Store and their initial organic purchases. This group did not use the EP and was not informed about their shopping pattern during the particular time period. Their data were open to analysis as part of the agreement when signing on to the bonus program for the The Store.

1.1.2. Survey to EcoPanel users

In order to get a better understanding of EP's users; their relationship to food in general and organic food in particular, a questionnaire was set up. The intention of the questionnaire was to create an overall image of the motives driving the EP users' food consumption. The questionnaire contained nine areas; personal background, food engagement, cooking, health, lifestyle and values, importance of different aspect when buying food, food knowledge, organic food, and relation to information and communication technology (ICT). It was distributed in February 2015 at the initial login of the test-users. 63 of the 65 testers filled it out. The survey was compiled by the statistical program built into the Google survey tool and generated a summary of results.

1.1.3. Interviews with EcoPanel users

Data from users' food shopping in relation to the EP and survey data from the users were combined with semi-structured interviews. The aim was to gain a deeper understanding of the informants' food shopping. Questions were structured in an interview guide, focusing three different themes: Backgrounds and practices related to food shopping, views of organic food, and reactions and thoughts of the EP. From the 65 users that logged in to test the prototype, we selected ten individuals who were representative both from a demographic and an organic food interest perspective. We strived for an even distribution in gender, age, interest in organic food, and size of households. Table 3 gives an overview of the informants.

Table 3. Overview of informants.

Informant ID	Gender	Age	Number of Adults in Household	Number of children	Informant's expected percentage of organic food shopping	Actual percentage organic food	Percentage of shopping at The Store
I-1	M	50 - 59	2	0	1 - 10%	9%	More than 75%
I-2	F	30 - 39	2	2	11 - 20%	28%	Almost 100%
I-3	F	40 - 49	2	3	21 - 30%	23%	Almost 100%
I-4	F	40 - 49	2	2	11 - 20%	17%	More than 75%
I-5	M	40 - 49	2	2	1 - 10%	3%	More than 75%
I-6	M	50 - 59	3	0	21 - 30%	15%	Almost 100%
I-7	F	30 - 39	2	0	1 - 10%	15%	Almost 100%

I-8	F	30 - 39	1	0	21 - 30%	37%	More than 75%
I-9	M	50 - 59	2	2	51 - 60%	59%	50-75%
I-10	F	30 - 39	2	2	-	53%	Less than 25%

The ten informants were between 30-59 years old, evenly distributed within the span. One of them lived in a single household; otherwise they all lived in households consisting of couples with or without children (see Table 3). For two (I-4, I-6) a high school exam was the highest education; the rest had college or university degrees. Two of the informants spent up to 5-9000 SEK on their food shopping per month. Eight of the ten informants were employed at the The Store, and two (I-9, I-10) were in other ways linked to the project. Regarding how much organic food the informants consumed, everyone but the neutral informant (I-5) purchased far above the national retail average of 5% for 2014 [44]. Four of the informants were located in the middle span (6-20%) and five in the higher span (21-100%).

The interviews were conducted in March 2015 at the workplace of each informant. There were two interviewers at each interview; a main interviewer who conducted the interview and one support interviewer, whose main task was to listen and come up with additional questions if necessary. Each interview took 1-1,5 hour and was recorded with the informant's consent. Informants brought their own laptop to be able to log on to the EP during the interview. A timeslot was dedicated to a combined observation and interview, where the informants were asked to show how they used the EP and how they reflected on it. The recorded interviews were transcribed and analysed according to Kvale's interview analysis "concentration", "categorization" and "interpretation" [45]. After reading through all the transcribed material, the research team defined ten central categories that had emerged during the interviews to be the most prominent. For each category, we read through the material and gathered the relevant material related to it. The material was structured in a table with three columns including quotations, concentrations (keywords) and categories. The central quotations were inserted and categorized into sub-categories.

3. Results

3.1. Survey and monitoring of food shopping

The monitoring of shopping data for the 65 test users of EP showed that the average percentage of organic purchases before EP was 20%. During the five months' test period, the average percentage of organic purchases was 25%, an increase of 23%. The reference group increased during the period of the user test with 6%. The data from survey and from monitoring are also reported in [33].

Table 4. Comparison of EcoPanel users' organic food shopping with a reference group.

	Average organic proportion before monitoring (%)	Average organic proportion during monitoring (%)	Increase in percentage
EP users	20	25	23%
Reference group	19	20	6%

3.1.1. Motives to buy more organic food

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One of the questions from the survey sent to the 65 users was: What would motivate you to buy more organic food? The list of the results in table 5 is based on the sixty-three responses, and is constructed in descending order according to the results. Results show that the assortment was slightly more important than the price. The high position of the motivators 3 and 4 might be linked to the respondents' employments in The Store. Regarding the EP as a motivator, one third of the respondents (33%) wanted feedback on their organic purchases.

Table 5. Survey responses (N=63) to different motives for buying organic food. "Eco-points" refers to an economic bonus and "eco-ambassador" refers to an honorary title.

Motivations to buy more organic food	No of responses	Percentage of responses
1. Better organic assortment	50	79 %
2. Cheaper organic food	46	73 %
3. Get "eco-points" (discount) to complement the bonus points	44	70 %
4. Extra bonus on reaching a certain organic level	36	57 %
5. Get feedback on my organic purchases	21	33 %
6. More knowledge about organic and its benefits	17	27 %
7. Could be appointed "eco-ambassador" when reached an organic level	9	14 %
8. Compare myself with others who buy organic food	9	14 %

The mean frequency of using the EP was three times for one test user during five months. It was used at least once by all users and the maximum use was 7-16 times.

3.2. Interviews

The following sections present results from interviews with ten informants. The central categories emerging from the interviews were divided into *attitudes towards organic food*, *food shopping/provisioning practices*, and *reflections on shopping in relation to feedback from the EP*. Nine out the ten informants had a positive attitude towards organic food and one informant had a neutral attitude (I-5). This meant that most informants associated organic food with quality and believed it to benefit the environment, health and animal welfare in various ways. As one informant reasoned:

> *I associate organic with quality.... it's produced under better circumstances, it's better for me and the kids from a health perspective and better for the environment, and for the animals ... but, the biggest driver is probably toxins, to avoid getting poisons in ourselves, I think.*
>
> *(I-2)*

The nine positive informants wished to have a larger share organically produced food in their grocery bag, but considered assortment and price the main reasons preventing them to realize their ambitions. This was also in line with responses from 63 test users to the questionnaire.

 doi:10.20944/preprints201907.0353.v1

3.2.1. Reflections on the feedback provided by the EcoPanel

There was a consensus among informants that the EP in general gave valuable knowledge about the households' shopping pattern. Eight of the informants (I-1, I-2, I-3, I-4, I-6, I-7, I-8, I-9), had the ambition to buy organic food and stated that the eco-shares visualized through EP provided valuable information.

It was generally found motivating to be able to get feedback on the organic purchases. On the question, if the EP would motivate them to buy more organic food, one (I-3) said the EP stimulated the household's organic ambitions. Another informant (I-7) was encouraged by the design of EP to increase the proportion of organic food purchases. A third person (I-1) thought it was motivating to be able to spot a certain product category. In addition to providing a pleasant overall experience for the informants and allowing them to follow up on their own food shopping over time, the EP served as an instrument for them to evaluate their own shopping performance.

Evaluating one's own organic shopping performance in relation to feedback

Interview statements where informants evaluated their shopping performance according to the feedback from the EP clearly expressed how informants strived towards the goal of buying more organic food. They used expressions, such as "improve", "unhappy with myself", and to "be better than them", which illustrated that there was a direction of their interpretation of the feedback from the EP. Either they compared their performance to their own previous performance, or expressed a wish to compare it to a norm. While reading the feedback of their performance, some informants also offered an explanation to why their proportion of organic food was not higher, e.g.:

> *...I could improve for 'fruit and greens' I think…because there I thought I would have been higher than 35% for instance. So - I like this (the feedback) - just because you may see very clearly where you're good and where you're not…because it's usually a habit and it might be that you're used to dairy and egg. There I pick organic. Fish is a bit harder… (I-8)*

The above quotations illustrate how the feedback from the EP showed informants that their purchase of organic food did not live up to their expectations. The first one (I-8) also illustrates how the division of feedback into different grocery categories (Figure 2) supported the discovery that there was a supply of organic food in other categories than those that the informant was already used to (in this case fish). Other types of evaluations of shopping performance expressed a need of comparing not only to one's own expectations, but also to a group value. Quotations from I-7 and I-3 show reflections over how EP could be improved by allowing users to compare to a target value and compare their own performance to this. I-7 would have liked an average to compare with and I-3 would have liked to compare to other customers in the shop:

> *...to see how the group in the store did their shopping. To be able to compare myself to others…like (a daily newspaper) does: 'this week only 4% got this question right'…I need to check whether I'm better than them. (I-3)*

As reported in [33] the survey data showed that the test users who underestimated their purchases of organic products were the users who increased their organic purchases the most. The

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above quotations confirm that the need to compare with some relevant value may stimulate shoppers to increase their purchase of organic food.

Questioning one's own motives

Some informants' went beyond an evaluation of their own performance in relation to expectations as they seemed to question their own motives for their purchases. The informant I-2 reflected on the relative concept of "expensive":

> *...I spoke to a colleague…and for instance fish I think I had zero and there she had pretty high, so then I had to think: 'why don't I buy organic fish? Well, I experience it as very expensive'. And that's really strange, what you experience as expensive – there's no logic to it… you have some kind of image of 'this is how much it should cost'. Then, you may spend a lot more money on something else, which in proportion certainly is more expensive. (I-2)*

Apparently, the EP feedback made her realize she usually did not buy organic fish because she found it too expensive compared to non-organic fish. This lead her to ask herself in what respect she thought it was too expensive. As it was not a matter of how much she could afford or not she would probably decide to buy the organic fish after all. Similarly, informant I-1 reflected around his underlying reasons for not buying organic:

> *Yes, it's an eye-opener… why don't I actually buy more? When this is a category where there's so much of organic and where I think the products are good and price worthy (I-1)*

Exploring details behind shopping data

So far, quotations from informants have shown how they used information from EP as input into evaluating their own shopping behaviour and motives. Some informants also used the feedback to examine the EP feedback even further. One informant did this by trying to recall the concrete context of the shopping, another by expressing that she wanted to know what to do to increase her share of organic food:

> *The most important is after all, for oneself to look at how much organic it was…and then it may be a bit amusing to wonder 'what did we do that month?'… no fish apparently (reading from EP) (I-3)*

> *Increase them I think… (In response to how she thinks EP influences the way people buy organic food) … especially concerning those five products (referring to module advising users to change to five specific products for best impact on the environment) (I-7)*

Informant I-7 pointed to the importance of actionable data – that people need to get feedback on their actions in combination with advice on how to act to change things.

 doi:10.20944/preprints201907.0353.v1

The examples of reflections from users of EP presented above illustrate how the feedback on their own shopping met their own goals, values and expectations. As can be seen from these examples, the evaluation of their own performance could end with them being content with their performance or with the conclusion that they could do better. However, the evaluation could also result in informants wanting to learn more or looking for ways to improve their performance. Here, the actionable feedback provided by "Five products challenge" was useful. As feedback is always interpreted in terms of something else, it is interesting to note that informants had expectations, goals or ambitions, which they evaluated against the information they received from the EP. In this way, the EP provided information which consumers could use to change their shopping behaviour.

For one of the informants (I-2) the motivation was grounded in being able to support the organic development from a broader perspective. It made her feel like a clever and well-informed citizen. Since she believed that "organic" had high status in society, it motivated her to see the organic columns growing in the EP. She believed that if she would actively use the EP as a recurring tool, it could boost her ethics. She expressed it in this way:

> *For it's a small inner struggle between convenience, wallet and doing the right thing ... I get to wrestle a bit with myself in the shop, you have to have this little better self on the shoulder and say to yourself, I have the economy, not everybody has. Despite the higher price, I must think it's worth prioritizing it. I believe that the EP can support as "a better self on the shoulder "... It would strengthen my line in the store, I think it would get me to increase my organic purchases more. (I-2)*

4. Discussion

By using the design of EP as a point of departure for our study on food shopping practices, key issues involved in the transition to more sustainable food practices have been highlighted. One major conclusion from our study is that the EP motivated informants to increase the proportion of their organic shopping. Test users in general increased their share of organic food when they were able to see it visualized. The most stated reasons were that it gave valuable knowledge about their household's shopping practices and that the EP confirmed households' ambitions. Another major conclusion is that the EP served as a tool for reflection for the informants in the study. The feedback from the EP stimulated informants to reflect in different ways: By evaluating their household's performance in shopping organic; by questioning their own values; and by further examining the link between the visualization of their shopping to activities and details of shopping. Differentiating reflections in this way provides empirical illustrations to the definition of critical reflection formulated by [46] p. 50 as:

> *Bringing unconscious aspects of experience to conscious awareness, thereby making them available for conscious choice. This critical reflection is crucial to both individual freedom and our quality of life in society as a whole, since without it we unthinkingly adopt attitudes, values, practices, and identities we might not consciously espouse.*

The reflections brought forward through the interviews would according to [23] be significant for shoppers that are more ethically and politically minded than convenience shoppers. Organic sales went up by 41% in all three major food retailers during 2014 [44]. During this time, The Store launched weekly organic products with a discount, exposing these products in the shop. The Store also introduced a membership program where organic purchases counted twice as much as conventional products, thus encouraging consumers to choose organic products. So, clearly, there were other types

 doi:10.20944/preprints201907.0353.v1

of interventions and also a societal trend towards more organic shopping coinciding with the EP intervention.

4.1. *Food shopping practices*

The proposition that practices constitute individual actions and create social structures is at the core of the social practice theory framework. This is a key in understanding how the empirical data collected in our study relate to the formation of food shopping practices. The individual actions as shown through the shopping data and indirectly through narratives of informants are instances and reproductions of practices. In designing EP, we nurtured a goal that it would play a role in bringing forward the weave of food shopping practices with a focus on organic food.

In scrutinizing how the elements of the dimensions interact we find that the EP, mediates between dimensions of a social practice theory framework, such as the stuff dimension and the skills dimension [47], by providing shopping data. Users may interpret these according to their own ambitions, knowledge and values. Results from interviews indicate that through seeing their own shopping data mirrored by EP, the informants became aware of how their food shopping activities align with their ambitions, expectations and perceived norms for shopping organic products; how their food shopping activities vary over time, and; how their food shopping expresses a form of lifestyle.

The three top motives among survey respondents for increasing their shopping of organic food were "better assortment of organic food" (79%), "cheaper organic food" (73%), and to get an economic reward in terms of some kind of bonus (70%). The motives of better assortment of and cheaper organic food clearly point to the dimensions of stuff, skills and images of the social practice theory framework [47]. Within HCI, researchers have referred to the corresponding dimensions as "near materiality", "the individual" and "societal structure" [48]. The connection to the supply chain of organic products has a bearing on agricultural policies. These two motives from the survey are also highlighted in the interviews, where assortment and price are mentioned as preventing informants from shopping organic products. The motive of getting a discount on products entails a closer connection to the private economy of the household.

To make the interrelationship between the stuff/near materiality and skills/the individual pillars clearer we here attempt to explain it in terms of what the EP communicates, how the communication meets the skills dimension and how they relate to norms. First, we hold that the design of EP is not neutral. On the contrary, EP was intentionally designed to communicate values and emotions linked to organic food. The EP communicates that organic food is positive for the environment. It indirectly rewards shopping organic products by showing how the exchange of certain products may have a positive impact on the environment, thus facilitating for users to increase their proportion of organic products in their shopping. The information provided for users to learn more about organic food also supports a positive association between organic food and the environment.

Secondly, EP provides information on an individual level by mirroring households' activities. It tells users which specific products their households have bought; which categories these products belong to; how much money the household has spent on categories of groceries over time; and how big proportion of this money is spent on organic groceries. Although not sufficient for the emergence of new shopping practices, to embody the information provided by EP into individual activities is crucial for new types of practices to be formed – practices involving shopping more organic food. The monitoring of shopping data enabled us to study the evolvement of shopping practices over one year for a large sample of grocery chain employees. The reference group of 2587 consumers who did not receive the EP increased their purchase of organic food products with 6%, while the sample of 65 consumers using the EP increased their purchase with 23% - a substantial difference. Our monitoring data show a change in organic food shopping and our interviews point to norm and value related factors influencing individual food shopping activities. But, of course, there are more factors, which may be attributed to the evolvement of organic food shopping practices. During the period of the EP intervention for the 65 users, several other changes occurred which were likely to influence formation of new food shopping practices. Organic sales went up by 41% in all three major retailers during 2014

[44]. During this time, The Store launched weekly organic products with a discount, exposing these products in the shop. The Store also introduced a membership program where organic purchases counted twice as much as conventional products, thus encouraging consumers to choose organic products. So, clearly, there were other types of interventions and also a societal trend towards more organic shopping coinciding with the EP intervention. The emergence of the new practices including more organic products, thus, supports the idea that for new practices to be formed openings in more than one dimension in the social practice theory framework are required [17].

4.2. Potential for change

The social practice framework is useful for analyzing food consumption practices and to generate input to where change may be stimulated. New practices are formed when they are preceded by changes at least in two of the pillars of practices [17]. The EP primarily targeted the pillar of body/skills (e.g. knowledge, reflection, beliefs). But in expecting practice change to occur through awareness alone we would overestimate "the agency of ideology over practice histories" [17]. Although people may be considered "carriers of practices" [49], the material world and social contexts are also heavily involved in the shaping of practices. Food-shopping practices are for instance partly formed by the availability of food on the market, the price, supply and the packaging of food. But food-shopping practices also rest upon material characteristics of shops – their spatial layout, size etc. The design of EP and the subsequent user study were intended to make the complex pattern of food shopping practices transparent also by addressing the social context in which these practices occur.

5. Concluding remarks

The study presented here has shown how an online visualization of personal shopping data may intervene with food shopping practices to form new and more sustainable ones. The visualization of food purchases in the EP, placing organic products in the spotlight for each food category stimulates critical reflection and the formation of new practices. Although the study focused on three specific phases of shopping – planning, the act of shopping, and what happens after – the design intervention in the shopping practice may be applied to other phases, e.g. the shoppers' journeys to and from the store. Moreover, the food shopping practice is closely linked to other practices also eligible for explorations through design interventions. One such practice is the eating practice, which so far has shown to be quite resilient to many forms of external pressure [50]. Other related practices are cooking and handling of food waste, which both have received attention regarding visualization to motivate sustainable practices [51,52]. A fruitful direction for future research may be to broaden the perspective to explore how different practices combine into sustainable consumption patterns and how visualization and design may play a role in this combination.

Acknowledgements

The authors would like to thank test users, informants and experts from the food chain where the project was carried out. We also thank Vinnova for supporting the study through a grant to the Centre for Sustainable Communications - CESC - at KTH, Royal Institute of Technology.

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