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This is the accepted version of a paper presented at *CHI, Toronto, April 26- May 1, 2014.*

Citation for the original published paper:

Normark, M., Tholander, J. (2014)

Performativity in Sustainable Interaction: The Case of Seasonal Grocery Shopping in EcoFriends.

In: *CHI '14 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 271-280). New York: ACM Press

<http://dx.doi.org/10.1145/2556288.2557318>

N.B. When citing this work, cite the original published paper.

Definitive Version in the ACM Digital Library doi>[10.1145/2556288.2557318](https://doi.org/10.1145/2556288.2557318)

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# Performativity in Sustainable Interaction: The Case of Seasonal Grocery Shopping in EcoFriends

## ABSTRACT

The EcoFriends application was developed as an attempt to support grocery shopping adjusted to vegetables' seasonality through a performative approach to interaction and interactive applications. The design aimed for critical reflection and inspiration among users, rather than achieving a certain kind of persuasion. It guided the practical design to be modelled on playfulness and challenging of ideas. It also allowed us to identify a number of critical issues regarding interactive technology and interaction design, related to aspects of knowledge and truth, trust, and responsibility. We argue that research addressing design for interactions about value-laden concepts such as sustainable action need find ways of supporting various knowledge discourses.

## Author keywords

Performative Design; Mobile Interaction; Sustainable Interaction

## ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## INTRODUCTION

Designing technology for sustainable lifestyles is complex, requiring considerations of various experiential dimensions including values, ideologies, facts, inspiration, and usability [5,6,9,10,17,25,26]. Sweden, being a country in northern Europe with a winter season, imports twice as much agriculture produce as is exported. It has therefore been suggested that by buying what is locally harvested,

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long transports from the other side of the world can be avoided. We have designed a mobile application called EcoFriends to support sustainable shopping through adjusting it to what is 'in season'. This project was originally done in collaboration with researchers' in natural resource management.

Our overall aim was to explore critical perspectives on design [3,4,11,12,29] to address the complexities of sustainability and sustainable interaction. This involved supporting sustainable grocery shopping through inspiration rather than persuasion. Achieving this required a design approach where the information in the system was to be challenging and thought provoking and inspired users to engage in interaction with a multitude of issues. We designed EcoFriends and used it as a technical probe. This approach allowed us to reflect on more general aspects of interaction design in value-laden domains. During the process of designing and studying EcoFriends (earlier briefly described in [34]), we learned that the for people, the relevance of seasonality of a vegetable or fruit, depend upon a number of aspects, such as growing methods, transportations, price, cooking preferences, taste, water use, storage, societal situations, and country of origin. The final design attempted to expose a number of such aspects of what constitutes grocery shopping 'in season'. This included what lay people and experts say about various products in different contexts, and information from various local sources such as news or weather information.

As pointed out by [8], sustainable application designs easily become problematic in the parallel ambitions of addressing the diversity of dimensions involved in sustainable interaction, with that of turning these into hard facts. Their critique focus on how the design scope of persuasive technology, such as supporting sustainable lifestyles, has been too narrow. They highlight how sustainability is often too narrowly defined in order to make room for measurable progress. They argue that a strict focus on individuals and behavior change tend to bracket out social, cultural, institutional, and personal contexts of lived experiences. To take this into a concrete design case, we analyse the ways that EcoFriends was encountered by users. This revealed a number of underlying tensions in the design of applications organised

around multi-faceted societal phenomena, such as sustainability.

As conceptual starting point for our analysis of the application and the interaction, recent work from Science and Technology Studies (STS) and social theory are used, in order to outline a distinction between so called *representational and performative technologies*. These two notions reflect two perspectives on knowledge conceptualized as primarily representations of phenomena, or knowledge as social and material performances of phenomena. In the discussion, these findings are related to issues foundational to interaction design practice such as the role of epistemological perspective, norms and values [13,14,15,19,23,24,31].

### **TECHNOLOGY AS REPRESENTATION VS TECHNOLOGY AS PERFORMANCE**

In this work, we have explored what theorists such as Barad, Pickering, Hekman has labeled a *performative perspective* on knowledge and epistemology [1,2,18,28]. This perspective is put forth as an alternative to a *representational perspective* that broadly conceptualise knowledge production processes as ways of representing real world phenomena, such as technology or interaction. From such point of view end-users, technology and designers are relatively fixed categories with well-defined relations and boundaries [7]. Design wise, interactive technology is then assumed to clearly represent and reflect such relations and boundaries *Performative perspectives*, on the other hand, is concerned with processes of participation as social and material performances in real-world phenomena. This includes an inseparability between knower and known, and for the case of interaction, between user and technology, and user action and actions generated by applications. Performative perspectives have recently been brought into HCI and interaction design by a number of researchers. Perhaps most fundamentally in Suchman's work on interaction as processes of reconfigurations between human's and machines [32,33]. But also in more applied work such as that of Jaccucci et al on design things [19], Tholander et al. on agency and materiality [35], as well as Leahu's work in affective interaction [21]. The central element of this perspective is that it proposes that design and user actions should be understood as emerging from the *intra-actions within a phenomena, rather than from the interactions between different actors and objects*. This perspective poses fundamental questions for how we understand interactive applications, the information and the models these contain, and how these applications are communicated and interacted with.

The performative model also differs from the representational model in that it focuses on the enactment of a phenomenon rather than on pre-defined conceptions. First and foremost, as stated above, the performative model does not take users, technology and other participants as

fixed categories with a given set of properties that can be reflected through representational relations between these. Rather, these categories dynamically emerge, and thus change, through the on-going performances between actors and objects. Like Suchman proposes, it is the material discursive boundary-making practices that produce categories like users, applications, information, and values.

In our study we use this distinction between representational and performative technology to understand tensions that surfaced in the analysis of the application and the user encounters.

### **ECOFRIENDS - PROBING DESIGN FOR SEASONALITY**

In wealthy parts of the world, it is more or less expected that all vegetables and fruits should be available at all times of the year, no matter local growing seasons. This means that the greens are transported from other parts of the world as well as grown in heated green houses. In the wake of environmental concerns, it has in Sweden and several other countries been suggested to essentially buy fruits and vegetables that are 'in season' instead. Reasons for this include environmental aspects to decrease transportation and supporting local farming, as well as considering natural conditions that maximize taste and nutritional value of fruits and vegetables. The EcoFriends application was designed to engage groups of friends to reflect on their everyday vegetable consumption behaviors from social, political, and organic perspectives. Shopping of groceries is nowadays characterized by considerations of a variety of factors such as price, taste, health, habits, social context, availability, and to an increasing extent ethical aspects, such as environmental effects and fair trade (see Figure 1).

Ecofriends was designed with an open-ended style of interaction in mind, with the intention to spur reflection, inspire, and challenge people's basic assumptions regarding seasonal aspects of groceries. The application works as a mobile scanning device to be used when grocery shopping at the supermarket. A user's 'EcoFriends' are simply other users that uses the application and are connected using through a social network such as Facebook.

When investigating and discussing how to work out a model of the factors that constitutes the degree to which a grocery could be understood as being 'in season', we faced a number of issues that reflected the complexity and uncertainty of what constitutes sustainable action. Is a vegetable to be defined as in season at its first harvest, or is it all through the harvest period? Is it to be considered in season if it is imported, from countries how far away? How should traditionally grown local vegetables be weighed in relation to transported organically grown ones? Should stored root vegetables be considered as 'in season' if energy is needed for the storage? These were questions

that made the calculation of a ‘in season’ value very difficult in our early attempts. It became apparent that every attempt to calculate seasonality would inevitably be arbitrary. We shifted approach and modelled the notion of shopping vegetables that are in season as a socially constructed phenomenon that emerges from everyday updates from blogs and twitter updates with organic profiles and social interactions within a selected EcoFriends group. Based on our early focus groups, we also wanted to contextualize the product’s origin by adding facts about the place of origin [16,29].

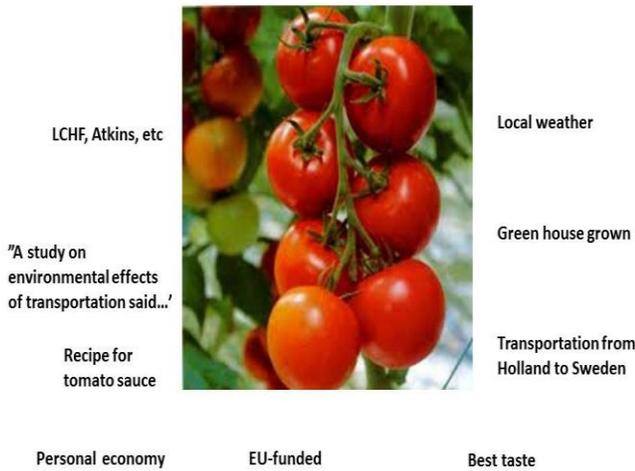


Figure 1: Potential factors exemplifying how the relevance of seasonality in a grocery is perceived

To allow for interaction around such social values around what constitutes ‘seasonality’ of fruits and vegetables, we focused on two social dimensions of people’s actions relevant to grocery shopping, consumption, and cooking. These are based on data captured from social media such as Twitter and blogs. *Firstly*, the application was organized around values as phenomena that is expressed by social actions that we chose to call *voices*. In our application we included three different voices: your social network, voices of a selected part of food ‘experts’ with strong organic profiles, and the voice of the local community. *Secondly*, the application was designed to include *contextual information* about the various groceries included in the application. The application dynamically gathers information about the origin and context of the different products that the users are buying. Local news, weather, tweets and a blogs relating to the product is supporting users in making a *contextually rich interpretation* of the product and its origin.

**Visualizing social voices and displaying context**

The application has three visualization views; the scanning of groceries, the seasonal changes of groceries (Figure 2, left), and product-related information (Figure 2, right). Groceries are scanned by taking a picture of the barcode of

a product through a big mouth. The groceries scanned are displayed in a list including the total cost. Seasonal changes are displayed on a round tablecloth with products that are in season in a particular week distributed over it. The more a product is in season the bigger its picture. The ‘voices’ of your social network, ‘the food experts’, the local community, and are depicted in through colour variations: color, black and white, and light green respectively. The five top products in each of the three categories have a pink border.

Specifically, the voice of your social network is based on the purchases of fruits and vegetables for when a product is popular or ‘in season’. The voice of food experts uses occurrences of particular groceries in social media (30 selected food blogs) for when a product is ‘in season’. The voice of local community is based on twitter feeds in your local area to for when various products are ‘in season’.

These three categories have their own visual expressions to let the user distinguish between them. The groceries that are less ‘in season’ are gradually faded out in the interface. The user can scroll back and forth in time to see how seasons dynamically change from week to week over the last year.



Figure 2: User interface views

The three voices are seemingly incompatible and thus create a deliberate contrast to each other with the intention to push the user towards a more critical reflection regarding the governing topic of eco-friendly seasonal shopping. For instance, the voices of food experts and the local community is based on their expressions on-line, while the voice of your social network users are based on their concrete shopping actions.

By selecting a product, specific information about its origin is displayed, the current weather, a news clip, and a map of its location. This works to contextualise the

products and the social voices tying them to already on-going discussions and information around food and grocery shopping, and the broader context related to the product. In a way this is the very opposite of organic labelling in that it does not disconnect consumers from producers.

### LESSONS LEARNED FROM ECOFRIENDS

In the following sections, we discuss user encounters that were collected during three field experiments arranged as dinner parties among groups of friends, consisting of four to eight people including two researchers. Each group was asked to use the application to plan a three-course dinner, shop for groceries, and cook a meal together. During the dinner itself we held open-ended discussions around the participants' experiences of the activity and the application. The discussions evolved around the following themes:

- How the participants interpreted the application and what the various interaction was about.
- Expressions and actions around season and grocery shopping.
- How and if the application influenced their understanding and motivations of seasonal shopping.

The discussions were all videotaped.

In our analysis, we attempted to move beyond descriptions of practical user encounters towards analyses of the phenomena at play when designing for sustainability. It required careful consideration of what it really means to design technology with the ambition of entering into people's everyday practices such as grocery shopping. We encountered a number of overlapping and sometimes conflicting areas that created tensions in the interaction with the application. These were:

- Users' conceptions of sustainability
- Users' expectations of the application
- Users' experience of the interaction

The application was designed to attempt to display a multi-faceted perspective on seasonality in grocery shopping. Overall, we found that this to large extent also occurred in the participant's interactions and their experience of the application. This took form both in the form of confrontation and frustration of user values, as well as practical usefulness and difficulties. In order to understand the processes that created the broad range of experiences, we would like to dig deeper into this. Especially, we analysed the user encounters where the interaction with the application resulted in situations that challenged the participant's pre-conceived knowledge conceptions about seasonality.

### Reflecting "truth"

This first excerpt was chosen since it raises a number of concerns that recur throughout the discussion about the application. In particular, it exposes a discrepancy between the users' expectation of how seasonality should be defined and the way the application portrays it.

The participants, here mainly displayed by W2, talk through their experiences of the design and the functionality of the application. They review their understanding of the application and the topics that engages them, in particular their understanding of how the applications portrays information about seasonal and sustainable grocery shopping.

At the start of the excerpt the users are turning the table cloth in the interface in order to move back and forth in time of year, thereby exploring the seasons of various groceries.

1. *W2: But..eh..well, if you could see last week and how it has changed in here, like..eh...what was popular four weeks ago, I find that interesting...I would also like to know what 'being in season' really is, that is what is grown a lot. I find that interesting when...shopping, if I want to shop environmentally friendly,.../... /then you can see October, what's in season then. Then I think its carrots and stuff I know is grown then.*
2. *Researcher: Were there any carrots in it?*
3. *W2: No I didn't go back that far*
4. *Researcher: but did you feel that you had to know what's correct?*
5. *M1: I felt I couldn't trust it*
6. *W2: Nah, but I thought that if I would use this, it would be more interesting to use if I...because I think that it's good to shop in season when...you...vegetables are better and cheaper and often not transported that far, they might even be from Sweden. At least during summer and spring and autumn as well, in that sense it would be more interesting to check...eh...although I do know some of it myself, but..*

In the first turn, W2 talks about how the seasonality of a product changes throughout the year and how she believes that in order for the application to be practically useful, one would want to know what "being in season really is about" and how it is reflected in the application. Moreover, W2 couples this concern with what is correct, with other aspects relevant to what she calls 'environmentally friendly action', such as origin, what specific products one is buying, how far it has been transported, if it is domestic, etc. Furthermore, in turn six, she brings up a number of practical circumstances and reasons that would make the application interesting and useful, such as the quality,

price, environmentally friendliness of particular products as well as her own knowledge in these matters.

The concerns that get established in this first excerpt point to the general tensions and challenges in how the participants portray their experiences of EcoFriends. There is an expectation of a delimited definition of what it means for a fruit or vegetable to be in season, i.e. the application should provide ‘correct knowledge’ about these matters, rather than open-ended sometimes even disparate information. Despite this expectation about when a product is in season, the participants argumentation around these matters points to how these are multi-faceted issues that are difficult, even impossible, to define in absolute or discrete terms. The open-ended fashion in which seasonality is modelled, represented, and portrayed in EcoFriends, constitute the foundations for the some of the challenges experienced by the participants’.

The participant’s critique regarding the open-ended character through which seasonality is portrayed in EcoFriends is put forth despite their own arguments, often well-grounded, as to why seasonality is problematic to define. Likewise, this expectation of a ‘real definition’ stands in conflict to the practical and open-ended situations that the application is used in. This relates to Brynjarsdóttir et al.’s critique of persuasive applications that deny reflecting these kinds of conflicts as being based on a “modernistic expectation” on technology [8]. Such modernistic expectation, they argue, narrows the focus of design and evaluation towards simplistic metrics and away from the complex issues involved in persuasion and sustainability.

### Exploring knowledge

In the following excerpt, the discussion evolved around examples that illustrate conceptions of the application. One participant browsed for carrots and used it as an example to discuss the application’s model of seasonality. Her opinion was that the seasonality of carrots should provide a suitable example of a specific product’s seasonality, i.e., carrots must be in season during mid-autumn.

1. *Woman 2: I don’t know, I think that...I had some thoughts of what food in season was, and was not, already... I guess I had a problem with trusting the stuff that didn’t match what I thought earlier... I would have needed another kind of format, so now tomatoes from Holland are okay, but not tomatoes from Brazil, sort of...like tomatoes are in season all the time, it has to be since it is so common*
2. *Woman 1: I agree*
3. *W2: ...hey, I just found carrots...then I don’t understand why carrots aren’t in it all along... like at the autumn break, sorry, but like this*
4. *Man 1: twitter I guess?*

5. *W2: but after mid-October there are no carrots, although they are in season [in reality]*

This excerpt points to the kinds of considerations that participants come back to throughout the study. W2 had an idea of when carrots should be in season. She argued that well-familiar vegetables such as tomatoes and carrots should be suitable examples for testing how seasonality is modelled, and the way it is displayed to users in EcoFriends. She used the differences in environmental effects of imported tomatoes from Holland versus Brazil as a suitable example that should be clearly reflected by the application. Furthermore, she also probed the application by searching for when carrots are portrayed as being in season, compared to her own preconception.

Carrots were to some degree in season at that time of the year as she argued should be the case, but it was not put forward as one of top ones. As discussed above, in EcoFriends, seasonality is based on the occurrences of groceries in various social media. However, there is no hard-coded correlation between harvest period and seasonality in EcoFriends. The discrepancy between the particular way that core concepts are modelled in the application, and the participants’ view of how such concept should be modelled in this application, brings along a number of discursive tensions. These tensions regard how the users experience the conception of season in EcoFriends, and expectations of applications for sustainable grocery shopping.

### Open-endedness

The third excerpt further deals with the open-ended definition of seasonality in EcoFriends. In summary, the issue of concern in this excerpt is oriented towards how the participants relate to the open-ended representation of seasonality and their expectations for well-defined concepts as a requirement for a trustworthy design.

1. *Researcher: What is it that you need to feel that you can trust your choice?*
2. *W2: But of course I choose what is really in season...who decides that, I don’t really know, but...eh...price of course determines it in one sense, because when potatoes are in season, potatoes are cheap, for example.*
3. *M2: Maybe one relies on...or I would be more trusting if I got some further sources, like, um, five chefs recommends this...if it would be, like, I don’t know, Råd & Rön [Swedish product review magazine], like a source of some kind.*

In turn 2, W2 says that she chooses groceries based on what is in season. At the same time she also points to the difficulty of specifying what it means for a product to be in season, and the need to actually know that in order to make informed shopping choices. Following up on that, she suggests price as a potential factor for when potatoes are in

season. Considering the various candidate factors she brought up in in Excerpt 1, such as being locally grown or the distance a product was transported, this suggestion further points to a pragmatic, situationally dependent perception of seasonality. This in turn points to an interesting contrast between what could be defined as her practice- or rule of thumb-based conduct on the one hand and the rational discussion of seasonality as such and its role in technology.

### Reliable sources?

This excerpt elaborates on the discussion about trustworthy sources in sustainability issues and grocery shopping:

1. *Researcher: Did you manage to choose? Did you make good choices anyway?*
2. *M1: I don't know, it's impossible to say, because I don't trust these, you must ask someone else [laughs]*
3. *M2: You don't trust yourself either, do you? [laughs]*
4. *Researcher: Please tell us some more, do you rely on your own judgment in this context?*
5. *W2: But I don't know when eggplants are in season and this [EcoFriends] does not tell me that. Or because an expert has chosen it, why was it chosen...maybe it was because they had a good recipe for that. Why did they choose it? Is it...like, because they cook fancy food, or? Or what was it, I don't remember who those experts where...*
6. *Researcher: Chefs, agronomists and sustainability award winners*
7. *W2: Uhu, but chefs might be going for something else [than ingredients in season]*
8. *Researcher: But was that something you thought of in the grocery store, like 'this is in season but it is not shown [in the EcoFriends app]'?*
9. *W2: Eeeehm...I kind of don't know exactly when the season ends for carrots and root beets, but it was plenty of them and they were cheap. We were going to buy root beets but they weren't in the app so then we bought mango instead.*

As stated in the previous excerpts, the participants in our study apply practical experiences for shopping groceries in season. However, in this excerpt they have a number of arguments supporting the complexity involved in narrowly defining a concept such as seasonality. On elaborating on the issue of trust, in turn 5, W2 brings up the various agendas of different stakeholders such as chefs and producers as uncertain sources. W2's question, "*Why did they choose it*", is an example of the kind of explorative question. The uncertainty introduced by EcoFriends spur the kind of reflective reactions we see here, which the application was actually designed to foster. Whether this is a good or bad design idea could of course be debated and it

should be remembered that EcoFriends was set up as a technical probe. But what is more interesting is that it also points to the important issue that the ambiguous design spur a questioning about seasonality as a concept.

### Who is responsible

Another aspect that regarded the relationship between sustainability and responsibility came forward. One participant said:

*"the origin of a product is more like a label, just like a price tag, it might say Israel or 4.95, but that does not really mean anything"*.

And also:

*"When I hold two tomatoes in my hand, one labelled as environmentally friendly, but grown far away, and one conventionally farmed, but grown nearby, I don't know whether the label includes the effects of transportation or not, so I don't know which one to choose"*.

This utterance points to the fact that there are a number of available sources that provides hints of how to select vegetables and fruits in a sustainable way. However, using these is not a straightforward matter. It requires an effort of deciding and taking responsibility that is experienced as unclear or even confusing, sometimes to an extent that some of the participants perceived as meaningless.

The different concerns regarding the locus of responsibility for a particular action cannot be understood as connected to a singular source, but instead a phenomenon that emerges in the matrix of users, the application, designers and the information assembled and portrayed through the application. When a product is 'in season' becomes a question of constant (re)negotiation that relies on the dynamics of the external forces, social and broadcasting media, and other actors.

Several of the participants repeatedly claimed that "it would be irresponsible" for an application to portray information that potentially could play a role in users making "unethical" choices or that they would become misinformed about what *actually* constituted season for a particular product. This was not because such choices would not be made otherwise, but because an application that influences users should - in a sense - do that in the most *correct* manner possible. Some seemed to express the idea that "the application would be irresponsible". They were concerned with that the application would determine the actions of users in inappropriate ways. Arguably, this illustrates how conceptual simplifications such as this may lead users to expect technology to assume some of the responsibility for their actions. This kind of reasoning about responsible and environmentally friendly shopping contains a tension between knowledge, habits and who is to take responsibility, society or individuals.

## ANALYSIS

The design and study of EcoFriends was set up as a technical probe in order to provide an understanding of the complexity of designing applications for sustainable interaction. When designing EcoFriends, one of the most important conceptual ideas was that it should not provide guidelines, but rather work as a discursive companion and inspiration for buying and cooking food in season. In particular, the design aimed at avoiding a persuasive ‘voice’ in the application by using a performative design approach. In EcoFriends we have attempted to view sustainable action as constantly negotiated. The analysis of the user study spurred a number of issues regarding the design and use of performative design approaches and value-laden concepts:

- Users repeatedly claimed that the application should be modelled around a stable knowledge set rather than as ‘knowledge in flux’.
- The users were searching for the practical usefulness of the conceptual ambiguities in the content of the application
- In claiming that the system should contain some kind of ‘truth’ users expected the application to involve a delimited scope of the concept of seasonality
- The ambiguity embedded in the design spurred reflection and criticism of the sources that the application relied upon.
- Responsibility for decisions and their consequences became a negotiated issue in which users claimed the application and the designers should be seen as responsible actors.

The way that the participants talk about sustainability is related to how knowledge is modelled in interactive applications and thereby the ways such designs reproduce knowledge. The participants request for getting the “correct” information illustrates how the application is expected to ‘simplify’ for users in making responsible and sustainable actions. Much of what they say point to an expectation that applications like EcoFriends should act as a decision support application rather than as tools for reflection. EcoFriends, on the contrary, is designed to challenge and mirror the complexity and open-endedness of a sustainability practice such as buying groceries ‘in season’. A traditional response to this tension would be to claim that the application should be redesigned according to the users’ expectations. However, we argue that we got illustrative data of a number of underlying assumptions. Designing reflective sustainable interactions thus need to expose users to some of the ‘socio-material entanglements’ that we have learned constitute sustainability. For designers, this involve shifting viewpoint from that of considering the user as the sole agent that drives the interaction, towards that of considering interaction/agency as emergent in the socio-material matrix in which these issues are embedded [35].

On a situated level, the participants experienced discrepancies between their own pre-conceptions about how seasonality should be modelled, and the way it was actually modelled in EcoFriends. It was challenging for the participant to deal with the fact that the design of the application itself rests on the assumption that we cannot be sure of what is correct information and not, and that the design of the application puts this assumption upfront.

This could be formulated as a discrepancy in the fundamental assumption as to what constitutes the seasonality of a fruit or vegetable, between the perspectives of the participants versus that of the application. The discrepancy regarded the specific character of how the participants experienced seasonality within the specific context of the application, and not necessarily their general understanding of such concepts. Rather, in the specific context of an application designed for sustainable interaction, the participants expected that the technology should include a model of seasonality that is based on what we above characterised as *representational* technology. In such a design, a concept like seasonality would be modelled through measurable or more or less discrete representations of its core concepts. On the contrary, in EcoFriends, the core concepts of seasonality is modelled around what we characterise as *performative* technology. In such technology, seasonality is constructed and portrayed based on the dynamics of different actors relevant to the social and material circumstances around seasonality.

### Performativity in interaction design

The distinction between representational and performative technologies has been exposed on several occasions throughout our study. This distinction and the challenges it brings along provides an interesting case for interaction design in sustainable interaction. Especially, this is the case in settings that involve knowledge in value-laden domains.

To further elaborate on this, let us turn to the influences from the STS research area that we have seen in HCI, such as [21,23,24,31]. The distinction between representational and performative perspectives to technologies, resonates with what Barad argues to be confusion between representation and truth [2]. Barad’s point is that by assuming the representation (EcoFriends) as the real, actual phenomenon (in this case the connection between vegetables and their harvest seasons as well as place of origin) one tends to ignore the “socio-material entanglements” that the representations of the application, including simplifications, adjustments and illusions, lives in. In EcoFriends, users’ responses suggested that there was an expectation that the application should clarify the often confusing bits and pieces of knowledge about seasonality that is already available, and work as a carrier of a straightforward *truth*. But by conceptualizing sustainability issues as open-ended on-going production of

knowledge we have instead made various, socially dynamic aspects come to matter. To use Barad's terminology, this turns what is relevant and perceived as objective, into a topic of negotiation in an on-going process of inclusion and exclusion of what is central and what is peripheral.

EcoFriends essentially builds on experts as well as lay people's opinions, but to some extent the design failed to communicate this. There could be several reasons for this such as unclarity in the design and set up of the study. One possible reason behind this is that the participants are unaccustomed to ambiguous data in general, and in particular as a critical element of interactive applications design. Conceptually, this reflects a discrepancy between the users' epistemology and that of EcoFriends. Such discrepancy has consequences for a number of aspects in the interaction, such as users' trust, their expectations of the application, and questions of accountability and responsibility. This resonates with fundamental conceptions for understanding interaction in HCI. Already in Normans [ref] early work a distinction between the user's mental model and the designer's conceptual model of the application was proposed, and that this distinction was as a source of many of the challenges in HCI, see e.g. [27]. Obviously, ways of overcoming this gap has been a central topic in much interaction design research. These notions have proven too simplified in accounting for when interaction breaks down. We would like to formulate such discrepancies in terms of differences in epistemologies that go beyond aspects that can be addressed by design only. Rather, than seeing these epistemological differences as problems that need to be overcome, they can be seen as design resources that could let us designing technologies that challenge users' pre-conceptions and let designers, as well as users, to experience value-laden technologies in less absolute terms [21].

The seasonal information and the information fragments around each specific product in EcoFriends provides a, to use Latour et al's words, 'highly specific point of view' on the product and its seasonality [20]. The point of view of a particular user differs from that of all other users, and also dynamically changes along with changes and updates in the social media, information sources, and shopping behaviour that EcoFriends relies upon. Thus, these different points of view cannot be said to provide absolute or objective lenses into what constitutes the seasonality of a product.

## CONCLUSIONS

In EcoFriends seasonality was modelled through a so called *performative* approach. It makes several social-relational aspects such as personal and social connections manifest in an application for sustainable interaction. By conceptualizing design in this manner, it allowed us to

study them from new viewpoints, and bring new issues to the surface.

To probe support for grocery shopping 'in season' we, as well as the participants, got to reflect further on the dynamics involved in such a concept. In EcoFriends, the dynamic image of seasonality consist of *social voices* of vegetables that are in season. The social voices is based on experts and friends blogging and twittering, as well as news and weather information. Through such online contributions, they all participate in defining the boundaries of vegetables 'in season'.

The analysis can be summarized in a number of themes revolving around aspects of truth, trust and reliability. The open-ended design of EcoFriends revealed a dynamic and socially-dependent perspective on knowledge. We found it interesting how this led users to engage in questions regarding the underlying assumptions that the application was based on. We have formulated this as a set of design challenges requiring further research. These included:

1. *The expectation for stable knowledge.* Sustainable and value-laden domains contain dynamic and often inconclusive knowledge. Interaction around such knowledge need to balance the circumstances of practical everyday use without hiding the underlying complexity and its inevitable ambiguity.
2. *The expectation for a clearly delimited scope of the application and the interaction.* People's perception and expectation that interaction should portray 'the truth' of a phenomena, stands in contrast to a performative interaction design that contains and reveals a multitude of potential truths, that often reach out into novel settings and domains.
3. *Responsibility as negotiated.* The locus of responsibility, the responsibility of interaction, and the nature of responsible design is an issue under negotiation between interaction designer and user. A performative approach can be used to challenge the foundations of ideas and preconceptions around facts, information and knowledge in value-laden domains, thereby making negotiation a topic for the interaction

## Final remarks

In contemporary society, digital applications to a substantial extent are used as sources of knowledge. Interactive technology, engaged in value-laden societal discourse such as sustainability, revolves around making the complex relations involved in these simplified for everyday life. Our study shows that an application like EcoFriends inevitable gets placed in this discourse, and when the application does not play along with this discourse, users get frustrated. In that way, interaction design is highly normative by the way it conceptualizes knowledge, not because it simplifies the world, but because design reshapes the world. Our result revealed underlying assumptions about interaction design and how

we have come to expect knowledge to be presented through technology. Thereby, introduction of new technology reproduces and reinforces a conceptual understanding of what we are expecting to be able to achieve through technology. Consequently, research addressing design for interactions about value-laden concepts such as sustainable action need to find ways of supporting users to be aware of such expectations.

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