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The effects of information form and domain-specific knowledge on choice deferral

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ABSTRACT

Three studies examined the effect of information form on choice deferral in consumer choice and explored the moderating role of knowledge about the product domain. Two theoretical approaches were contrasted: (1) The process approach predicting that choice deferral varies as a function of information form, and (2) the communication approach predicting an interaction of information form and domain-specific knowledge. Participants were presented with different laptops described in an absolute (e.g. '300 GB hard disc'), evaluative-numerical (e.g. 'hard disc with 30 out of 100 points in an expert rating') or evaluative-verbal (e.g. 'bad hard disc') information form, and they could choose to buy one of the laptops or defer. Domain-specific knowledge was also assessed. In Study 1, evaluative-numerical and evaluative-verbal values led to more deferral in people with high domain-specific knowledge. The pattern for evaluative-numerical and evaluative-verbal values was replicated for a different information organization in Study 2. Study 3 showed that absolute values led to more deferral the less knowledgeable participants were and demonstrated that domain-specific knowledge and deferral were unrelated when absolute and evaluative-verbal values were presented in combination. In sum, the results support the communication approach and have methodological implications for decision research and theoretical implications for understanding choice deferral in real-life decisions.

1. Introduction

People face decisions on a daily basis. They decide to have coffee rather than tea in the morning, to opt for steak at lunch and to buy the new expensive mobile phone although they still have a functioning old one. In many situations, people do not make a decision right away but postpone the decision and instead search for more alternatives or more information about the alternatives at hand, which is commonly referred to as *choice deferral* (Anderson, 2003; Dhar, 1997; Tversky & Shafir, 1992). For instance, participants faced with a decision to buy one of two new high-tech mobile phones may conclude that they are better off searching for more information to have a sound basis for making a decision later. Otherwise, they might

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end up regretting their choice when a better alternative is found only after the purchase decision in favor of an inferior option has already been made.

It is well established that people frequently defer decisions in artificial experiments (e.g. Dhar, 1997) as well as in settings with real consequences (e.g. White & Hoffrage, 2009). However, in both kinds of situations researchers and marketers often use different ways of displaying information about the available options, and it is not clear how variations in presenting information about choice options affect decisions or deferrals. For example, researchers sometimes present attributes of the choice alternatives in absolute terms (e.g. price of $199; Dhar, 1996) whereas in other experiments they use verbal labels (e.g. poor sound system; Luce, 1998) or numerical rating scales (e.g. amount of work is 2 on a scale from 1 to 3; Patalano & Wengrovitz, 2007). Hence, *information form* (Kleinmuntz & Schkade, 1993) varies not only across studies but also between experiments within the same paper (e.g. Dhar, 1997; Dhar & Simonson, 2003) or even within one experiment (e.g. Chernev, 2006; Dhar & Nowlis, 1999). In real-life, one will rarely find a car that is offered with a 'good price' instead of an absolute monetary value or a university course that is advertised with a work load of 2 on a rating scale instead of a fixed number of hours per week. Such differences between situations that people are familiar with and situations that they are supposed to imagine in experiments may have systematic effects on their behavior in both instances.

Whether variations in information form influence deferral decisions is a methodological question of great importance. Researchers need to pay attention to the effects of information form when designing experiments, and inconsistent findings for context and task effects in the field of judgment and decision making may be reinterpreted in the light of these new findings (e.g. set size; Scheibehenne, Greifeneder, & Todd, 2010). Showing that information form affects choice deferral also has immediate implications for choice situations in realistic decision-making situations beyond the laboratory, in particular for consumer choice behavior.

In this research we systematically explored the effect of different information forms on choice deferral in a hypothetical laptop purchasing decision, contrasting two theoretical approaches: the *process approach* and the *communication approach*. Both approaches postulate that choice deferral rates vary as a function of how the information about the available options is presented. They differ, however, with regard to the nature of the effects, particularly about the role of individual differences in domain-specific knowledge on the part of the decision maker.

1.1. Information form, prior knowledge and choice deferral

People are more likely to defer decisions when they find them difficult to make (Tversky & Shafir, 1992) or when they are uncertain regarding the option that best fits their demands (Dhar, 1997), provided all options have some attractiveness (White & Hoffrage, 2009). Additionally, people often do not have well-defined preferences but construct their preference for an option in a given set while working on the decision task at hand (Bettman, Luce, & Payne, 1998; Lichtenstein & Slovic, 2006; Slovic, 1995). Therefore, participants have to understand and process the provided information so that they are able to compare options in a relative manner and gain confidence concerning their preference. If they are unable to understand the information, their confidence that their preferred option actually is the best choice may not surpass the critical threshold for making a decision (White & Hoffrage, 2009). Thus, they should be more likely to defer. This reasoning suggests that depending on the way in which the information is processed by, and presented to, the decision maker, deferral may increase or decrease. To the extent that variations in information form affect the processing and communication of the information, this variable will affect the probability of choice deferral.

In the present research, the focus was on examining the effect of information form by using three different forms of presenting information about choice options (see Kleinmuntz & Schkade, 1993 for a similar conceptualization): (a) absolute, (b) evaluative-numerical (henceforth eval-numerical) and (c) evaluative-verbal (henceforth eval-verbal) information form. Absolute refers to information about specific attributes of the choice options that depend on the given context (e.g. Stone & Schkade, 1994). For instance, a laptop can be described in absolute terms by stating that it has a hard disc of '4096 MB DDR3 with 1066 MHz'. Whether or not this information denotes the laptop as good or bad with respect to its hard disc cannot be read directly from the information provided but has to be inferred, based on contextual knowledge about the meaning of the specific value. Eval-numerical and eval-verbal information describes the options in terms of the relative quality of attribute values on a scale that does not depend on the given context (e.g. Stone & Schkade, 1991; Stone & Schkade, 1994). In both forms, the evaluation is contained in the attributes themselves and does not have to be inferred. However, the two forms differ in how this relative information is provided. Eval-numerical values use figures, whereas eval-verbal values use words. For instance, a hard disc of a laptop can be described as scoring '78 out of 100 points' (eval-numerical) or it can be described as 'good' (eval-verbal).

To address the question of how information form affects choice deferral, we drew on two pertinent approaches in the choice literature: the *process approach* and the *communication approach*.

1.1.1. The process approach

The process approach states that depending on the information form, individuals apply different decision strategies to construct their preferences. These strategies may be linked to increases or decreases in the likelihood of choice deferral.

Information form is known to particularly affect the way information is processed (Schkade & Kleinmuntz, 1994). Huber (1980) showed that eval-numerical attribute values lead to more combination, comparison, and offsetting of information than eval-verbal values. Stone and Schkade (1991) discovered that eval-numerical values produced more alternative-based

comparisons and cognitive operations, both indicative of compensatory decision strategies, than did eval-verbal values. Furthermore, Stone and Schkade (1994) demonstrated that absolute values (unique, context-dependent scales in their terms) led to faster and more attribute-based decisions, indicative of non-compensatory strategies, than did eval-verbal and eval-numerical values (common, context-independent scales in their terms). In their experiments on the effect of decision strategies on choice deferral, Dhar (1996) and Dhar and Nowlis (1999, 2004) have demonstrated that compensatory processes are followed by increased deferral compared to non-compensatory processes.

Thus, according to the process approach choice deferral rates should vary as a function of information form: absolute values are assumed to lead to more non-compensatory processes than eval-verbal and eval-numerical values (Stone & Schkade, 1994), which should decrease deferral (Dhar, 1996; Dhar & Nowlis, 1999, 2004). Eval-numerical values are assumed to lead to more compensatory processes than eval-verbal values (Huber, 1980; Schkade & Kleinmuntz, 1994; Stone & Schkade, 1991), which should increase deferral (Dhar, 1996; Dhar & Nowlis, 1999, 2004). Therefore, all else being equal eval-numerical values should lead to more deferral than eval-verbal values, which in turn should lead to more deferral than absolute values.

1.1.2. The communication approach

The communication approach analyzes the effects of information form on choice deferral from the perspective of conversational analysis (for theoretical developments see Grice, 1975, and Schwarz, 1994; for a recent application to consumer choice see Zhang & Schwarz, 2012). In a communication process between the seller and the buyer, the seller has to convey the necessary information to the buyer in a comprehensible way, depending on the buyer's needs. For a sound decision, buyers need two different kinds of information, namely the attributes of a product (e.g. 2048 MB DDR3 with 1066 MHz) and an evaluation of their quality (e.g. fairly poor). Unfortunately, absolute, eval-verbal, and eval-numerical values do not convey both kinds of information at the same time. Whereas absolute values only describe the attribute of the product, eval-verbal and eval-numerical values only contain information about its quality. Whether or not a given form of information will lead to more or less choice deferral depends on the fit between the information provided and the prior knowledge of the buyer (e.g. Levinson, 1980).

People with much prior knowledge about the product in question are able to infer its quality from the absolute values provided and then have all the information they need for a sound decision. For people with little prior knowledge, absolute information is not enough for making a sound decision because they cannot infer what the information means in terms of the quality of the product. Therefore, absolute information increases the odds of choice deferral in people with little prior knowledge. Conversely, eval-numerical and eval-verbal values provide information about product quality but do not facilitate an unambiguous inference about the attribute. For instance, there may be more than one hard disc that corresponds to an eval-verbal value of 'very good'. For people with little prior knowledge this does not matter because they do not look for absolute information. However, people with much prior knowledge will want to know about the absolute attributes and will be more likely to defer when they only have eval-numerical or eval-verbal information.

Thus, the communication approach states that people are more or less equipped to understand the information provided in a specific form. Absolute values fit people with much prior knowledge more than people with less prior knowledge, whereas the reverse is true for eval-numerical and eval-verbal values. Hence, it may be predicted that for absolute values deferral probability increases as prior knowledge decreases, whereas for eval-numerical and eval-verbal values deferral probability increases with higher prior knowledge.

1.2. The current research

Three studies were conducted to investigate the effects of information form and prior knowledge on choice deferral in a hypothetical decision about buying a laptop. Study 1 was conducted to contrast hypotheses derived from the process and the communication approach, respectively. Based on the process approach, it was predicted that regardless of prior knowledge, the likelihood of choice deferral would be lowest when information about the laptops was presented in absolute form, followed by the eval-verbal form and finally the eval-numerical form. By contrast, the communication approach would predict that deferral rates depend on the interaction between information form and prior knowledge: For absolute values, prior knowledge should correlate negatively with deferral rates, whereas for eval-numerical and eval-verbal values, prior knowledge should correlate positively with deferral rates.

Based on the findings of Study 1 that favored the communication approach, Study 2 manipulated the visual organization of the information (list-by-alternatives vs. the matrix format used in Study 1) to rule out the possibility that the failure to find the difference between eval-numerical and eval-verbal information predicted by the process approach was due to the way in which the information had been visually organized.

Finally, Study 3 examined whether the effects of prior knowledge on choice deferral found in the first two studies could be reduced by adding eval-verbal information to the absolute information. If, as argued by the communication approach, people with little prior knowledge are more likely to defer their choice because they cannot make enough sense of the information presented in absolute form, their choice deferral rate should decrease if they received absolute information enhanced by eval-verbal information.

In all three studies, we collected data from high school students and university undergraduates (and five people in employment in Study 3). We considered that people in this age group would be likely to purchase their own laptop for the first time and should therefore find our hypothetical consumer choice scenario realistic and easy to image.

2. Study 1

This study was designed as a first test of the effects of information form and prior knowledge on choice deferral, contrasting the process approach and the communication approach. Participants had to make a (hypothetical) decision between four laptops described in terms of absolute, eval-verbal, or eval-numerical values. They could choose to buy one laptop or defer their choice to search for more alternatives and/or more information about the options at hand.

Based on the process approach, we predict that deferral rates should be highest in the eval-numerical condition, followed by the eval-verbal and the absolute conditions (Hypothesis 1).

Based on the communication approach, it was predicted that the effect of information form on choice deferral would be moderated by participants' prior knowledge about laptops. When the information is presented in absolute form, deferral probability is predicted to correlate negatively with prior knowledge about laptops. By contrast, when the information is presented in eval-verbal or eval-numerical form, the correlation is predicted to be positive (Hypothesis 2).

Note that for absolute information, the process approach predicts low deferral rates regardless of prior knowledge. By contrast, the communication approach predicts low deferral on the basis of absolute information only for people with high levels of prior knowledge. Moreover, the process approach predicts less deferral for eval-verbal than for eval-numerical information, whereas the communication approach does not predict a difference in deferral rates between these two forms.

2.1. Method

2.1.1. Participants

One-hundred-eighty-five participants (84 male) took part in the study, including $n = 97$ undergraduates and $n = 88$ high school students with a mean age of 19.99 years ($SD = 4.10$, range: 15–44)[2]. Two participants did not indicate their prior knowledge about laptops, one did not indicate a choice, one did not indicate choice satisfaction and three did not indicate their choice certainty. They remained in the sample for all other analyses. High school students participated as part of a project week. Permission to conduct the study was obtained from the school administration, and participants were informed that they could refuse or terminate participation at any time. The psychology undergraduates were tested in class and received course credit for their participation.

2.1.2. Materials and procedure

Attribute lists describing four laptops were generated in two pilot studies. For each laptop, five attributes were provided: (1) processor, (2) working memory, (3) graphics board, (4) hard disc capacity, and (5) battery life, and different combinations of each attribute were generated for each laptop. In the first pilot study, three computer experts evaluated the attractiveness of the laptops in terms of their individual features on a scale from 0 to 100. Additionally, attractiveness ratings for processors and graphic boards were derived through quality checks from the internet. Individual values were then combined to create laptop profiles that varied with regard to different attributes but were equally attractive overall. The attributes were selected so as to convey moderate attractiveness to make both choice and deferral realistic options.

In the second pilot study, 16 high school students were presented with the sets of attributes and evaluated the attractiveness of each laptop to confirm that all options were similar in attractiveness for people with different levels of prior knowledge. In addition, participants completed a measure of knowledge about laptops to establish sufficient variability in prior knowledge about laptops in this target group. Furthermore, it was confirmed that participants were indeed able to imagine the situation of buying a laptop and choosing from a set of laptops as presented in the main experiment ("How easy did you find it to imagine being in this situation; response scale from 1 *not at all easy* to 9 *very easy*; $M = 6.59$, $SD = 1.46$, *range*: 4–9).

Participants in the main study were randomly allocated to three conditions manipulating information form: absolute, eval-numerical, and eval-verbal. In the "absolute information" condition, they received the features of the different laptops as selected in the pilot study. For the "eval-numerical information" condition, these absolute values were converted into numerical scores on a scale from 0 to 100 based on the expert ratings. Finally, in the "eval-verbal condition", the numerical values were replaced by their verbal counterparts according to Schkade and Kleinmuntz (1994). The format of the three conditions is presented in the Appendix.

The study was presented as a study on consumer buying behavior. Participants in the absolute information condition were given the following instruction: "Please imagine that you want to buy a laptop for which you have budgeted between €750 and €900. The first store you enter offers the following four laptops in that price range." Then participants were shown the descriptions of the four laptops organized in a matrix with one column for each laptop and one row for each attribute dimension. In the eval-numerical condition, participants were told that the attribute ratings were based on expert ratings on a scale from 0 to 100. Those in the eval-verbal information condition were told that the experts' numerical ratings were translated into verbal labels based on a conversion matrix. In both the eval-numerical and eval-verbal condition, the conversion matrix was presented right before the laptops in order to ensure that participants would be able to understand the values (see Schkade & Kleinmuntz, 1994).

[2] In all three studies, including Sample (university versus high school students in Study 1 and 2 as well as university vs. high school students vs. employed people in Study 3) in the analyses did not yield main effects or interaction effects. Therefore, data were collapsed across these subgroups in each study.

After the laptop presentation, participants were asked to indicate whether they would want to purchase one of the laptops or prefer to search for further options and/or more information about the laptops presented. Participants were further told to bear in mind that if they chose to defer the purchase, the options might no longer be available at a later date (Dhar, 1997). Although these hypothetical consequences did not have any real implications for the participants, previous research has shown that such consequences may nevertheless affect decisions (e.g. Xu & Wyer, 2007).

Prior knowledge about laptops was assessed with a single item ("My knowledge about laptops and their characteristics encompasses: (1) *very little knowledge* to (9) *high knowledge*"). A further item measured choice satisfaction ("How satisfied are you with your decision?; (1) *very unsatisfied* to (9) *highly satisfied*), and one item measured choice confidence ("How confident are you that you made the right decision?" (1) *very uncertain* to (9) *highly certain*). All three ratings were obtained after participants had reported their decision. Furthermore, participants were asked to indicate what they would recommend to their best friend. They were allowed to recommend a choice, to defer the choice, or make no recommendation at all. Because of an error, the recommendation was only measured for eighty-eight participants.

Together with satisfaction and confidence, the recommendation was used to validate the prior knowledge variable. It was expected that prior knowledge would be positively related to both satisfaction and confidence. Furthermore, the less knowledgeable participants were expected to be more likely not to recommend anything to their best friend, as this is a less committing option than recommending either choice or deferral.

Finally participants were thanked and given the opportunity to be informed about the purpose of the study.

2.2. Results

The descriptive statistics for all measures are presented in Table 1 for the total sample and the three experimental conditions. About a third of participants decided to defer their decision. Mean ratings for satisfaction and confidence and the recommendation rates for purchase and deferral did not differ significantly between the three conditions. Satisfaction and confidence were positively correlated with deferral probability ($r = .24$, $p = .001$ and $r = .48$, $p < .001$, respectively).

To confirm the validity of the prior knowledge variable, we tested its relationships with satisfaction, confidence, and recommendation. Both satisfaction ($r = .24$, $p = .001$) and confidence ($r = .34$, $p < .001$) were positively correlated with prior knowledge. Recommendation (0 = Choice/Deferral; 1 = No recommendation) showed a negative link with prior knowledge ($r = -.23$, $p = .02$). Together, these findings confirm the validity of the prior knowledge variable.

The two hypotheses were tested in a logistic regression of choice (dummy-coded; 0 = purchase, 1 = deferral) on information form (*z*-standardized), prior knowledge, and their interaction term. Since information form was a categorical variable with three levels, two dummy-coded variables were created. The process approach predicts that absolute values lead to less deferral than eval-numerical and eval-verbal values. This is reflected in Dummy 1 (0 = absolute, 1 = eval-numerical/eval-verbal). The process approach further predicts that eval-numerical values lead to more deferral than absolute and eval-verbal values. This assumption is reflected in Dummy 2 (0 = eval-numerical and 1 = absolute, eval-verbal). Dummies 1 and 2 were then entered together in Block 1 to test the main effect of information form on choice deferral (Hypothesis 1) equivalent to a χ^2-Test. Dummy 1 was also used to compute the interaction term with prior knowledge to test the prediction of the communication approach that the linear effect of prior knowledge on choice deferral would depend on information form, being negative for absolute values and positive for both numerical and verbal values (Hypothesis 2). So, after controlling for the main effect of prior knowledge in an additional Block 2, the interaction between Dummy 1 and prior knowledge was entered in Block 3. No prediction was yielded by the communication approach for the interaction of Dummy 2 and prior knowledge, and adding this interaction in Block 3 did not change the level of significance of our focal interaction.

The results of the logistic regression are shown in Table 2.

A test of Block 1 against a model with the constant only was not significant, $\chi^2(2) = 0.06$, $p = .97$, which indicates that adding the two information form comparisons to the model did not explain variance in deferral probability. This means that Hypothesis 1 is not supported by the data. Contrary to the process approach, no significant differences in deferral probabilities were found between the three information form conditions. As can be seen in Table 2, the only marginally significant effect was the interaction between information condition (absolute versus eval-verbal/eval-numerical) and prior knowledge, introduced in Block 3, $\chi^2(1) = 3.02$, $p = .08$. In total, 61% of the cases could be classified correctly, whereas 53% would be expected by chance.

To examine the interaction more closely, choice (0 = purchase, 1 = deferral) was regressed on prior knowledge separately for the absolute and the eval-numerical/eval-verbal conditions. In Hypothesis 2, a negative relationship was predicted

Table 1
Descriptive statistics Study 1.

	Total sample	Absolute	Eval-numerical	Eval-verbal
Deferral %	38	38	39	36
Prior knowledge (*M*, *SD*; 1–9)	4.72 (2.27)	4.50 (2.21)	4.97 (2.34)	4.69 (2.28)
Satisfaction (*M*, *SD*; 1–9)	5.59 (2.06)	5.74 (2.07)	5.56 (2.02)	5.48 (2.09)
Confidence (*M*, *SD*; 1–9)	6.01 (2.15)	5.66 (2.33)	6.05 (2.09)	6.27 (2.01)
No recommendation %	29	39	33	18

Table 2
Study 1: Logistic regression of choice on information form (absolute vs. eval-numerical vs. eval-verbal), prior knowledge and their interaction.

Predictors	*B* (*SE*)	Wald χ^2	*OR*	95% CI for *OR*	
				Lower	Upper
Constant	−0.49 (0.47)	1.08	0.62		
Block 1		0.06			
Dummy1[a]	−0.03 (0.38)	0.01	0.97	0.46	2.04
Dummy2[b]	−0.03 (0.38)	0.01	0.97	0.46	2.03
Block 2		1.61			
Prior knowledge	−0.21 (0.29)	0.55	0.81	0.46	1.42
Block 3		3.02[+]			
Dummy1 × prior knowledge	0.59[+] (0.34)	2.95	1.81	0.92	3.54

Note: Nagelkerkes R^2 = .04. *B*, Wald χ^2 and *OR* are taken from the last block.
[+] $p < .10$.
[a] Information form: absolute vs. eval-verbal/eval-numerical.
[b] Information form: eval-numerical vs. absolute/eval-verbal.

between prior knowledge and deferral in the absolute condition and a positive relationship in the eval-numerical/eval-verbal condition. In the absolute condition, a comparison of a model with prior knowledge compared with a constant only model was nonsignificant, $\chi^2(1) = 0.55$, $p = .46$, Nagelkerkes $R^2 = .01$, but in the expected direction, $B = -0.21$, $SE = 0.29$, $\chi^2(1) = 0.55$, $p = .46$, $OR = 0.81$. In the eval-numerical/eval-verbal condition, a comparison of a model with prior knowledge compared to a constant only model was significant, $\chi^2(1) = 4.12$, $p = .04$, Nagelkerkes $R^2 = .04$. As predicted, the relationship was positive, $B = 0.38$, $SE = 0.19$, $\chi^2(1) = 3.98$, $p = .05$, $OR = 1.46$. The interaction is depicted in Fig. 1. When information about the laptops was presented to them in eval-numerical or eval-verbal form, participants were more likely to defer the more knowledgeable they were about laptops.

2.3. Discussion

Study 1 served as a first test of the effect of information form and prior knowledge on choice deferral. Two hypotheses were advanced to contrast the process approach and the communication approach. The process approach predicted a main effect of information form on choice deferral (Hypothesis 1). This hypothesis was not supported by the data. The communication approach predicted an interaction effect of information form and prior knowledge on choice deferral (Hypothesis 2). In line with this prediction, a marginally significant interaction of information form and prior knowledge was found. A closer examination of the interaction showed that, as predicted, for eval-verbal and eval-numerical information, deferral rates were significantly higher the higher participants' prior knowledge. For the absolute condition, the expected reverse effect of prior knowledge was not significant.

A positive correlation was found between deferral and satisfaction as well as confidence across all conditions, indicating that people who deferred their decision were more satisfied and confident with their chosen course of action than those who decided in favor of buying one of the laptops. Unlike studies that measured confidence prior to the actual decision and mostly found that low confidence is linked to more deferral (e.g. White & Hoffrage, 2009), we measured confidence after the decision had been made. Deferring a decision means keeping all options open for the future. The current finding may thus be interpreted within the framework of research on post-decisional regret where it has been widely shown that people experience regret once they have committed themselves to one option at the expense of others (Bui, Krishen, & Bates, 2011; Sagi & Friedland, 2007).

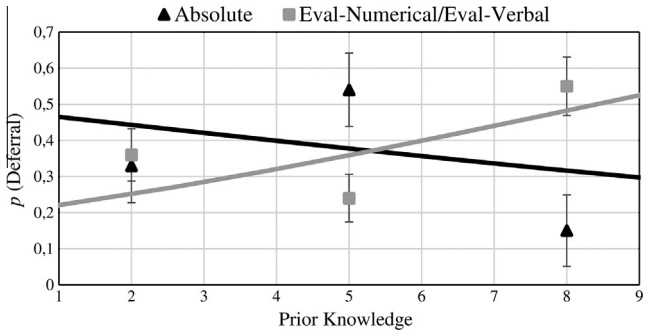

Fig. 1. Interaction effect of information form (absolute vs. eval-numerical/eval-verbal) and prior knowledge on deferral in Study 1. The squares and triangles and corresponding error bars depict observed mean deferral probabilities ± 1 SE when prior knowledge is divided into three groups. The first group includes values from 1 to 3, the second includes values from 4 to 6, and the third includes values from 7 to 9. The lines are based on equations fitted to the data.

Overall, the findings lend partial support to the communication approach and no support to the process approach. However, they need replication. It could be argued that participants did not sufficiently process the information for a main effect of information form predicted by the process approach to be found. Therefore, Study 2 was designed to promote more thorough information processing.

3. Study 2

Study 2 was designed to replicate the positive relationship between prior knowledge and deferral probability for the eval-numerical and eval-verbal groups. These information forms have been studied most often in previous research (Huber, 1980; Schkade & Kleinmuntz, 1994; Stone & Schkade, 1991). The failure to find a difference in deferral probability in Study 1 between eval-verbal and eval-numerical information contradicts the process approach. To ensure that participants would engage in a thorough processing of the information provided, we varied another information display variable, namely information organization.

In the discussion of Study 1, we reasoned that participants may not have processed the information sufficiently to show the main effect of information form predicted by the process approach. People rarely take all information into account to construct a preference. This is especially true for the matrix organization that was used in Study 1, which makes it easy for people to scan and compare different options on important attribute dimensions in a relatively superficial process (Schkade & Kleinmuntz, 1994). In contrast, if the information is arranged in a list-by-alternative format, the order in which the attributes are presented differs between options, requiring greater information processing efforts (Schkade & Kleinmuntz, 1994). Therefore, to provide a more stringent test of the process approach, we examined the effects of information form when attribute values were presented in a list-by-alternative format. Based on the process approach, an interaction effect is predicted (Hypothesis 3): If the information is arranged in a list-by-alternative format, deferral probability is predicted to be higher for eval-numerical than for eval-verbal values. To replicate the findings of Study 1, a matrix condition was also included. When the attributes are arranged in a matrix, deferral probability should be the same for eval-numerical and eval-verbal values, as found in Study 1.

The communication approach, on the other hand, does not predict an interaction effect of information form and organization on deferral rates. Instead, it suggests that both eval-numerical and eval-verbal information forms are linked to higher deferral rates in people with high domain-specific knowledge, regardless of information organization. Accordingly, it was predicted in Hypothesis 4 that deferral rates would increase the more knowledgeable participants were about laptops in both the list-by-alternatives and the matrix organization. This hypothesis directly replicates the comparison of eval-verbal and eval-numerical information conditions of Study 1. Because this is the comparison for which the process approach and the communication approach make different predictions, only the eval-verbal and eval-numerical conditions were included in the present study.

3.1. Method

3.1.1. Participants

One-hundred-seventeen participants (40 males) attending high school ($n = 22$) and university ($n = 95$) took part in the study. The mean age was 22.23 years ($SD = 4.64$, range: 15–44). The undergraduate students were enrolled in Psychology, Linguistics, Sports, and Educational Science. High school students were approached after a math class and participated on an unpaid voluntary basis. Undergraduates were tested after a lecture. Participants received course credit or had the opportunity to take part in a raffle of two Amazon vouchers worth €20.

3.1.2. Materials and procedure

The same material used in the eval-numerical and eval-verbal conditions in Study 1 was used for this study. Within each of the information form conditions, information organization was manipulated. Half of the participants received the attributes in a matrix format, with each row of the matrix presenting information about the same attribute (see Appendix), or in a list-by-alternative format that included the same attributes but listed in different orders for the different laptops. The remaining variables (i.e., choice, prior knowledge, confidence, satisfaction, and the recommendation), the cover story and procedure were identical to Study 1.

3.2. Results

Means and standard deviations of all variables are reported in Table 3 for the total sample and the four experimental conditions. As in Study 1, no significant differences were found between conditions in terms of satisfaction and recommendations. Information form had an effect on confidence ($p = .03$) such that eval-verbal information led to more confidence than eval-numerical information. Furthermore, satisfaction and confidence were both positively correlated with deferral probability ($r = .18$, $p = .053$ and $r = .42$, $p < .001$, respectively).

To validate the prior knowledge variable, we again tested its relationships with satisfaction, confidence and recommendation. Satisfaction was not significantly related to prior knowledge ($r = .12$, $p = .19$) although the relationship was positive.

Table 3
Descriptive statistics Study 2.

	Total sample	Matrix		List-by-alternative	
		E-N	E-V	E-N	E-V
Deferral %	47	30	50	52	57
Prior knowledge (*M*, *SD*; 1–9)	4.74 (1.94)	4.50 (1.55)	5.21 (2.17)	4.72 (2.07)	4.57 (1.94)
Satisfaction (*M*, *SD*; 1–9)	5.97 (1.62)	5.60 (1.79)	6.11 (1.50)	6.21 (1.45)	6.00 (1.72)
Confidence (*M*, *SD*; 1–9)	6.12 (1.76)	5.73 (1.46)	6.36 (1.73)	5.79 (1.84)	6.60 (1.92)
No recommendation %	27	27	32	35	17

Note: E-N – eval-numerical; E-V – eval-verbal.

Confidence was positively correlated with prior knowledge ($r = .30$, $p = .001$). Recommendation (0 = Choice/Deferral; 1 = No recommendation) showed a negative link with prior knowledge ($r = -.25$, $p = .01$). Thus, the validity of the prior knowledge variable was again confirmed.

Following the process approach, Hypothesis 3 predicted an interaction effect of information form and organization on choice deferral, with highest deferral rates when eval-numerical values were presented in a list-by-alternative organization that requires more thorough information processing than the matrix organization. Following the communication approach, Hypothesis 4 predicted a main effect of prior knowledge on deferral probability. To test both hypotheses in one model, a logistic regression was conducted regressing choice (dummy-coded; 0 = purchase, 1 = deferral) on information form (0 = eval-verbal, 1 = eval-numerical) and information organization (0 = list-by-alternative, 1 = matrix) in Block 1 and their interaction in Block 2 to test Hypothesis 3. In Block 3, prior knowledge (*z*-standardized) was entered to test Hypothesis 4. The interaction of information form and prior knowledge was entered in Block 4 but was not expected to predict deferral. Only a main effect of prior knowledge on choice deferral was predicted for both eval-numerical and eval-verbal values.

Only one significant effect emerged from the analysis, which was the main effect of prior knowledge, $\chi^2(1) = 4.81$, $p = .03$, Nagelkerkes $R^2 = .11$. This finding supports Hypothesis 4: As predicted by the communication approach, prior knowledge was positively related to deferral $B = 0.43$, $SE = 0.20$, $\chi^2(1) = 4.53$, $p = .03$, $OR = 1.54$. Sixty-two percent of the cases were correctly classified, although 50% would be expected by chance. All other comparisons were not significant ($ps > .11$), including the interaction between information form and organization proposed in Hypothesis 3 based on the process approach.

3.3. Discussion

Study 2 served two aims. The first aim was to replicate the positive relationship of prior knowledge and deferral probability for the eval-numerical and eval-verbal values. The second aim was to examine whether the effect of information form on choice deferral would be found when thorough information processing was elicited by presenting the information in the list-by-alternative organization. No effect of information form was found on deferral probabilities under either list-by-alternative or matrix organization, disconfirming the process approach. Thus, in combination, no support was found in Studies 1 and 2 for the process approach in accounting for effects of information form on choice deferral.

Based on the communication approach, a positive relationship between prior knowledge and deferral probability was predicted. This was supported by the data: The more knowledgeable participants were about laptops, the more likely they were to defer their choice when only knowing about the laptop properties in eval-verbal or eval-numerical form.

4. Study 3

The evidence presented so far was in line with the communication approach and failed to support the process approach. To further corroborate these findings, a third study was conducted with two aims: The first was to replicate the negative relationship of prior knowledge and deferral probability in the condition with absolute values that had failed to reach significance in Study 1. For this purpose, one condition of Study 3 presented participants with exactly the same information as used in the absolute information condition in Study 1. The second aim was to examine a further hypothesis derived from the communication approach that referred to the combination of absolute and eval-verbal information. In line with the communication approach, it can be assumed that combining absolute information with eval-verbal information will make deferral probability independent of prior knowledge about laptops because accessible information is available for both highly knowledgeable and non-knowledgeable persons. People can base their decision either on the absolute or on the eval-verbal information depending on the fit with their pre-existing knowledge. Therefore, a second information form condition was included in this study alongside the absolute information condition. In this new condition, participants received both absolute and eval-verbal information. Based on the communication approach, it was predicted that the effect of information form on choice deferral would be moderated by prior knowledge (Hypothesis 5). When only absolute values are presented, deferral probability should be negatively correlated with prior knowledge. When absolute and eval-verbal values are presented in combination, deferral should be unrelated to prior knowledge.

4.1. Method

4.1.1. Participants

Two-hundred-forty-six participants (79 male) took part in this study. The sample was composed of $n = 47$ high school students, $n = 194$ psychology students and $n = 5$ persons in employment. High school students were approached after a math class. Psychology students were tested in small groups of three to nine people and persons in employment were allowed to fill in the questionnaires at home. The mean age was 22.44 years ($SD = 4.44$, range: 16–41). Two participants did not indicate their prior knowledge, two participants did not indicate their satisfaction, one did not indicate his confidence and two did not indicate their recommendation. They remained in the sample for all other analyses. Participants received course credit or had the opportunity to take part in a raffle of two Amazon vouchers worth €20.

4.1.2. Materials and procedure

Participants were randomly allocated to one of two form conditions. They were either presented with absolute values only or with a combination of absolute values with their eval-verbal counterparts in parentheses in the same cell. The same items as in the previous studies were used to measure choice, prior knowledge, satisfaction, confidence and the participant's recommendation to a friend.

4.2. Results

Table 4 presents the means and standard deviations of all variables for the total sample and the two experimental conditions. As in Study 1, no significant differences were found between conditions in terms of satisfaction, confidence and recommendation. Confidence was significantly correlated with deferral probability ($r = .27$, $p < .001$), but satisfaction was not.

As in the previous studies, satisfaction was significantly correlated with prior knowledge ($r = .13$, $p = .04$). Confidence was also positively correlated with prior knowledge ($r = .16$, $p = .01$). Recommendation (0 = Choice/Deferral; 1 = No recommendation) showed a negative link with prior knowledge ($r = -.28$, $p < .001$).

To test Hypothesis 5, a logistic regression was conducted regressing choice (dummy-coded; 0 = purchase, 1 = deferral) on information form (0 = absolute + eval-verbal, 1 = absolute) and prior knowledge (z-standardized) in Block 1 and their interaction in Block 2. We predicted an interactive effect of information form and prior knowledge on choice deferral: For information presented in absolute form, deferral probability was expected to be higher the less knowledgeable participants were about laptops. For information presented in combined absolute + eval-verbal form, deferral probability was predicted to be unaffected by prior knowledge. The results are shown in Table 5.

The model with the two main effects was not significant compared to a model with the constant only, $\chi^2(2) = 3.35$, $p = .19$, indicating that neither information form nor prior knowledge predicted deferral probability independently. Introducing the interaction term significantly improved the model, $\chi^2(1) = 4.34$, $p = .04$. The full model correctly classified 65.2% of the cases, whereas 52.4% would be expected by chance.

To examine the interaction more closely, separate logistic regression analyses of choice (dummy-coded; 0 = purchase, 1 = deferral) on prior knowledge for each of the two form conditions were conducted. In the absolute group, a significant model was found compared to a model with the constant only, $\chi^2(1) = 5.70$, $p = .02$, Nagelkerkes $R^2 = .06$. As expected, the relationship was negative, $B = -0.45$, $SE = 0.19$, $\chi^2(1) = 5.45$, $p = .02$, indicating that deferral decreased the more knowledgeable participants were about laptops. In contrast, prior knowledge was unrelated to deferral in the absolute + eval-verbal condition ($p = .57$). The interaction is depicted in Fig. 2. These findings lend full support to Hypothesis 5.

4.3. Discussion

Study 3 sought to demonstrate the negative relationship between prior knowledge and deferral probability in the absolute information form condition and to show that the effect of prior knowledge on choice deferral disappears when both absolute and eval-verbal information are presented in combination. The negative relationship between prior knowledge and choice deferral for absolute values that had failed to reach significance in Study 1 was significant in the present study. The accumulated evidence of Studies 1 and 3 thus supports the claim made by the communication approach that for absolute

Table 4
Descriptive statistics Study 3.

	Total sample	Absolute	Abolute + eval-verbal
Deferral %	39	42	35
Prior knowledge (*M*, *SD*; 1–9)	4.19 (2.10)	4.06 (2.10)	4.32 (2.10)
Satisfaction (*M*, *SD*; 1–9)	5.86 (1.81)	6.08 (1.74)	5.64 (1.87)
Confidence (*M*, *SD*; 1–9)	5.84 (2.00)	5.99 (1.84)	5.70 (2.14)
No recommendation %	28	30	26

Table 5
Study 3: Logistic regression of choice on information form (absolute vs. absolute + eval-verbal), prior knowledge and their interaction.

Predictors	*B* (*SE*)	Wald χ^2	*OR*	95% CI for *OR*	
				Lower	Upper
Constant	−0.63* (0.19)	10.95	0.53		
Block 1		3.35			
Form	0.30 (0.27)	1.28	1.36	0.80	2.29
Prior knowledge	0.11 (0.19)	0.33	1.12	0.77	1.62
Block 2		4.34*			
Form × prior knowledge	−0.56* (0.27)	4.28	0.57	0.34	0.97

Note: Nagelkerkes R^2 = .04. *B*, Wald χ^2 and *OR* are taken from the last block.
* $p < .05$.

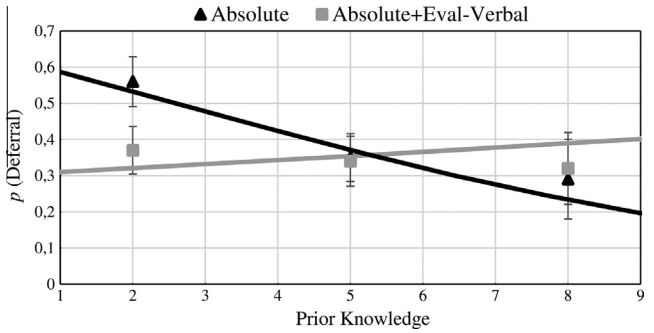

Fig. 2. Interaction effect of information form (absolute vs. absolute + eval-verbal) and prior knowledge on deferral in Study 3. The squares and triangles and corresponding error bars depict observed mean deferral probabilities ± 1 SE when prior knowledge is divided into three groups. The first group includes values from 1 to 3, the second includes values from 4 to 6, and the third includes values from 7 to 9. The lines are based on equations fitted to the data.

values more knowledge is linked to less deferral. In addition, the communication approach was further corroborated by showing that when both absolute and eval-verbal information was presented in combination, choice deferral became independent of prior knowledge.

5. General discussion

5.1. Summary of the main results

Three studies were conducted to contrast two explanations of the effects of information form on choice deferral. Participants had to decide between laptops described in terms of absolute, eval-numerical, or eval-verbal values. The first explanation, which we called the process approach, predicted a main effect of information form on choice deferral, assuming that participants adapt to varying information forms by applying different decision strategies which, in turn, should have different effects on choice deferral. The second explanation, which we called the communication approach, predicted that the effects of information form on the probability of choice deferral should be contingent upon prior knowledge. Different knowledge levels require different information forms to enable participants to understand the information. If information form and pre-existing knowledge do not fit, participants cannot make use of the information and are more likely to defer.

Study 1 tested two competing hypotheses derived from the two approaches. The process approach predicted that deferral rates should be lowest when participants are presented with absolute values, followed by eval-verbal and eval-numerical values. The communication approach, by contrast, predicted a moderating role of prior knowledge. Deferral and prior knowledge should be positively related when participants are presented with eval-numerical/eval-verbal values and there should be a negative relationship for absolute values. The data provided no support for the process approach but yielded partial support for the communication approach by showing that deferral rates in the eval-verbal and eval-numerical conditions increased with prior knowledge about laptops.

In Study 2, information organization was manipulated to ensure that participants would have to process the information sufficiently for the strategy-mediated effects predicted by the process approach to occur. However, even when information was arranged in a list-by-alternative format, requiring more thorough information processing, prior knowledge and choice deferral were positively related for both eval-numerical and eval-verbal values. Again, this evidence favored the communication approach.

Finally, Study 3 replicated the negative relationship between prior knowledge and choice deferral for absolute values. In addition, it demonstrated that the effect of prior knowledge could be made to disappear by presenting both absolute and eval-verbal values simultaneously.

In combination, findings from the three studies favor the communication approach over the process approach as an account of the effects of information form on choice deferral. Our findings suggest that the format in which information about the objects of choice is presented may have a significant effect on the likelihood of deferring a choice. Although we instructed participants to imagine that they actually wanted to buy a laptop, they were less likely to do so when the information they received did not match their prior knowledge.

5.2. Limitations and future directions

Despite finding support for the predictions of the communication approach, some limitations have to be noted about the current studies. First, the analyses were restricted to examining effects at the outcome level of decisions without exploring the underlying mechanisms stipulated by the two approaches (for arguments in favor of research on mechanisms see e.g. Crusius, van Horen, & Mussweiler, 2012; Weber & Johnson, 2009). In the case of the process approach, we cannot conclude, on the basis of our data, that the failure to find a main effect of form on choice deferral was due to the absence of an effect of information form on participants' strategy application (compensatory or non-compensatory). Similarly, the communication approach was also tested only at the outcome level. It was assumed that participants would be more or less able to understand and process information presented to them in different information forms depending on their prior knowledge. However, information processing ability was not measured directly, leaving the possibility that other mechanisms may be responsible for the effects. A possible candidate to consider is an account based on metacognitive experiences, which are known to be related to choice deferral (Novemsky, Dhar, Schwarz, & Simonson, 2007; Schwarz, 2004). When people experience decisions as difficult, for instance when they are forced to report 10 instead of only two reasons for making a particular choice, they are more likely to defer. It could be that in the case of a fit between the recipients' prior knowledge and the way the information is presented, information processing is subjectively experienced as easier than in the case of a non-fit, which would be an alternative explanation for the higher deferral rates in non-fit situations found in Study 1. But metacognitive experiences cannot account for all results presented here. In Study 2, where information organization was manipulated in a matrix or a list-by-alternative format, a metacognitive approach would predict a main effect because it is far more difficult to 'find' the respective information when attribute values are arranged in different orders in a list compared to a matrix. However, no effect of information organization on deferral was found. Furthermore in Study 3, an account based on metacognitive experiences would predict a difference between deferral probability for absolute and absolute + eval-verbal values for people with much prior knowledge. Highly knowledgeable participants should be distracted by the additional eval-verbal information in the combined condition compared to the absolute values, disrupting fluent processing. However, no effect of prior knowledge was found in the combined absolute and eval-verbal condition.

Another limitation is that our hypotheses were tested only for one product category, namely laptops. However, this represents a prototypical example of everyday consumer decisions, and there is reason to believe that the findings are generalizable to other domains where specialized knowledge is required to evaluate alternative options. Support for this reasoning is required from future studies.

Our results may also be discussed in relation to research by Fasolo, Hertwig, Huber, and Ludwig (2009) on the role of size, entropy and density of information in decision-making processes. Size, referring to the number of products in a set, was held constant in our studies and will therefore not be discussed further. Entropy is a function of the number of attribute levels for each attribute dimension and the distribution of the options across these levels. Entropy is high when an assortment includes options (e.g. laptops) that are evenly distributed across several levels (e.g. 5 h, 7 h, etc.) of several attribute dimensions (e.g. battery life). Density is a function of the differences between each of the options and their closest neighbors in a set. Density is high when the mean interproduct distance is low. Fasolo et al. (2009) found that high entropy and density lead to more choice difficulty, which is one of the best predictors of choice deferral (e.g. Dhar, 1997). Although our option set did not differ in size, it did differ in entropy and density. Absolute and eval-numerical values offered more attribute levels and therefore also more opportunities for an equal distribution of options across these levels compared to eval-verbal values. For instance, processors were described in four absolute values, four eval-numerical values, but only three eval-verbal values. Thus, entropy was lower for the eval-verbal form than for the absolute and eval-numerical forms. Density, on the other hand, was higher in our studies for the eval-verbal form than for the eval-numerical and absolute forms. In the case of eval-verbal form, the two processors presented as "average" had a distance of zero. In the absolute and eval-numerical conditions, these processors had different values and therefore a distance of greater than zero. In combination, this analysis suggests that the effects of entropy and density cancelled each other out in our set with regard to decision difficulty. Thus, the obtained differences between the information form conditions are unlikely to be the result of differences in difficulty. Nonetheless, it is possible that entropy and density perceptions may depend on an interaction of participants' prior knowledge and information form. For instance, a knowledgeable person may perceive the difference between 'GeForce GT 330 M' and 'GeForce G 310 M' to be larger than a less knowledgeable person, because on the surface they appear to be quite similar but in fact they are not (78 vs. 57 points). For eval-numerical values, the difference is obvious for all participants. These variables should be included into future experimental and applied research on choice deferral.

5.3. Implications

The results presented in this article have both methodological and applied implications. From a methodological point of view, information form plays a role in every experiment on choice deferral and decision making in general. Our findings show that decision outcomes may be affected in fundamental ways as a function of whether participants are presented with absolute values in one study and eval-verbal values in another (see, for example, Iyengar & Lepper, 2000, Study 1 for the use of absolute information and Luce, 1998, for the use of eval-verbal information). Sometimes, different information forms are even mixed in one experiment (e.g., Dhar & Nowlis, 1999) or across two or more experiments within one article (e.g. Dhar, 1997). Moreover, using the same information form without considering differences in participants' prior knowledge may lead to a distorted picture about the effects of information form on deferral rates (e.g., Luce, 1998). These issues may pose a threat to research in judgment and decision making and should be given greater attention in future research.

From an applied perspective, the results have implications for the presentation of product-related information in the real world of consumer decision making. In many domains, attribute values are typically presented in an absolute form, which puts people with little prior knowledge at a distinct disadvantage. Our findings show that when they lack the necessary knowledge to evaluate absolute attributes of a given product, they are more likely to defer their choice altogether. However, as shown in Study 3, if these values are complemented by eval-verbal values, this disadvantage can be compensated. Avoidant behaviors such as choice deferral are often accompanied by negative emotions (Anderson, 2003). Presenting information in such a way that consumers feel confident in choosing a product may increase not only their willingness to buy a product but also their positive mood. This positive affect may then lead the consumer to visit the store again. Sales managers may therefore be well-advised to complement technical information about the absolute properties of their products with eval-verbal or eval-numerical information about product quality so as to fit customers' different degrees of prior knowledge about the product.

6. Conclusion

Information display variables are a default part of any experiment on decision making as well as each real-life choice situation. The current findings demonstrate that one display variable, namely information form, interacts with prior knowledge in its effect on choice deferral. If options are presented with their absolute properties, the less knowledgeable people are, the more they defer. In contrast, if options are presented with numerical ratings or verbal quality labels, the more knowledgeable people are, the more they defer. Researchers should be aware of information form in conjunction with prior knowledge when designing their experiments or comparing their results to that of others. In real-life situations, less knowledgeable consumers seem to be more likely to leave the store empty-handed if product information is presented in absolute terms. Sellers should overcome this disadvantage by combining absolute with eval-numerical or eval-verbal information. Then, we are convinced, people will find it much easier to make the decisions they face on a daily basis.

Table A.1
Absolute information.

	Laptop 1	Laptop 2	Laptop 3	Laptop 4
Processor	Core i3-330 M with 3 MB Cache (1066 MHz) and 2.13 GHz	Core 2 Duo SU7300 with 3 MB L2-Cache (800 MHz) and 1.30 GHz	Core 2 Duo SU9400 with 3 MB L2-Cache (800 MHz) and 1.40 GHz	Core 2 Duo T5800 with 2 GHz
Memory	2048 MB DDR3 with 1066 MHz	2048 MB DDR3 with 1066 MHz	4096 MB DDR3 with 1066 MHz	2048 MB DDR3 with 1066 MHz
Graphics	Mobility Radeon HD 4330	Mobility Radeon HD 4650	GeForce GT 330 M	GeForce G 310 M
Hard disc	320 GB with 5400 rpm	400 GB with 5400 rpm	400 GB with 5400 rpm	320 GB with 5400 rpm
Battery life	Up to 7 h	Up to 7 h	Up to 4 h	Up to 8 h

Table A.2
Eval-numerical information.

	Laptop 1	Laptop 2	Laptop 3	Laptop 4
Processor	90	51	56	78
Memory	38	38	73	38
Graphics	45	80	78	57
Hard disc	50	57	57	50
Battery life	80	80	47	87

Table A.3
Eval-verbal information.

	Laptop 1	Laptop 2	Laptop 3	Laptop 4
Processor	Very good	Fair	Fair	Good
Memory	Fairly poor	Fairly poor	Good	Fairly poor
Graphics	Fair	Good	Good	Fair
Hard disc	Fair	Fair	Fair	Fair
Battery life	Good	Good	Fair	Very good

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Appendix A

See Tables A.1–A.3.

Appendix B. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.joep.2014.05.001.

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