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All or (almost) nothing? The influence of information cost and training on information selection and the quality of decision-making

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Selection and the Quality of Decision-Making.**

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Für den Inhalt der Passauer Diskussionspapiere ist der jeweilige Autor verantwortlich.
Es wird gebeten, sich mit Anregungen und Kritik direkt an den Autor zu wenden.

ALL OR (ALMOST) NOTHING? THE INFLUENCE OF INFORMATION COST AND TRAINING ON INFORMATION SELECTION AND THE QUALITY OF DECISION-MAKING.

Caroline Baethge · Marina Fiedler

The following experiment examines the influence of cost of information and training on the quality of individual investment decisions. We expand upon the existing behavioral literature by proposing a new scenario experiment which enables us to study individual and institutional factors influencing the selection and processing of information that lead to an investment decision. The amount and type of information used, as well as the time of information processing of individual decision-makers will be measured by subjects' interaction in the experimental task. Furthermore, we examine whether or not cost of information and training indeed influence the quality of (investment) decision-making. The results suggest that training is crucial to the amount and type of information used as trained individuals make better investment decisions, using the most relevant information.

Keywords

training, cost of information · information selection · quality of decision-making · performance

Highlights

- Cost of information does influence the information selection.
- Untrained individuals are put off by the cost of information.
- Training is crucial to the amount and type of information used.
- Individuals spend more time analyzing information when they are faced with costly information.
- Trained individuals make better investment decisions by analyzing the available information more thoroughly.

1. Introduction

In this study we are interested in whether or not trained individuals employ their acquired knowledge and as a result select only that information which is relevant in solving an investment task. The thorough information selection should in turn lead them to a superior decision. Given that today, however, factors such as time constraints, financial outlay and problems of accessibility have an influence on information selection and on successful decision-making, the cost involved in the acquisition of information needs to be taken into account as one determining institutional factor. When information acquisition has an actual price the decision-maker must carefully evaluate the trade-off between the up-front cost and the possible long term benefit of improved decision quality (Connolly and Thorn 1987; Golman and Loewenstein 2014). Previous studies on information purchase however have found that people are generally poor at balancing this trade-off depending on the task and type of information presented. Information cost therefore causes all types of inefficiencies and suboptimal search strategies such as over-, under- and mis-purchasing of information, i.e. choosing irrelevant information when there are better sources available. (Connolly and Thorn 1987; Connolly and Wholey 1988; Newell et al. 2004; Rötheli 2001) What has not been properly addressed in this context, however, is the role of training. It is apparent that training in a task-specific domain should be taken into consideration when trying to explain why people arrive at suboptimal search strategies. Trained individuals, as a result of their ability to evaluate the presented information correctly in terms of relevance, should be better placed to purchase relevant information than untrained ones.

Training or rather expertise itself has been subject to many studies on differences between experts and novices (e.g. Andersson 2004; Bédard and Mock 1992; Chase and Simon 1973; Chi et al. 1982; Chiesi et al. 1979; Dane et al. 2012; Devine and Kozlowski 1995; Frederick 1991; Larkin et al. 1980; Hershey and Walsh 2000/2001; Hitt and Tyler 1991; Schoemaker 1979; Spence and Brucks 1997; Vera-Munoz et al. 2001) trying to answer the question as to whether or not expertise leads to superior performance or better ways of arriving at a decision.¹ These studies either involve a process or outcome model of expert problem solving.² The outcome models (e.g. Andersson 2004; Bédard and Mock 1992; Chiesi et al. 1979; Devine and Kozlowski 1995; Hershey et al. 1990; Hershey and Walsh 2000/2001; Larkin et al. 1980; Schoemaker 1979; Spence and Brucks 1997) focus on the problem solving

¹ Generally, expertise can be referred to as the “possession of a large body of knowledge and procedural skill” (Chi et al. 1982 p. 8) whereas training in a certain domain implies that an individual has acquired declarative knowledge only in that domain.

² For a review on experts’ performance versus studies on experts’ processes see Camerer and Johnson (1997).

behavior that underlies high quality decision making, with the goal of designing expert systems or strategies. Most of them find a superior performance of experts as compared to novices. By contrast, process models (e.g. Chase and Simon 1973; Chi et al. 1982; Chiesi et al. 1979; Frederick 1991; Schoenfeld and Herrmann 1982; Vera-Munoz et al. 2001) identify the nature of mental processes underlying individual preferences, focusing little on the actual outcome. They find that experts' superiority can most often be found within their specific domain, either because they have the ability to see meaningful patterns in a specific task or because it reflects a certain organization of knowledge base which they can rely upon (Chi et al. 1988; Hardiman et al. 1989). However, it does not reflect a generally superior perceptual ability because in some domains – such as in judging probabilities or making predictions – or in novel tasks, experts also underlie judgmental biases just as much as novices and do not perform better (Bolton et al. 2012; Camerer and Johnson 1997; Newell et al. 2004; Shanteau 1992a).³

Taken from the studies on cognitive processes of experts it seems apparent that experienced individuals' organization of knowledge enables them to solve specific tasks with less effort when they actually use those structures (Hardiman et al. 1989). To the best of our knowledge, no study to date has focused on actual monetary cost involved in the acquisition of information and its interaction with training. When faced with information cost, both trained and untrained individuals have to consider whether to bear immediate further cost to acquire new information with the possibility of a higher payoff. But trained subjects should have an advantage in evaluating that trade-off to their benefit because they should know which information is most important in arriving at the correct decision. Furthermore, most of the studies on expertise focus only on the extreme ends of a “knowledge continuum” (Devine and Kozlowski 1995) which leaves the question as to whether or not an early stage of expertise development – i.e. declarative knowledge in a certain domain – does lead to superior performance.⁴ Additionally, those studies fail to investigate the interaction between a decision-maker's knowledge and the different elements of information acquisition and evaluation, that is, the amount and type of information used, as well as the decision-maker's actual performance.

We address these issues by incorporating information cost and training into a new scenario experiment. In order to be able to observe both information processing and actual decision-making we introduce an experiment which includes individual information selection,

³ Chi (2006) reviews studies on experts' characteristics and reports areas where experts typically excel.

⁴ Previous studies have mainly concentrated on the comparison between complete novices and experts with longstanding experience, or have focused exclusively on experts.

evaluation and actual decision-making in an investment task involving costly information acquisition. In order to observe the effect of an early stage of expertise as compared to complete novices we are particularly interested in university trained individuals in a special domain, that is, training in finance. University trained individuals are not yet experts (due to a lack of experience), but their acquired knowledge corresponds to the first stage concerning the development of domain-related expertise (see Shanteau 1992a; Vera-Munoz et al. 2001). We propose that training, i.e. previous knowledge in finance, as well as cost of information, influence the information selection process which precedes investment decisions and therefore the quality of decision-making. The results could deliver valuable contributions in understanding the role of training in decision-making and last but not least demonstrate how effective information selection and evaluation determine the individual outcome.

2. Theory and Hypotheses

2.1. Cost of Information and Training

In order to understand how training and information cost influence the quality of decision-making it is first and foremost important to understand their influence on information selection and evaluation because the process of information selection and evaluation finally leads to a decision being made (Barrick and Spilker 2003). We therefore focus on the determinants involved in the information selection and evaluation, that is, the amount and type of selected information. Furthermore, we are interested in the time spent on the selection of information and decision-making. We propose that both training and the cost of information influence the process of information selection and, as a result, the decision-making which precedes an investment decision.

2.2. Amount of Information

There are several motives from various disciplines such as psychology, cognitive science and economics explaining why individuals engage in information seeking behavior: They address the demand or need for information by seeking answers (Taylor 1962), reduce the uncertainty caused by an insufficient level of knowledge (Atkin 1973; Murray 1991), are searching for a meaning (Artandi 1973; Karlsson et al. 2004) or acquire information out of curiosity (Loewenstein 1994).⁵ From an economic perspective, the demand for information can be explained by utility considerations. That is, information is acquired to the extent that it

⁵ See Case (2012) for a review on information needs.

leads to superior decisions that raise the individual utility. (Golman and Loewenstein 2014; Stigler 1961)⁶ In a setting where individuals have very little or no information about the decision situation and do not have sufficient knowledge to derive an optimal decision, they are going to reduce their uncertainty by acquiring as much information as possible. (Belkin 1978; Case 2012) As long as information is without charge and available in a manageable amount it is easy for the individuals to access all of it even if they have already sufficiently reduced their uncertainty. Aside from humans' restricted capability to process an unlimited amount of information (Simon 1955; 1956; 1959) individuals have simply no monetary incentive to do otherwise. If on the other hand information is costly, subjects face a high cost of additional information selection which is why it makes sense for them to acquire only as much information as they actually need to optimally reduce uncertainty. Otherwise they would literally reduce their utility by acquiring redundant information. Therefore it is only rational for a subject to purchase information if the involved utility exceeds the cost of additional information (Kraemer et al. 2006; Lanzetta and Kanareff 1962). Overall, we propose that the cost of information induces a change in information selection behavior, with subjects selecting less information than is the case when it is free.

Hypothesis 1a. When information has a price, individuals select less of it.

The question remains as to whether or not training should lead to the selection of a smaller amount of information. Concerning the possibility of differential behavior between trained and untrained individuals it seems obvious that trained individuals, due to their previous knowledge, face less uncertainty concerning domain-specific decisions. This can be explained by the fact that knowledge is generally linked to the ability to identify relevant information (Barrick and Spilker 2003; Gaeth and Shanteau 1984; Hershey et al. 1990; Larkin et al. 1980; Spence and Brucks 1997). Individuals with domain-related knowledge are also thought to have an understanding of the causal structure of information which is why their knowledge enables them to sort new information depending on its relevance (Rottman et al. 2012). Hence, previous knowledge in a certain domain should enable trained individuals to evaluate and identify information that is most relevant to the decision at hand. Untrained individuals on the other hand have no previous knowledge and are probably not able to identify the relevant information which is why they most likely select more than is necessary.

⁶ Goleman and Loewenstein (2014) show how those different motives can be integrated into one economic framework.

However, previous studies find mixed results concerning the amount of information used by experts and novices. Some find that novices use as much or more information than experts, with experts acquiring less information than there is available (Bédard and Mock 1992; Camerer and Johnson 1997; Shanteau 1992b, 1992a; Spence and Brucks 1997). This is attributed to the fact that experts are able to discriminate between relevant and irrelevant information and therefore only need a limited amount of information to arrive at a decision (Andersson 2004; Shanteau 1992b). Andersson (2004) on the other hand finds that experts actually acquire more information than novices in a lending decision. He argues that, among other things, his results can be explained by the fact that they had free access to a vast amount of information and did not face any monetary cost which gave them no incentive to acquire less information.

We propose that in both environments, that is, in a situation where information is free, as well as one in which cost is involved, trained individuals generally select less information than those with no previous training as they are better able to judge the specific relevance of the information.

Hypothesis 1b. When individuals are trained, they select less information than untrained individuals.

2.3. Time for Information Selection

The time of information selection naturally depends on the amount of information selected. As proposed earlier, monetary costs induce subjects to select less information than when it is free of charge because it gives them an incentive to focus on the necessary information in order to derive a decision (e.g. Andersson 2004). Thus, when information is costly, individuals select less of it which in turn reduces the time of information selection. However, actual cost of information might induce subjects to carefully select and analyze specific information which they are paying for in order to optimally reduce uncertainty. Cost of information causes a lessened result which is why the initial aspiration level a decision-maker may have set for him- or herself cannot be maintained. As a result, he or she intensifies the search for information (Selten 1998; Simon 1959). Individuals in a sense raise their cognitive effort levels in order to reach their desired aspiration level. This also relates to findings by Libby and Lipe (1992) who suggest that extrinsic incentives increase the cognitive effort expended on a task which could also lead to increased performance depending on a

subject's knowledge. We therefore propose that the cost of information increases the time subjects spend per information item.

Hypothesis 2a. When information has a price, individuals spend more time per information item.

Concerning the influence of training on the time of information selection and decision-making the literature finds mixed results. Some studies (Bédard and Mock 1992; Chi et al. 1988; Hershey et al. 1990; Larkin et al. 1980) suggest that trained subjects need less time for the selection of information and decision-making and are more efficient in terms of search time. This is attributed to the fact that they possess the ability to categorize available information faster and because practice in a certain domain makes the skill or knowledge acquired more automatic and frees up capacity for processing other aspects of the task (Chi et al. 1988). Hershey et al. (1990) suggest that decreased solution time comes from experts' use of solution scripts which enables them to engage in a goal-directed search pattern, whereas untrained individuals engage in less efficient search strategies. On the other hand, experts are also thought to analyze problems more qualitatively, expending more effort in order to actually understand them, whereas novices apply more superficial techniques and perceive only the surface structure of the problem (Chi et al. 1988; Schoenfeld and Herrmann 1982; Spence and Brucks 1997; Spilker 1995). This suggests that experts actually take more time compared to untrained individuals when it comes to dealing with specific information (Chi et al. 1982; Spence and Brucks 1997). We propose that trained subjects' knowledge therefore affects the time of information selection in two ways. Firstly, training fosters the acquisition of new information because trained individuals are able to encode task-specific information more efficiently (Chase and Simon 1973; Chiesi et al. 1979), which translates into them needing less time for the overall selection of information. However, due to their ability to identify and analyze information depending on its relevance, we propose that trained individuals spend more time per individual item of information in order to qualitatively analyze it, regardless of whether or not it is free or comes at a cost.

Hypothesis 2b. When individuals are trained, they need overall less time for the selection of information but spend more time per information item.

2.4. *Quality of Decision-Making*

Taking into account our previous propositions, the superior information selection process of trained individuals should also be reflected in the actual outcome i.e. the quality of their decision. As previous studies suggest, trained individuals, due to their previous knowledge, should arrive at better decisions than untrained ones (Bonner and Lewis 1990; Hershey and Walsh 2000/2001; Schoemaker 1979; Spence and Brucks 1997). Experts should outperform untrained individuals especially in a task with a demonstrably correct decision and quantified rules (Devine and Kozlowski 1995). Several studies have also shown that it is previous knowledge which accentuates the effort-performance relationship and is decisive for an increase in performance (Bonner and Sprinkle 2002; Cloyd 1997; Libby and Lipe 1992). We propose that information cost might induce both trained and untrained subjects to focus on particular information and raise the time spent on the information selection per item but that it is only training which actually leads to improved decision making. We therefore propose that subjects with previous training in a certain domain are more likely to make the correct decision when compared to untrained subjects.

Hypothesis 3. Trained individuals are more likely to choose the correct investment decision than untrained individuals.

3. **Experiment**

3.1. *Experimental Design*

We designed an individual decision task which allowed us to both observe subjects' information selection and information processing, as well as their actual decision making. Similar economic scenario experiments have been conducted by Heaton (2002) and Keasey and Moon (1996). Figure A1 in Appendix A illustrates the experimental procedure.

Scenario

The subjects were presented with an incentivized scenario which informed them that they would sequentially assess different investment projects concerning buying or renting a new warehouse in the position of a company's CEO, receiving 2 € for each correct investment decision. In each of the three projects subjects received a description of the decision task at hand with basic information on the company's capital assets, the annual expected turnover,

the cost of capital, as well as the warehouse's price or rent per year.⁷ Additionally, they were presented with ten items of information that were more or less relevant for the decision.⁸ The most relevant information provided for the investment decision was the net present value (npv) which can be used as an objective decision criterion⁹. A positive net present value indicates that the project will generate a return above the expected minimum rate of return which increases the investor's assets/ the firm's value. To arrive at a decision, a finance expert could also calculate the net present values based on the basic information provided in the scenario without necessarily looking at the additional ten information items. However, trained students do not have sufficient knowledge and experience to do so and were not provided with any helping devices such as a calculator. The three investment projects differed concerning only the following aspects: Project 1 was characterized with equal cash flows, project 2 with a realistic lease and project 3 with equal net present values. Therefore the correct investment decision for project 1 was to rent based on a higher net present value, to buy for project 2 based on a higher net present value and to buy for project 3 based on a higher profit as net present values were held constant.

The additional ten items of information were presented at once because the mere fact of information order could influence a subject's behavior (see Newell et al. 2004). They were covered only by a descriptive label indicating the information underneath e.g. "net present value" in order to be able to observe which items of information subjects' access and how often they do so.¹⁰ Subjects received a 2 € endowment to avoid loss aversion when facing cost of information and 2 € for each correct investment decision. Feedback on their performance was given only after the final project.

Treatments

Two treatments with either free information (FI) or costly information (CI) were conducted. Treatment 1 (FI) involved free information in all three projects. Subjects could open the available information as often as they wished without incurring any charge. Treatment 2 (CI) on the other hand involved cost of information in project 2. After completing project 1 subjects were informed that they would be charged a fee of 0.15 € for each accessed item of information which would be subtracted from the endowment. Once

⁷ The complete instructions are reported in Appendix B. The original instructions are in German and translated into English for the purpose of this paper.

⁸ Those items displayed the level of the net cash flow, profit, net present value, capital expenditures, marketing expenditures, operational expenditures, pension reserves, net book value of assets, raw materials and supplies and return on assets for two consecutive years and for both investment options (rent or buy).

⁹ Based on Fisher's separation theorem (1977) investment decisions should be based on objective market criteria, that is, the net present value, and separated from financing decisions and consumer preferences. That provides the theoretical basis for using the net present value as clear and unambiguous decision criterion.

¹⁰ Our design is similar to the mouse lab technique by Johnson et al. (1989).

charged for an information item they could access it as often as they wanted to. A balance of their current cost was also displayed on the information selection screen. We implemented cost of information only in project 2 because this is our main focus for analysis over all treatments. Project 1 and 3 were implemented only to observe subjects' unbiased behavior with free information in both treatments (project 1), and to control for a possible prevailing effect of information cost (project 3).

We also implemented an informational training screen with short definitions and explanations on the ten additional items of information which was utilized to check whether or not a possibly superior behavior of trained individuals comes with declarative and procedural knowledge about the information available (see Chi et al. 1982).

Before subjects started the first project they received general information on the experimental procedure and answered a financial knowledge questionnaire. The knowledge test was implemented in order to control for participants' actual previous knowledge on finance and to verify that the categorization into the group of trained and untrained individuals corresponds to different levels of previous knowledge in finance.¹¹ This was done because some studies which do not find an experience effect did not control for task-specific knowledge (Bonner 1990). After making the investment decision in a project subjects were asked to state upon which information out of the ten available they based their decision. They could choose one, multiple answers or none at all. This feature allowed us to not only observe the selection of information preceding a decision but also to know which information subjects actually used to come to a decision. After the final project, feedback on the overall performance was given to the subjects followed by a questionnaire on demographics such as gender, course of study, number of semesters completed and whether or not the participants had previously attained any qualifications in finance.

3.2. Measures

The descriptive statistics and two-tailed correlations of the study measures are displayed below in Table 1.

¹¹ Trained individuals answered on average 5.37 questions correctly, untrained individuals only 3.23. This difference is significant on a $p = .000$ level (MWU, two-sided).

Table 1*Descriptive Statistics and Correlations (Two-Tailed) of Study Variables*

	1.	2.	3.	4.	5.	6.	7.
1. quality of decision-making	1.000						
2. information cost	-0.008	1.000					
3. training	0.178 **	-0.026	1.000				
4. amount of information	0.002	-0.803 ***	-0.017	1.000			
5. clicks on npv	-0.038	-0.478 ***	0.192 ***	0.626 ***	1.000		
6. decision based on npv	0.102	-0.044	0.290 ***	-0.013	0.234 ***	1.000	
7. time of information selection	-0.029	-0.294 ***	0.040	0.471 ***	0.570 ***	0.026	1.000
8. time per information	0.113	0.304 ***	0.137 *	-0.200 ***	0.027	0.042	0.237 ***
9. time of decision-making	-0.150 **	-0.064	0.071	0.088	0.250 ***	-0.055	0.475 ***
10. age	-0.068	-0.081	-0.060	-0.006	-0.036	0.070	-0.041
11. gender	0.018	-0.011	0.157 **	0.020	0.181 **	0.140 *	0.077
12. semester	0.124 *	-0.140 *	-0.014	0.121	0.006	-0.121	-0.066
13. correctly answered questions	-0.049	0.032	0.346 ***	-0.028	0.180 **	0.168 **	0.137 *
Minimum	0	0	0	0	0	0	5
Maximum	10	1	1	10	7	1	362
Mean	7.230	0.500	0.219	4.510	0.725	0.407	59.505
SD	2.518	0.501	0.415	4.053	0.828	0.493	43.889

	8.	9.	10.	11.	12.	13.
1. quality of decision-making						
2. information cost						
3. training						
4. amount of information						
5. clicks on npv						
6. decision based on npv						
7. time of information selection						
8. time per information	1.000					
9. time of decision-making	0.017	1.000				
10. age	-0.154 **	0.163 **	1.000			
11. gender	0.178 **	-0.035	-0.010	1.000		
12. semester	-0.111	-0.035	0.179 **	0.025	1.000	
13. correctly answered questions	0.175 **	0.109	0.023	0.147 **	-0.072	1.000
Minimum	0	5	19	0	1	0
Maximum	70	141	60	1	20	12
Mean	14.211	29.214	25.428	0.313	6.148	3.708
SD	14.637	15.810	5.932	0.465	3.495	2.561

Notes. ***p<0.01, **p<0.05, *p<0.1.

Quality of Decision-Making. In order to evaluate the effect of costly information and training on the quality of decision-making we used a performance measure based on subjects' decision questionnaires. That is, the probability of buying in project 2. Subjects indicated on a scale of 0 "highly unlikely" to 10 "very likely" whether or not they wanted to buy the warehouse in scenario 2.

Information Cost. As described in the experimental design on pp. 84, treatment 1 involved free information only (“free information” = 0), whereas subjects in treatment 2 faced information cost in project 2 (“information cost” = 1).

Training. Subjects stated in the post-experimental questionnaire what kind of courses in finance they had so far attended. Based on whether or not they had attended a finance course they were either categorized into the group of untrained (= 0) or trained (= 1) individuals.

Information Amount. The amount of information was measured by the share of chosen information, that is, how many from ten available items of information the subjects opened (Minimum = 0, Maximum = 10).

Information Relevance. As indicated in the experimental design, the provided information was either more or less relevant for the investment decision. In project 2 the net present value is the most relevant information as the correct investment decision of buying is determined by its higher net present value. Therefore, our variable on information relevance, named *clicks on npv*, is measured by the frequency of choosing this specific information (net present value) (Minimum = 0, Maximum = 7). Additionally, we asked subjects to state upon which information they actually based their decision (“not based on the npv” = 0, “based on the npv” = 1). This variable, named *decision based on npv*, represents a subjective answer and validates the pure frequency of choosing the net present value because the later one could just be based on random choice.

Time of Information Selection. The time of information selection in seconds was measured by two variables representing different aspects. One is the actual time subjects spent on the information selection screen which we refer to as *time of information selection* (Minimum = 5, Maximum = 362). The second one is the *time per information item* which accounts for the overall time spent on each individual information item (Minimum = 9, Maximum = 70). We calculated the time per information item in order to control for the share of information items used, that is, how much information out of ten did subjects actually open. This was necessary as someone who has opened up more information items naturally needs more time. Moreover, this measure also indicates if subjects analyze the information item more thoroughly.

Time of Decision-Making. In a similar manner, the time of actual decision-making in seconds was measured by the time subjects spent on the decision-screen (Minimum = 5, Maximum = 141).

Control Variables. Besides the measures described above, we also implemented several additional control variables such as a subject’s age (Minimum = 19, Maximum = 60), gender

(“male” = 0, “female” = 1), current semester (Minimum = 1, Maximum = 20) and number of correctly answered questions on the knowledge test (Minimum = 0, Maximum = 12).

3.3. Experimental Procedure

182 students took part in the experiment with 91 participants in the free information treatment as well as 91 in the costly information treatment. Overall, 40 trained and 142 untrained individuals participated in the experiment with 70 untrained and 21 trained subjects in the free information treatment and 72 untrained and 19 trained subjects in the costly information treatment. The experiment was computerized with z-Tree (Fischbacher 2007) and was conducted at a German university in June 2013. The eight sessions each lasted about 25 minutes and yielded an average payoff of 9.75 € including a show-up-fee of 4 €.

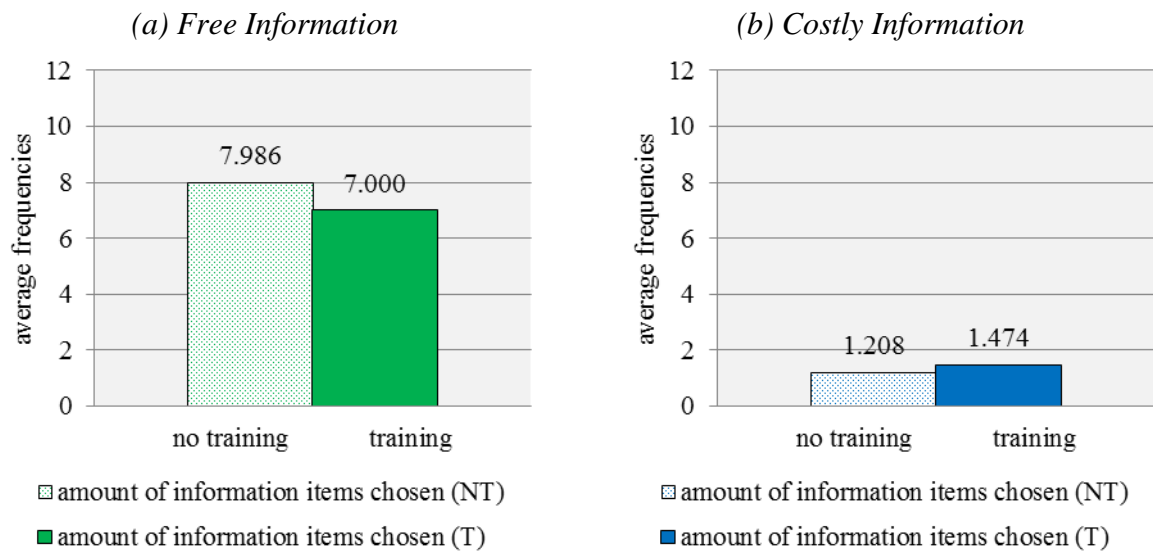
4. Results

The basis of our analysis is project 2. Unless otherwise stated all variables are based on the subjects' decisions in project 2.

4.1. Information Amount

Subjects chose on average 7.76 (SD: 3.14) out of ten available items of information when faced with free information. However, when they were confronted with information at a cost they selected significantly less (MWU, two-sided, $p = .000$). Only 1.26 (SD: 1.37) out of ten items of information were chosen. This effect even prevailed in project 3 when subjects again faced free information. The results clearly show that cost of information influences the information selection and leads to different behavior among subjects than is the case with free information. Therefore, hypothesis 1a can be confirmed.

The question remains as to whether or not a subject's training in finance does indeed influence the amount of information selected. Figure 1 displays both trained and untrained individuals' amount of information chosen for the free (1a) and costly (1b) information treatment.

Figure 1*Amount of Information*

In the free information treatment (Figure 1a) trained subjects on average selected 7.00 (SD: 3.23) out of ten available items of information and untrained subjects selected 7.99 (SD: 3.10). Comparing those shares of chosen information we find that trained subjects, when faced with free information, selected significantly less information than untrained subjects in the same position (MWU, two-sided, $p = .075$). However, they did not differ in terms of the selected share of information when faced with costly information (Figure 1b), with trained subjects choosing on average 1.47 (SD: 1.12) items and untrained subjects selecting 1.21 (SD: 1.42) out of ten available items of information (MWU, two-sided, $p = .202$). Thus, it seems as if untrained individuals were more put off by the cost of information because they decreased their chosen amount of information from 7.99 to 1.21 items which lead to both parties choosing an equal amount of information. This means that hypothesis 1b can only be partly confirmed: when it is free, trained individuals select less information than untrained ones. But when it is costly, trained and untrained individuals choose an equal amount of information and hence do not significantly differ in their chosen share of information.

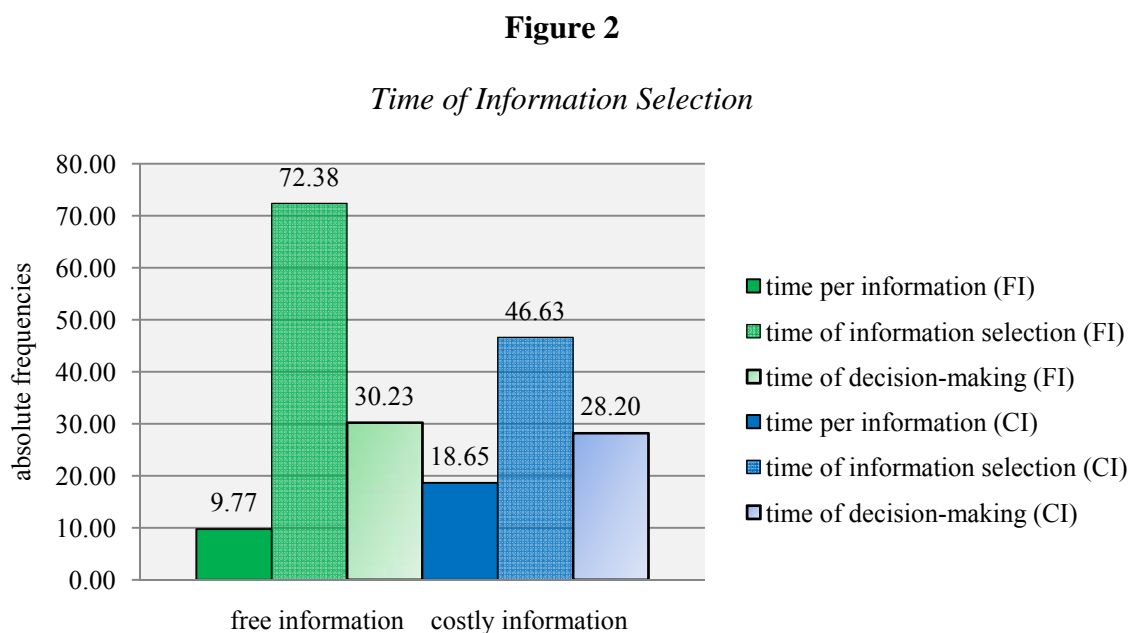
But are those results are driven by trained subjects' ability to judge the information's relevance? Therefore, we look at the frequency of choosing the net present value, that is, the most relevant information. When information is free, we find no significant difference between trained and untrained subjects in the frequency of choosing the most relevant information. The latter chose the net present value 1.01 (SD: 0.67) times, whereas the trained subjects selected it 1.47 (SD: 1.43) times (MWU, two-sided, $p = .141$). But when information is costly trained subjects chose the net present value significantly more often than untrained

individuals ($\text{npv_mean}_{\text{trained}} = 0.56$ vs. $\text{npv_mean}_{\text{untrained}} = 0.29$; MWU, two-sided, $p = .035$). Moreover, 57.9% (SD: 0.51) of the trained subjects indicated that the net present value did influence their decision, whereas only 33.3% (SD: 0.47) of the untrained individuals based their decision on the most relevant information (MWU, two-sided, $p = .052$). The result confirms that trained individuals not only select the most relevant information significantly more often when information is costly but they actually use it consciously to come to a decision. The results on the net present value as an actual decision criterion also hold true when looking at the free information treatment (MWU, two-sided, $p = .000$) i.e. trained subjects over all treatments based their decision on the net present value even if they did not differ from untrained participants in terms of frequency.

Taking together the results on the amount of information chosen we find that costly information triggers effective information selection: Trained individuals choose a smaller share of information when facing information cost but focus almost exclusively on the most relevant information – even though they are generally able to judge the relevance of information.

4.2. Time for Information Selection

Figure 2 illustrates the average time spent per information item, the time spent on information selection and on decision-making separately for the free (FI) and costly information (CI) treatment.



Not surprisingly, subjects need less time overall for the selection of information when information is costly because they simply choose less of it (see results on amount of information). Whereas they spent on average 72.38 (SD: 53.33) seconds on the selection of free information they spent only 46.63 (SD: 26.35) when facing costly information. But they actually spent more time on the individual information when information is costly. Subjects faced with costly information spent 18.65 (SD: 18.60) seconds per information as compared to 9.77 (SD: 6.70) seconds per information that subjects spent when information was free. This means that the average time spent per information significantly increased with costly information (MWU, two-sided, $p = .087$). Hence, hypothesis 2a can be confirmed because subjects overall spend less time on information selection and more on the individual information. Taking the time spent for each information item, they spend on average twice the time per item which could be an indicator that information cost triggers effective information selection and decision-making.

Turning to the analysis of the influence of training, we find no difference in time of information selection between trained and untrained individuals in either the free or costly information treatment. Focusing on the time spent per information the analysis shows an interesting result. Faced with free information, trained subjects spent on average 11.46 (SD: 8.84) seconds per information whereas the untrained ones spent 9.25 (SD: 5.88) seconds per information. They did not significantly differ in terms of time spent per information (MWU, two-sided, $p = .682$). However, the results reveal a different picture for the costly information treatment. We find that trained subjects facing costly information spent significantly more time per information with 25.18 (SD: 16.25) seconds as opposed to untrained subjects facing costly information who spent 16.93 (SD: 18.90) seconds per information. This difference is significant on a $p < 0.05$ level (MWU, two-sided, $p = .044$). Trained subjects obviously took their time to evaluate the information they paid money for, whereas untrained ones might have explored the task only superficially (see Chi et al. 1988). This also underlines the results found for the relevance of selected information as trained subjects did not simply choose information by chance. Consequently, hypothesis 2b can only partly be confirmed because training does not influence the time of (overall) information selection and – when facing free information – trained individuals do not differ from untrained individuals in terms of time spent per information. However, they even spend more time on the opened items of information when facing costly information.

Concerning the time for making the actual decision we do not find a significant difference for either the comparison of free and costly information treatment or indeed the different subgroups.

4.3. *Quality of Decision-Making*

Building on the results concerning factors such as information amount, relevance and time of information selection the question remains as to whether or not trained subjects are able to actually translate their thought-out selection of information into a superior decision. Table 2 displays a linear regression with the quality of decision-making as the dependent variable.

Table 2
OLS Regression for the Quality of Decision-Making

	Model 1		Model 2		Model 3	
<i>Variable</i>	<i>Coefficient</i>	<i>(SE)</i>	<i>Coefficient</i>	<i>(SE)</i>	<i>Coefficient</i>	<i>(SE)</i>
constant	7.242 ***	(1.192)	7.159 ***	(1.214)	7.153 ***	(1.260)
information cost	-0.113	(0.396)	-0.011	(0.464)		
training	1.253 ***	(0.413)	1.488 **	(0.671)	1.262 ***	(0.416)
information cost x training			-0.479	(0.822)		
amount of information chosen					0.005	(0.048)
time per information	0.021 *	(0.011)	0.022 *	(0.011)	0.020 *	(0.011)
age	-0.025	(0.046)	-0.024	(0.047)	-0.025	(0.047)
gender	-0.120	(0.372)	-0.102	(0.385)	-0.116	(0.371)
semester	0.100 *	(0.056)	0.102 *	(0.056)	0.101 *	(0.055)
correctly answered questions	-0.125	(0.081)	-0.129	(0.082)	-0.125	(0.081)
Number of observations	182		182		182	
R ²	0.078		0.080		0.078	
F	2.060 **		1.180 *		2.100 **	
ΔR ²	0.041		0.037		0.041	

Notes. Robust standard errors in parenthesis. Standard error adjusted for 182 clusters in Subjects. ***p<0.01, **p<0.05, *p<0.1.

The results reveal that cost of information does not exert an influence, whereas training in finance indeed positively influences the probability of buying. Therefore, hypothesis 3 can be confirmed. If subjects do have previous knowledge they are more likely to choose the correct investment decision ($p < 0.05$). This clearly underlines that training not only partly affects the information selection but that it also influences the actual outcome, that is, the investment decision. Cost of information, on the other hand, does not significantly influence

the probability of choosing the correct investment. However, our previous results showed that it influences the information selection and processing of individuals and leads trained individuals in particular to focus on the most relevant information.

Moreover, a variable on information selection also positively influences the outcome – namely the time spent per individual item of information. As shown in Table 2, the more time subjects spend per individual item of information, the more likely it is that they choose the correct investment decision. However, the amount of information did not exert a significant influence on the quality of decision-making (see Model 3). This underlines that it is not the quantity of information which leads subjects to a correct decision but much more the qualitative aspect, that is, how they analyze and interpret the information available to them.

5. Discussion

Our results suggest that training is crucial to the amount and type of information used because trained individuals make better investment decisions using the most relevant information. By contrast, untrained individuals are put off by the cost of information which leads them to make poorer investment decisions than trained individuals. We therefore show that cost of information does not necessarily lead to suboptimal information acquisition as was suggested in previous studies (e.g. Connolly and Thorn 1987; Newell et al. 2004; Rötheli 2001), rather it crucially depends on the level of knowledge subjects have. When it is free, both trained and untrained subjects select almost all available information. However, when cost of information is introduced experienced subjects tend to select the most relevant information only, whereas untrained individuals seem to under- or mis-purchase information as they are not able to judge its specific relevance. Additionally, cost of information incentivizes subjects, even more so those with previous training, to focus on an effective selection of information because they spend significantly more time analyzing individual information. This delivers a valuable contribution for the design of institutional information searches that precede decision-making. It would seem that a monetary, or more likely a time restriction on an information search can trigger effective information selection and evaluation when individuals receive a certain level of training. This in turn leads to better decision-making.

By including subjects with no previous training and subjects at the lower end of a “knowledge continuum” (Devine and Kozlowski 1995) with basic knowledge in finance we contribute to the literature on expertise showing that even an early stage of expertise can lead to superior performance as compared to complete novices. However, we did not use a very

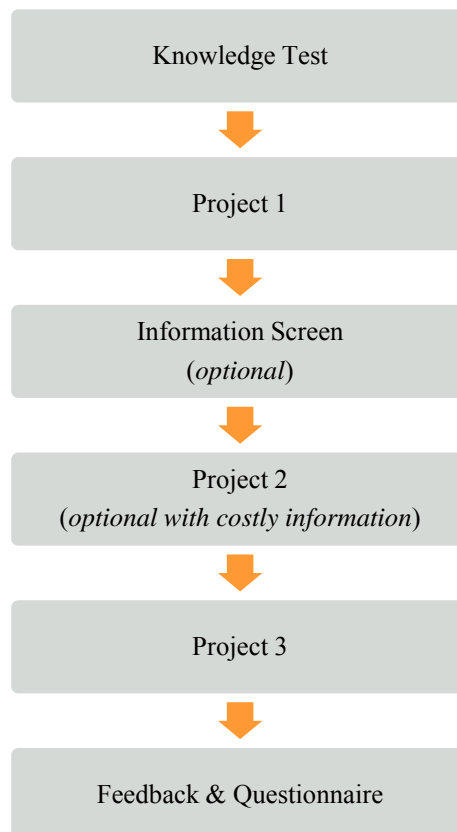
complex task, such as one which for example includes a self-administered information search. Such a task would probably not result in the superior performance of trained subjects because they have not acquired procedural knowledge in finance.

Furthermore, the experimental design we chose was especially useful in order to observe the link between information selection and actual decision-making behavior. That way, subjects' selection of information in terms of amount, type and selection time, as well as actual investment decisions, could be directly observed which in previous studies has tended to be analyzed only separately. Additionally, we combined the experimental approach with self-report measurements in order to collect information on a subject's reasoning. The participants could indicate which information they based their decision upon which is especially important to know in order to detect an actual advantage for trained individuals. Our study may lack external validity due to the laboratory setting. However, this also proved useful in that we were able to study trained and untrained individuals within the same context. Furthermore, given that the level of payoff for individual subjects was dependent on his or her decision it provided participants with an extra incentive to arrive at a correct decision within the context of the experiment.

Our findings have important implications for the design of training programs (Adams and Song 1989). Organizations should not only offer training programs but also focus on the information search phase. To get more insights into the information selection of advanced individuals, future studies should include trained subjects with more expertise. As we have shown, trained individuals with declarative knowledge (but who are not yet experts) already possess the ability to select and evaluate the relevant information in an investment setting, especially when the cost of information leads them to focus on particular aspects of the information available. It would be intriguing to see if experts with long-standing experience apply a similar method of information selection when arriving at a decision.

Appendix A: Experimental Proceeding

Figure A1 illustrated the process of the experiment which started with a financial knowledge questionnaire and ended with a post-experimental questionnaire containing questions on demographic variables.

Figure A1*Experimental Process*

Appendix B: Experimental Instructions

Treatment 1: Free Information

Instructions 1/2

Welcome to the Experiment!
The aim of this experiment is to gain an insight into people's decision-making behavior. Before you begin we would like to make you aware of some important points regarding the procedure of the experiment.
<p style="text-align: center;">General Instructions</p> <ul style="list-style-type: none">• Please remain seated and do not speak during the course of the experiment. Mobile phones must be switched off and any bags should be stowed under the desk.• If you should have any questions please raise your hand and a member of the team will come to assist you.• All participants in this experiment are together in the same room. Everyone will receive the same instructions and the same questionnaire at the end of the experiment.• Please read the instructions carefully and do not continue until you have understood everything. A copy of the instructions can be found at your desk.• The whole experiment should take around 60 minutes. In the event that you have reached your decision, please remain seated at your desk until all other participants have finished. This could take a few minutes. Please remain patient during this time. <p style="text-align: right;">Continue >></p>

Instructions 2/2

Welcome to the Experiment!
The aim of this experiment is to gain an insight into people's decision-making behavior. Before you begin we would like to make you aware of some important points regarding the procedure of the experiment.
<p style="text-align: center;">Information concerning the Procedure of the Experiment</p> <ul style="list-style-type: none">• The experiment consists of two parts, as well as a short questionnaire. A sign in the header of your screen will indicate in which part of the experiment you are currently in. Please be aware that the two sections are completely independent of each other.• The decisions which you reach in the experiment will remain completely anonymous. Neither the other participants, nor the director of the experiment will be able to identify you. None of the other participants will receive information concerning your decisions or payoffs.• Your final payoff depends upon the decisions you make throughout the course of the experiment.• Every participant receives a show-up fee of 4.00 € and an endowment of 2.00 € as well as the possible payoffs acquired within the context of the experiment.• At the end of the experiment you will be asked to leave the laboratory individually and an assistant, who is not aware of the content of the experiment, will give you your individual payoff. <p style="text-align: right;"><< Back Start Experiment</p>

Screen Preceding the Knowledge Test

Knowledge Test

In the following section you will be asked a few specific questions.
For some of the questions there could be several correct answers.
Please answer the questions based upon your knowledge or presumptions.

Continue

Knowledge Test 1/4

Knowledge Test 1/4

What do you understand under the term internal rate of discount?

☐ interest yielded by a particular investment project
☐ interest rate for the best alternative investment
☐ interest rate on the equity used for an investment
☐ interest rate on the debt capital required for an investment
☐ interest rate of the most favorable loan
☐ I don't know.

The profitability of an investment is calculated with the help of which value?

☐ cash value
☐ capitalized value of potential revenue
☐ cost value
☐ net present value
☐ remaining sales revenue
☐ I don't know.

Which of the following types of financing counts as external financing?

☐ replacement financing through accumulated depreciation
☐ self-financing through profits
☐ financing through pension reserves
☐ equity financing
☐ admission of a silent partner
☐ I don't know.

Continue

Knowledge Test 2/4

Knowledge Test 2/4	
Which of the following statements is correct? An investment is profitable when...	<input type="checkbox"/> it yields the internal rate of interest. <input type="checkbox"/> the interest rate is above the internal rate of interest. <input type="checkbox"/> the net present value is positive. <input type="checkbox"/> it is possible to recover the purchase payment. <input type="checkbox"/> the annuity is greater than zero. <input type="checkbox"/> I don't know.
When is a firm in a sound financial state?	<input type="checkbox"/> It has considerable funds. <input type="checkbox"/> The amount of cash is equivalent to 75% of the short-term liabilities. <input type="checkbox"/> Cash and the supply of semi-finished and finished goods cover the short-term liabilities. <input type="checkbox"/> The firm can cover the debt due at any time. <input type="checkbox"/> I don't know.
Which of the following statements is correct? The net present value of an investment is negative when...	<input type="checkbox"/> its internal rate of return is less than the calculatory interest rate. <input type="checkbox"/> its internal rate of return is greater than the calculatory interest rate. <input type="checkbox"/> ... the cash outflow is greater than the cash inflow. <input type="checkbox"/> ... the discounted cash inflow is less than the discounted cash outflow. <input type="checkbox"/> I don't know.
<div>Continue</div>	

Knowledge Test 3/4

Knowledge Test 3/4	
What does the leverage effect cause?	<input type="checkbox"/> an increase of the interest on debt capital <input type="checkbox"/> an increase of the return on total assets when the interest on debt capital is lower than the return on equity <input type="checkbox"/> a change in the return on equity with an increase in the debt-equity ratio <input type="checkbox"/> an increase in the return on equity as a result of taking on more debt when the return on total assets is lower than the interest rate on debt capital <input type="checkbox"/> I don't know.
Which of the following types of investment procedure counts as a dynamic investment procedure?	<input type="checkbox"/> profitability calculation <input type="checkbox"/> profit comparison method <input type="checkbox"/> internal rate of return method <input type="checkbox"/> annuity method <input type="checkbox"/> I don't know.
<div>Continue</div>	

Knowledge Test 4/4

Knowledge Test 4/4

For what reasons is an increase in capital implemented from company funds?

The ideal debt-equity ratio...

☐ injection of new equity capital

☐ an increase of shareholders' assets through the issue of bonus shares

☐ a decrease of the stock market price and an increase of the effective interest rate of shares

☐ avoidance of corporate tax

☐ I don't know.

☐ lies based on the Leverage-Model at the point where the return on equity reaches its maximum level.

☐ lies based on financial theory at the point where the average capital cost reaches its maximum level.

☐ can be calculated as precise individual value based on the classical thesis, because the function of the average capital cost i reaches a minimum.

☐ lies based on the Moglinari-Miller-Thesis at the point where equity costs reach their maximum level.

☐ I don't know.

Continue

Screen Preceding Investment Projects

Investment Projects

BUY or RENT ?

In the following section you will be presented with different projects for which you will be asked to make an investment decision.

Each one of the three projects was presented to an expert who was asked to make an investment decision.

You will receive **2 €** for each decision which is identical to the one made by the expert.

If your decision is not the same as that made by the expert you will receive 0 €.

Continue

Investment Project 1

Investment Project 1				
<p>General Information</p> <p>You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.</p> <p>Currently your company has current (capital) assets of 100,000 € at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is 100,000 € which will be taken out of the net cash flow. The rental cost of the warehouse is 50,000 € per annum.</p> <p>In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.</p>				
Profit	Marketing Expenditures	Return on Assets	Raw Materials and Supplies	Operational Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>
Net Cash Flow	Net Present Value	Pension Reserve	Net Book Value of Assets	Capital Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>
<input type="button" value="Ok"/>				

Investment Project 1 (Open Information)

Investment Project 1														
<p>General Information</p> <p>You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.</p> <p>Currently your company has current (capital) assets of 100,000 € at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is 100,000 € which will be taken out of the net cash flow. The rental cost of the warehouse is 50,000 € per annum.</p> <p>In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.</p>														
<table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 5px;">in Thousand €</th> <th style="text-align: center; padding: 5px;">Buy</th> <th style="text-align: center; padding: 5px;">Rent</th> </tr> </thead> <tbody> <tr> <td style="text-align: left; padding: 5px;">t = 0</td> <td style="text-align: center; padding: 5px;">200</td> <td style="text-align: center; padding: 5px;">100</td> </tr> <tr> <td style="text-align: left; padding: 5px;">t = 1</td> <td style="text-align: center; padding: 5px;">150</td> <td style="text-align: center; padding: 5px;">100</td> </tr> <tr> <td style="text-align: left; padding: 5px;">t = 2</td> <td style="text-align: center; padding: 5px;">100</td> <td style="text-align: center; padding: 5px;">100</td> </tr> </tbody> </table> <div style="text-align: center; margin-top: 10px;"><input type="button" value="OK"/></div>			in Thousand €	Buy	Rent	t = 0	200	100	t = 1	150	100	t = 2	100	100
in Thousand €	Buy	Rent												
t = 0	200	100												
t = 1	150	100												
t = 2	100	100												
<input type="button" value="Ok"/>														

Investment Project 1 - Decision

Please make your investment decision now.

How likely is it that you will purchase the new warehouse?	highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely
How likely is it that you will rent the new warehouse?	highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely
How likely is it that you will rent the warehouse since you consider the risk to be much lower than it will be if you were to purchase the warehouse?	highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely
How likely is it that you will rent the warehouse due to the fact that you consider liquid assets to be important?	highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely
How likely is it that you will finance the cost of the new warehouse through equity capital , even if your liquid assets decrease as a result of the purchase price?	highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely
How likely is it that you will purchase the warehouse with borrowed capital due to the favorable base rates?	highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely

What is your decision? ☐ Rent
☐ Buy

Investment Project 1

Please state a reason for your decision.

Please insert your answer in the space provided below and then press "Enter". As soon as your answers are no longer displayed they have been saved.

What information was important for you in arriving at your decision?

Multiple answers are possible.

<input type="checkbox"/> profit	<input type="checkbox"/> net cash flow
<input type="checkbox"/> marketing expenditures	<input type="checkbox"/> net present value
<input type="checkbox"/> return on assets (ROA)	<input type="checkbox"/> pension reserve
<input type="checkbox"/> raw materials and supplies	<input type="checkbox"/> net book value of assets
<input type="checkbox"/> operational expenditures	<input type="checkbox"/> capital expenditures
	<input type="checkbox"/> none of the above

Continue

Screen Before Investment Project 2

Investment Projects
<p>Thank you for your investment decision!</p> <p>Please click on continue in order to move on to Project 2.</p>
<input type="button" value="Continue"/>

Investment Project 2

Investment Project 2				
<p>General Information</p> <p>You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.</p> <p>Currently your company has current (capital) assets of 100,000 € at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is 100,000 € which will be taken out of the net cash flow. The rental cost of the warehouse is 64,000 € per annum.</p> <p>In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.</p>				
Profit	Marketing Expenditures	Return on Assets	Raw Materials and Supplies	Operational Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>
Net Cash Flow	Net Present Value	Pension Reserve	Net Book Value of Assets	Capital Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>
<input type="button" value="Ok"/>				

Investment Project 2

General Information

You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.

Currently your company has current (capital) assets of **100,000 €** at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is **100,000 €** which will be taken out of the net cash flow. The rental cost of the warehouse is **64,000 €** per annum.

In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.

Buy	Rent
85.94	85.53

Investment Project 2 - Decision

Please make your investment decision now.

How likely is it that you will **purchase** the new warehouse?

How likely is it that you will **rent** the new warehouse?

How likely is it that you will **rent** the warehouse since you consider the risk to be much lower than it will be if you were to purchase the warehouse?

How likely is it that you will **rent** the warehouse due to the fact that you consider liquid assets to be important?

How likely is it that you will finance the cost of the new warehouse through **equity capital**, even if your liquid assets decrease as a result of the purchase price?

How likely is it that you will purchase the warehouse with **borrowed capital** due to the favorable base rates?

What is your decision?

☐ Rent
☒ Buy

[Send Decision](#)

Investment Project 2 – Decision Questionnaire

Investment Project 2

Please state a reason for your decision.

Please insert your answer in the space provided below and then press "Enter". As soon as your answers are no longer displayed they have been saved.

What information was important for you in arriving at your decision?

Multiple answers are possible.

☐ profit

☐ marketing expenditures

☐ return on assets (ROA)

☐ raw materials and supplies

☐ operational expenditures

☐ net cash flow

☐ net present value

☐ pension reserve

☐ net book value of assets

☐ capital expenditures

☐ none of the above

Continue

Screen preceding Investment Project 3

Investment Projects

Thank you for your investment decision!

Please click on continue in order to move on to Project 3.

Continue

Investment Project 3

Investment Project 3				
<p>General Information</p> <p>You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.</p> <p>Currently your company has current (capital) assets of 100,000 € at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is 100,000 € which will be taken out of the net cash flow. The rental cost of the warehouse 62,500 € in the first year and 55,125 € in the second year.</p> <p>In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.</p>				
Profit	Marketing Expenditures	Return on Assets	Raw Materials and Supplies	Operational Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>
Net Cash Flow	Net Present Value	Pension Reserve	Net Book Value of Assets	Capital Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>
<input type="button" value="Ok"/>				

Investment Project 3 (Open Information)

Investment Project 3														
<p>General Information</p> <p>You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.</p> <p>Currently your company has current (capital) assets of 100,000 € at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is 100,000 € which will be taken out of the net cash flow. The rental cost of the warehouse 62,500 € in the first year and 55,125 € in the second year.</p> <p>In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.</p>														
<table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 2px 5px;">In Percent</th> <th style="padding: 2px 5px;">Buy</th> <th style="padding: 2px 5px;">Rent</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px 5px;">t = 0</td> <td style="text-align: center; padding: 2px 5px;">-</td> <td style="text-align: center; padding: 2px 5px;">-</td> </tr> <tr> <td style="padding: 2px 5px;">t = 1</td> <td style="text-align: center; padding: 2px 5px;">0.33</td> <td style="text-align: center; padding: 2px 5px;">0.45</td> </tr> <tr> <td style="padding: 2px 5px;">t = 2</td> <td style="text-align: center; padding: 2px 5px;">0.50</td> <td style="text-align: center; padding: 2px 5px;">0.45</td> </tr> </tbody> </table>	In Percent	Buy	Rent	t = 0	-	-	t = 1	0.33	0.45	t = 2	0.50	0.45	<input type="button" value="OK"/>	
In Percent	Buy	Rent												
t = 0	-	-												
t = 1	0.33	0.45												
t = 2	0.50	0.45												
<input type="button" value="Ok"/>														

Investment Project 3 – Decision

Investment Project 3 - Decision

Please make your investment decision now.

How likely is it that you will **purchase** the new warehouse? highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely

How likely is it that you will **rent** the new warehouse? highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely

How likely is it that you will **rent** the warehouse since you consider the risk to be much lower than it will be if you were to purchase the warehouse? highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely

How likely is it that you will **rent** the warehouse due to the fact that you consider liquid assets to be important? highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely

How likely is it that you will finance the cost of the new warehouse through **equity capital**, even if your liquid assets decrease as a result of the purchase price? highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely

How likely is it that you will purchase the warehouse with **borrowed capital** due to the favorable base rates? highly unlikely ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ very likely

What is your decision? ☐ Rent
☐ Buy

Continue

Investment Project 3 – Decision Questionnaire

Investment Project 3

Please state a reason for your decision.

Please insert your answer in the space provided below and then press "Enter". As soon as your answers are no longer displayed they have been saved.

What information was important for you in arriving at your decision?

Multiple answers are possible.

☐ profit
☐ marketing expenditures
☐ return on assets (ROA)
☐ raw materials and supplies
☐ operational expenditures

☐ net cashflow
☐ net present value
☐ pension reserve
☐ net book value of assets
☐ capital expenditures
☐ none of the above

Continue

Screen Preceding Feedback

Investment Projects

Thank you for your investment decision!

Please click on continue in order to move on to view your results for all sections of the experiment.

Continue

Feedback

Your Results

Knowledge Test

- You answered **2 out of 15** questions correctly.

Investment Project 1

- In Project 1 you opted to **buy**. Your payoff therefore is: 0.00

Investment Project 2

- In Project 2 you opted to **buy**. Your payoff therefore is: 2.00

Investment Project 3

- In Project 3 you opted to **rent**. Your payoff therefore is: 2.00
- As a result your total payoff in € including your show-up fee of 4.00 € amounts to: 10.00

Continue

Screen Preceding the Questionnaire

Questionnaire

In order to complete the questionnaire, please answer the following questions.
Please click on **Continue** to move on to the questionnaire.
Your answers will of course remain anonymous.

Continue

Questionnaire 1/4

Questionnaire 1/4

You are... ☐ male
☐ female

Please enter your year of birth:

Have you completed a school leaving certificate/A-Levels? ☐ yes
☐ no

When yes, in which year did you complete the exam?

In which university course are you enrolled?
*Please enter your degree course in the box displayed
on the right hand side and click the ENTER key
in order to save your data.*

What is your targeted degree? ☐ Bachelor
☐ Master
☐ "Diplom"
☐ Ph.D.
☐ Other

In which semester of study are you?

Continue

Questionnaire 2/4

Questionnaire 2/4

Please indicate whether or not you have already completed a degree in one of the following subjects:

- ☐ business
- ☐ governance and public policy
- ☐ education
- ☐ business administration and economics
- ☐ law
- ☐ computer science
- ☐ business computing
- ☐ economics
- ☐ Ph.D. in business
- ☐ Ph.D. in business with major in Accounting, Finance, Taxation
- ☐ cultural and business studies
- ☐ other (Please insert below and click on ENTER)

In the event that you have already completed a program of study please indicate the highest degree qualification you achieved.

- ☐ Bachelor Technical College
- ☐ Master Technical College
- ☐ "Diplom" Technical College
- ☐ Bachelor University
- ☐ Master University
- ☐ "Diplom" University
- ☐ Other

Continue

Questionnaire 3/4

Questionnaire 3/4

Have you chosen to specialize in a specific area in your degree?

☐ yes
☐ no

When yes then please indicate what you have chosen and click ENTER in order to save your data:

Have you attended classes in areas such as Taxation, Balances, Finance, Accounting or Investment during your studies?

☐ yes
☐ no

When yes then please indicate which classes you have attended and click ENTER in order to save your data:

Have you completed a traineeship in business?

☐ yes
☐ no

Continue

Questionnaire 4/4

Questionnaire 4/4

To what extent have you gained experience in the following areas up to this point?

application for a loan	not at all	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	very much
paying off a loan	not at all	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	very much
purchasing a car	not at all	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	very much
purchasing property	not at all	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	very much
other activity in the area of finance (a guarantee, ...)	not at all	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	very much

Please list your experience in the area indicated on the right hand side and click ENTER in order to save your data.

End

Last Screen

Thank you for your participation in the experiment!

Please insert your seat number in the following screen such that your payoff can be allocated to your lot number.

Treatment 2: Costly Information

Note: All other screenshots and instructions are equivalent to treatment 1.

Screen preceding Project 2

Investment Projects

Thank you for your investment decision!

You will now be presented with various pieces of information which you can retrieve or not.

There is a charge of **0.15 €** for each piece of information accessed. This will be deducted from your endowment of 2.00 €.

Please press "Continue" in order to continue to Project 2.

Project 2

Investment Project 2

General Information

You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.

Currently your company has current (capital) assets of **100,000 €** at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is **100,000 €** which will be taken out of the net cash flow. The rental cost of the warehouse is **54,000 €** per annum.

In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.

Profit	Marketing Expenditures	Return on Assets	Raw Materials and Supplies	Operational Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>
Net Cash Flow	Net Present Value	Pension Reserve	Net Book Value of Assets	Capital Expenditures
<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>	<input type="button" value="Open"/>

Cost of Information - 0.00 €

Ok

Project 2 (Open Information)

Investment Project 2

General Information

You are the chairman of a publicly owned company. An important investment decision is on the agenda for the new year.

Currently your company has current (capital) assets of **100,000 €** at its disposal. However, in order to store one of your products a new warehouse is required. You have the possibility either to purchase the warehouse or to rent it for two years. Regardless of whether or not you decide to purchase or to rent the warehouse, annual turnover will be 100,000 € as a result of the increase in storage space. Capital costs currently stand at 5%. The price of the warehouse is **100,000 €** which will be taken out of the net cash flow. The rental cost of the warehouse is **54,000 €** per annum.

In order to be able to arrive at an investment decision it is necessary to take into account the information below. As chairman you are aware that there are different interest groups in the company who represent clear preferences regarding the decision to either buy or rent and who at the same time may have influenced the figures given below.

in Thousand €	Buy	Rent
t = 0	-	-
t = 1	50	45
t = 2	50	45

Cost of Information - 1.20 €

Ok

Feedback

Your Results

Knowledge Test

- You answered **12 out of 15** questions correctly.

Investment Project 1

- In Project 1 you opted to **rent**. Your payoff therefore is: 2.00

Investment Project 2

- In Project 2 you opted to **rent**. Your payoff therefore is: 0.00

Investment Project 3

- In Project 3 you opted to **rent**. Your payoff therefore is: 0.00
- You spent the following amount of money on information in reaching your decision: -1.20
- From your endowment of 2.00 € you will therefore receive the remaining difference of: 0.80
- As a result your total payoff in € including your show-up fee of 4.00 € amounts to: 6.80

Additional Information Screen

Note: All other screenshots are equivalent to treatment 1 and 2.

Screen preceding Project 2 (Closed)

Investment Projects

Optional Information

You now have the opportunity to obtain optional information for the following decisions which could be beneficial in arriving at a decision.

You will receive information on the terms related to the investment decision.

If you wish to receive this information please click on "View Information".

If you wish to proceed to the next projects please click on "Continue".

View Information

Continue

Screen preceding Project 2 (Open Information)

Investment Projects

<p>Profit A profit is realized when the amount of revenue gained from a business activity exceeds the expenses, costs and taxes needed to sustain the activity which is equivalent to the net income within that period.</p>	<p>Net Cashflow It is a company's total cash minus total liabilities when discussing financial statements. The net operation cash-flow refers only to expenses for production and sales activities within the company. Additionally, the total cashflow considers expenses for financing, investment and pay-out decisions.</p>
<p>Marketing Expenditures Marketing expenditures are costs associated with every marketing activity within a company.</p>	<p>Net Present Value The net present value is the difference between the present value of cash inflows and outflows of an investment project. The NPV is used in capital budgeting to analyze the profitability of an investment or project. A positive net present value results when the internal rate of return exceeds the cost of capital. Such an investment increases investors' assets and should be realized. Investments with a negative npv, however, are not profitable since they do not reach the required minimum rate of return.</p>
<p>Return on Assets ROA is an indicator of how profitable a company is relative to its total assets. The return on assets gives an idea as to how efficient management is at using its assets to generate earnings. It is calculated by dividing a company's annual earnings by its total assets. Sometimes this is referred to as "return on investment".</p>	<p>Pension Reserve Pension reserves are provisions built for uncertain liabilities which result from a commitment made within the context of a company's retirement scheme.</p>
<p>Raw Materials and Supplies Raw material and supplies are equivalent to the expenses for the material or substance used in the production or manufacturing of a good. They are part of the cost which are included in the earnings statement along with the revenue generated within that period.</p>	<p>Net Book Value of Assets Capital assets are part of the company's assets which are not considered to be sold within one period. The net book value of assets equals the acquisition costs of fixed assets minus depreciation.</p>
<p>Operational Expenditures In contrast to the capital expenditures, which contain long-term capital goods, operational expenditures are costs that a business incurs as a result of performing its normal business operations. Expenses for raw materials and supplies, employees' wages, leasing rates, rent and energy are part of the operational expenditures.</p>	<p>Capital Expenditures Funds used by a company to acquire or upgrade physical assets such as property, industrial buildings or equipment. This type of outlay can be financed by debt or equity capital.</p>

Close

Continue

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