Bus Inf Syst Eng 60(4):317–329 (2018)
https://doi.org/10.1007/s12599-017-0501-5

RESEARCH PAPER

Facilitating Informed Decision-Making in Financial Service Encounters

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Received: 11 November 2014 / Accepted: 11 December 2016 / Published online: 14 November 2017

Abstract While advice-giving encounters form an integral part of banks' services, clients often buy inappropriate products and face financial consequences. Legislators have started to put banks under pressure to ensure that clients are properly educated. However, the literature describes barriers due to which client education is doomed to fail applying current advice-giving practices. Practicable alternatives to the predominant *perfect agent* style of advice-giving are dismissed, mainly with the argument of client-side cognitive limitations. This paper challenges this assumption by suggesting a decision-making process that seamlessly integrates educational interventions, thus supporting informed client decision-making. In the spirit of design science research, the authors take a fresh look at the problems of client education in cooperation with a large Swiss retail bank to derive generalizable requirements, and design a novel IT-supported advice-giving process. An evaluation demonstrates the design's utility in significantly improving client learning, compared to traditional service encounters. This research extends the current discourse on service encounter design, and seeks to help practitioners to design the financial service encounters of tomorrow.

Keywords Financial service encounters · Client learning · Financial literacy · Instructional design

Accepted after four revisions by Prof. Dr. Schoder.

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1 Introduction

Individuals often buy ill-fitting financial products and later suffer the resulting losses. Inappropriate buying decisions cause losses in the range of €20 to €50 billion per year in Germany alone (Oehler and Kohlert 2009; Oehler 2012). Notably, most individuals select financial products based on advice received in financial service encounters offered by their financial service providers (FSP). Despite (or even as a result of) these service encounters, clients regularly buy improper financial products.

The literature cites insufficient knowledge levels as a common factor that impairs buying decisions (e.g., Oehler and Kohlert 2009). There are several hypotheses on why clients' knowledge levels do not change during service. Temporal and cognitive constraints, for instance, suggest that the necessary amount of knowledge simply cannot be transferred (Oehler and Kohlert 2009). An imputed *principal-agent conflict* suggests that advisors (agents) are not motivated to educate clients, since they deliberately exploit knowledge asymmetries to maximize their own profits (Eisenhardt 1989; Nussbaumer et al. 2011). Observations of real-world encounters further suggest that a phenomenon named an *interaction as if* (Jungermann and Belting 2004) blocks client learning altogether. During *interaction as if* episodes, advisors and clients do not even seek to clarify an aspect; they just pretend to explain and understand, in order to save face and get the job done (Jungermann and Belting 2004). On the one hand, these hypotheses seem plausible, given the low financial literacy levels with respect to investments in the general population (Chen and Volpe 1998; ANZ Bank 2008). On the other hand, there are also clear indications that clients with sufficient knowledge levels are better able to select suitable products. Service models based on 'informed decision-making' (Gafni et al.

1998) or on value co-creation (Schmidt-Rauch and Nussbaumer 2011) require sufficient client knowledge levels but offer superior service performance in return. Thus, it is crucial to find ways to sufficiently educate clients, to raise the quality of financial services, and to lower the losses owing to inappropriate investments. While the literature describes how people with insufficient client knowledge behave in service encounters, and what superior services designs could look like, it lacks concrete prescriptions on how client learning can be supported during service encounters.

Legislators, who are also aware of the problem, have started to put pressure on the banks to ensure that clients are sufficiently enlightened on products' associated risks. Changes in regulations during the past few years (e.g., the preparation of MIFID-II) show legislators' efforts. However, putting these regulations into practice does not address the problem at its core. For instance, banks must now provide detailed documentation on the products they sell, although this approach is known to be ineffective concerning the compensation for knowledge gaps (Chater et al. 2010). Other measures, such as a reversal of the burden of proof that clients were sufficiently knowledgeable at the time of purchase (e.g., as proposed in a draft of the Swiss regulation framework FIDLEG) (cf. The Federal Council 2015), are also ineffective concerning client learning. While such reversals of proof may put the client in a better legal position, they do not necessarily lead to better client education, since FSPs have only limited abilities to manage today's client education efforts.

Based on the working hypothesis that the service encounter is the only viable point in time for client education, we state our primary research question: *How can client learning be fostered and managed in financial advisory service encounters?*

We approached this question in a design research (Hevner et al. 2004) setup, in close cooperation with a large Swiss retail bank. This setup allowed us to anchor the design problem in both the literature and the application domain. This cooperation further enabled us to evaluate the utility of the design prescriptions in a realistic environment. Assessing the problem and the solution in the dimensions of the *specific problem, abstract problem*, *abstract solution*, and *specific solution* (cf. Lee et al. 2011), we formulated a corresponding explanatory design theory (Baskerville and Pries-Heje 2010) to support and communicate our design rationales. The primary artifacts we created were an IT system and an improved advice-giving process. The IT system hosted an interactive learning environment, while the process prescribed the sequence of learning activities. This process was termed *learning interleaved decision-making*, since it bonds learning activities to decision-making points in the encounter. Thus, the design solution self-aligns to the course and topics of the encounter. A subsequent evaluation of the design in a realistic laboratory setting suggests that learning interleaved decision-making encounters significantly outperform traditional 'pen and paper selling' encounters concerning client learning. Thus, this working design solution and its abstract design prescriptions provide a practicable answer to the stated research question.

These results are relevant to both practitioners and to the academic discourse on financial advice-giving and advice-taking. We add to the discourse by offering an alternative view on client education that pushes the assumed limits and capabilities of traditional service encounters. We also reduce the lack of design prescriptions for service encounters in the literature. We offer practitioners manageable and auditable client education procedures with assessable effectiveness. Using such a system would be beneficial to clients, since they could be better integrated into the decision-making process, and would thus have the chance to take more suitable financial decisions.

2 Background

2.1 The Client's Knowledge in a Service Encounter

In their simplest form, dyadic service encounters consist of an expert (service provider) and a layperson (client). Knowledge levels (objective and mutually perceived ones) moderate the interaction between these two stakeholders. While some models take the knowledge asymmetries between these two persons as a given, and argue that the participants utilize these differences (e.g., principal-agent conflict) (Eisenhardt 1989; Novak 2009), other models treat the knowledge levels as dynamic entities and focus on their change throughout the service. The literature describes two extreme variants: *informed decision-making* and *perfect agent* (Gafni et al. 1998). Both models rely on knowledge transfer to enable decision-making: While in the informed decision-making model, the service transfers all decisions-relevant expert knowledge to the client, making her the primary decision-maker, the *perfect agent* model works the other way around. Here, all relevant aspects of the client's situation (including hidden needs) are transferred to the agent (the expert), enabling him to make a correct decision. Financial service encounters are most often described as *perfect agent* encounters. This is considered the only viable option, owing the strong boundaries and problems that hamper the necessary knowledge transfer to the client in each phase of the service (see Oehler and Kohlert 2009): In the information collection phase (phase 1), advisors ask general questions (e.g., whether the client has previous experience of buying

stocks) to assess the client's knowledge and expertise level. This method is very sensitive to the specific formulation of questions and produces highly subjective self-assessments. For the information phase (phase 2), Oehler and Kohlert further conclude that information overload is inevitable, given the vast amount of information necessary to provide the required basis for a truly informed decision. In the recommendation phase (phase 3), the main problem is that clients are not aware of all solution options to their situation, because the advisors only present one option (or, at best, a small number of options) as a final solution for acceptance or rejection. Thus, in practice, these services typically resemble *perfect agent* encounters, which are prone to advice-giving fails, since advisors (1) can easily act in their own interests or (2) are unaware of their clients' hidden needs and may thus select inappropriate products.

Client learning before or after the service encounter are not viable options. While clients have superior access to information via the internet (Nussbaumer et al. 2011), the specific knowledge requirements for a particular encounter are unclear before the fact. Thus, goal-oriented preparation seems unfeasible. Learning after the fact is useless concerning the decisions already made during the encounter. Thus, the service encounter remains the only option to practically raise a client's knowledge level.

2.2 Practical Approaches to Client Learning

A recent EU report (Chater et al. 2010) addresses the question when and how to undertake consumer education in the financial sector. It identifies the service encounter as a prime point to convey the relevant information; in it, the information can be tailored to the customer, can be more specific (in contrast to a broad education on financial topics), and can be delivered at the time of the decision. However, the mere provision of additional information in a service setting has no significant effect on a client's decision capability (Chater et al. 2010). This is in line with Burton's (2002) general model of consumer education, which assumes a general relationship between the knowledge distance between provider and client, and the knowledge transfer method used. In a low knowledge distance service (e.g., a haircut), the simple provision of relevant information might be sufficient, while in complex services, client learning is required (Burton 2002) but does not seem to happen sufficiently (e.g., Oehler and Kohlert 2009). A recent study (Fernandes et al. 2014) stresses the necessity to transfer knowledge directly when it is needed. The authors note that knowledge decays over time, and that just-in-time knowledge transfer is therefore preferable. However, they do not go beyond stating this general requirement.

2.3 Experience-Based Learning

To our best knowledge, the closest approach to enhance client decision capabilities just-in-time is presented in the work of Bradbury et al. (2015): it incorporates the notion of simulated experience in a financial context, where clients are provided with a simulation of random distributions to educate them on risk-taking. Bradbury et al. (2015) found that investors educated via a simulation are willing to invest in riskier products compared to those who received only descriptive information. The aforementioned investors also showed fewer regrets about their decisions afterwards. Bradbury et al. (2015) explicitly call for the implementation of such actions in real-world service encounters.

The didactic literature offers many approaches to enhance learning. Experience-based learning approaches (Kolb 1984; Gentry 1990; Kirschner et al. 2006) appear promising for service encounters because they can be immediately applied and offer efficient access to knowledge. Tools that support experience-based learnings are often conceptualized as open-ended learning environments: the learner gains knowledge via active exploration in interactive simulations (Land and Hannafin 1996). If this is reduced to the exploration of single causal constructs, then these systems are also called *microworlds* (Rieber 1992), because they focus on the exploration of a single concept in a reduced (micro-)environment. Such microworlds have lately been successfully applied to educate clients on financial matters (Heinrich et al. 2014), but we still lack the crucial step of embedding such microworlds in the service encounter.

3 Methodological Framework

The method of design research (Hevner et al. 2004) guided our activities. Specifically, design science research (DSR) focuses on the instantiation of design solutions in the form of artifacts that address relevant problems (Hevner et al. 2004). DSR provides methodological guidance to abstract the concrete solution of a specific application case to a more general solution, addressing a larger class of problems. The design theorizing framework (Lee et al. 2011) distinguishes between the specific problem and the abstract problem as well as the abstract solution from the instance solution. The abstract domain is typically reserved for scientific discussion using concepts and theories, while the instance domain describes the specific implementations and evaluations. These four quadrants are linked by an abstraction step (moving from the specific problem to the abstract problem), a solution-finding step (moving from the abstract problem to the abstract solution) and a de-abstraction step (moving from the abstract solution to the

instance solution); the instance solution is evaluated against the instance problem to assess its utility (Lee et al. 2011). For the purpose of communication and to provide a comprehensible level of rigor in the design description, we followed the framework of explanatory design theories (EDTs) (Baskerville and Pries-Heje 2010). In EDTs, the design is prescribed in the form of a concise description of the abstract problem called *general requirements*, represented as *conditions* and *capabilities* and a corresponding set of *general components* that address the requirements (Baskerville and Pries-Heje 2010). In this setup, both ex ante and ex post evaluation activities ensure that the design solution fits the problem and produces value for its users while providing further design insights. To do this rigorously, these activities are aligned with the DSR evaluation framework of Sonnenberg and vom Brocke (2012). Thus, we divide the evaluation into four parts: (1) ex ante evaluation of the problem, (2) ex ante evaluation of the design targets, (3) ex post evaluation of the instance solution's concepts, and (4) ex post evaluation of the artifact's utility.

We focus on evaluation parts 1 and 3 in-depth, since these revealed the most interesting insights from a DSR perspective. Part 1 is established by field interviews validating the general problem and providing further insights into how this problem manifests in the specific case. We ensured evaluation 2 by applying a user-centered design process (cf. Rosson and Carroll 2002), strongly including the participating bank during the design cycle. Experimental techniques used during a lab experiment comprise evaluation 3. Evaluation 4 would require a real-world use of the artifact (not yet performed); qualitative feedback gained in in-depth interviews with the subjects of the artifact's evaluation gives a first impression of potential strengths and weaknesses of the design. We present specific information on the data collection and the evaluation design in the corresponding sections.

Although the field study, system design, and evaluation were performed in linear order (as presented herein), the conceptualization of the design knowledge was an ongoing process throughout the project.

4 Problem Domain

The problem domain consists of the specific problems and the more generalized abstract problem. It is hard to define these two independently, since they strongly depend on each other. Thus, we began with an empty template of the abstract problem and refined it later while analyzing the specific problem.

4.1 Defining the Abstract Problem as a Theoretical Lens

As motivated in the introduction and background, the question how one can support client learning is closely related to the question how one could implement an educational design of such a setting. Although financial service encounters are not primarily educational settings, there is no obvious reason to believe that the underlying mechanisms of instructional design would be any different to other settings of adult education. Thus, whenever advisors want their clients to understand a topic, we argue that they should apply all basic elements of instructional design (Fig. 1), either implicitly or explicitly. Besides the educational material (e.g., brochures banks hand out to their clients), Shiffman (1986) argued that proper educational design also includes activities that define educational goals, matching the learner's capabilities, and creates strategies for assessment to support the actual teaching. Finally, one should evaluate the instructional design – typically after its first instantiation.

Thus, the abstract problem is defined as the problem of implementing these five steps of instructional design in financial service encounter practice. Though this is only a 'template' of the abstract problem, the observations made in the field fill these gaps and tailor this template towards the application domain.

4.2 Data Collection

We selected semi-structured interviews to specifically analyze one instance of the abstract problem in the field. Thus, we conducted 11 individual interviews with experienced advisors of a large Swiss retail bank in March 2013. The bank selected the interview partners on a voluntary basis. Whenever possible, they were interviewed at their workplaces. The advisors were between 23 and 42 years old (m = 34 years) and had been working in this bank for between six months and 20 years (m = 10.3 years) at the time. The interview guideline included specific questions targeting practices related to the instructional design, i.e.,

Fig. 1 Simplified model of instructional systems design (derived from Schiffman 1986)

practices that focus on the analysis of the learner, assessment strategies, and the selection of tools used for education. For instance, the guideline included the question: *How or by which criteria do you find out how much a customer already knows about the topic the service encounter is about?* It further also asked for instance whether the advisors try to transfer knowledge to their clients or not, what knowledge type they intend to transfer, and whether they believed the client's knowledge level to be sufficient to make informed decisions or not.

4.3 Abstracting from the Specific Problems

Most advisors stated favoring a procedure in which a client's situation and problem are elucidated in a first meeting, followed by a discussion on possible solutions and products. An advisor then prepares one or more concrete offers, and discusses these in a subsequent meeting, which usually takes place within a week. Thus, also in this instance, the practices resemble the *perfect agent* model. But, contrary to our initial expectations, the interviews revealed that client education is perceived as crucial and is generally sought by the advisors. However, answers to the questions on the de facto implementation of client learning revealed several problems. As an overarching issue, client education lies completely in the realms of the advisors' personal responsibility, and is hardly controllable by the bank. The subsequent subchapters discuss these problems in detail and deduce general requirements.

4.3.1 Analysis of the Learner

As expected, no advisor mentioned formal testing to assess the clients; they assess them subjectively and dispersed throughout the course of the service. Whenever they felt a knowledge gap, they either sought to explain this issue directly in the service encounter, or to provide further material on the topic by mail before or after the service encounter. However, without any guiding process, many knowledge gaps may not be detected and therefore not addressed. Advisors also mentioned that many clients had visited other banks beforehand. They thereby assumed that the client already had substantial knowledge. Given the large variance of knowledge levels among the clients and uncertainty about relevant topics in an upcoming encounter, it is deemed illusory to purposefully assess a client before the service. Thus, a client should be assessed during the service encounter in an ad hoc manner.

We therefore formulated the general requirement of *ad hoc client analysis*: Due to the unknown knowledge state of the client (condition), advisors need to pinpoint knowledge gaps during the encounter (capability).

4.3.2 Goal-Setting

When the advisors described how they set learning goals for their client education effort, a picture of very heterogeneous approaches and goals also emerged: Some advisors thought it sufficient to provide only the amount of information requested by a client, while others restricted their explanations to risks and opportunities associated with the products in question, and still others wanted their clients to clearly understand their decisions. This is further complicated by the fact that the course of a specific service encounter is largely undefined beforehand and emerges dynamically based on the topics discussed, decisions made, and information provided. Also, the specific learning goals depend on the client and her prior knowledge and therefore strongly depend on the outcome of the ad hoc client analysis.

Thus, we formulated a general requirement of *ad hoc setting of learning goals*: While the learning goals cannot be determined statically beforehand (condition), advisors should select appropriate learning goals based on the emerging knowledge requirements of the ongoing service (capability).

4.3.3 Assessment Strategy Development

Many of the interviewed advisors stated that they simply asked a client whether she is already knowledgeable during the encounter or whether she has prior experience with some products, to assess her knowledge level. But such approaches have been judged to be questionable, because they can suffer from framing effects (Oehler and Kohlert 2009). Some advisors also stated that they 'hope' for an informed decision made by the client. However, hope and assumptions are not sufficient to cope with the demands of upcoming regulatory frameworks to assure sufficient knowledge.

We call this the general requirement of *client assessment:* A meaningful and auditable client assessment is required by legislators (condition). Advisors should assess clients to check whether or not client education activities were successful during the service (capability).

4.3.4 Tool Selection and Creation

Concerning the tools the advisors used during a service encounter, freehand sketches were often mentioned to explain products. Some advisors utilized printouts from their back office software solution, while others used information freely available on the internet, while still others rely on the booklets and other printed material provided by their employer. One advisor also mentioned using analogies to explain difficult concepts. In addition to

the service encounter, some advisors also mentioned pushing information via mail (e.g., sending them weekly market letters) to clients they perceive to be knowledgeable. From the perspective of the bank and the regulators, such individual procedures jeopardize both management and auditability of client educating efforts.

We call this the general requirement of *tool selection*: Advisors should select tools based on clear criteria (capability). The bank should provide a sufficient selection of tools with known performance (capability).

4.3.5 Evaluation of the Instructional Design

Several advisors had doubts about client knowledge levels being sufficient for informed decision-making. Concerning the evaluation of the instructional design, this leaves only two possible conclusions: Either (1) advisors do not evaluate their own instructional design performance at all, or (2) if they do, they do not know how to improve on their existing procedures. From the bank's perspective, this is even worse, since no evaluation of these instructional procedures can take place, because the institution cannot even observe the individual practices. This is especially problematic regarding the verification whether or not the relevant client education, as foreseen by the legislators, has taken place.

Thus, we formulate the general requirement of *learning design evaluation*: Client education takes place in the confined space of dyadic advice-giving and is subject to individual advisor properties (condition). Advisor self-assessment is insufficient to manage the instructional design (condition). However, the bank needs to be able to evaluate and manage the instructional design to ensure regulatory compliance (capability).

In short, the specific application domain parameterized the abstract problem template. In contrast to traditional learning environments, financial services face the problem of an inaccessible client knowledge beforehand, unknown topics that may become relevant throughout the service, individual advisor behavior, and a dyadic environment inaccessible to providers. These conditions shape all aspects of instructional design, requiring a novel solution to overcome the challenges and create a purposeful and auditable client learning solution.

5 Solutions Domain

We will now present the design of the solution in terms of an abstract design and a specific instantiation in the application domain. In the subsection on the abstract solution, we focus on general solution components and explain how these address the general requirements. In the subsection on the specific instantiation, we focus on the details of implementing the identified general components in terms of a specific process and an IT solution, incorporating specific learning challenges given in the instance domain.

5.1 Designing the Abstract Solution

The primary design intervention of the solution automatically aligns learning with decision-making and externalizes the instructional design so that it becomes independent from advisors' personal attitudes. Externally managed, the instructional design can be delegated to specialists who care about educational quality and the effectiveness of instructional activities. This requires three general solution components, which we will explain in some detail in the next three subsections: (1) A decision-aware learning process, (2) reusable, modularized learning tools, and (3) effective, self-adapting learning environments.

5.1.1 Learning Activities Aligned with Decision-Making

Enabling informed decision-making means involving the clients in the decision-making activity rather than just confronting them with a final solution they can only accept or reject (Jungermann 1999; Oehler and Kohlert 2009). Thus, instead of featuring a single decision, an informed decision-making encounter encompasses a sequence of *decision points* that define the path from the client's initial problem towards a solution of financial products and services. The more of these decision points clients engages in, the better they participate in the whole decision-making process and the more informed the decision-making is. However, the client must acquire the required knowledge in order to take part in the decision-making process. Thus, the design aligns an educational stream of learning activities with the decision-making stream (see Fig. 2).

While particular decision points might not be anticipatable before the service, we argue that the set of possible decision points is finite; thus, appropriate learning modules can be prepared in advance for all of them. This strict alignment of connecting learning modules to decision points has interesting properties: the client is not educated on topics that are not important in that specific service encounter, and relevant knowledge to teach in order to engage in the next decision point is not missed. Further, this process is self-aligning to the course of the service encounter. Thus, this directly addresses the requirement of *ad hoc goal-setting*. Also, *tool selection requirement* is addressed by offering appropriate learning units automatically.

Thus, we formulated the general solutions component of a *learning interleaved decision-making process*: The

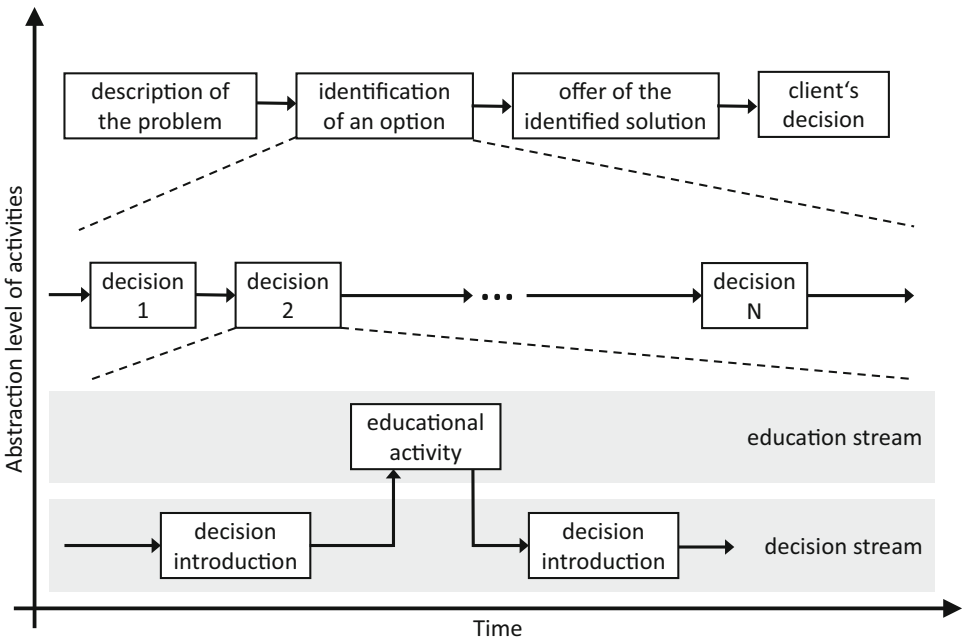

Fig. 2 From the model of advice giving and taking (Jungermann 1999) towards learning interleaved decision-making

decision process is accompanied by a stream of learning activities. At each decision point, a context-specific learning module is entered and executed before the decision point is addressed.

5.1.2 Modularized Learning Units

The prescribed process of learning interleaved decision-making requires a set of well-prepared learning units. As noted, a team of experts can design and evaluate these modules. Modularized learning units directly address the generic requirement of *tool selection*, since a ready-made module is available for each decision point, thus releasing the advisor from selection (or creation) activities. Available in a pool of modules they are at hand at the discretion of the advisor and the current demands of an upcoming decision. Thus, the general requirement of *instructional design evaluation* is also addressed, since these modules can be individually managed and assessed on their effectiveness.

Thus, we formulated the general solution component of *modularized learning units*: The bank provides pre-defined learning units for all relevant decision points.

5.1.3 Open-Ended Learning Environments

In open-ended learning environments, the clients interact with the system in an individual way depending on their current knowledge level (c.f. Land 2000). Having only a single learning environment per topic that self-adapts to the client's knowledge level also directly addresses the *ad hoc client analysis* requirement.

While using the system, the advisor guides the client (role of a master), while the client improves by working with the system (apprentice role). As a form of situated learning (Brown et al. 1989), experiential learning blends naturally into the encounter situation. In the master role, the advisor observes the learner's performance, getting direct feedback on the learning progress (addressing the *client assessment* requirement). Further open-ended learning environments were proven to effectively convey knowledge in advice-giving environments (Heinrich et al. 2014).

Thus, we formulated the general solution component of *open-ended learning environments*: Relevant client learning content is accessible through open-ended, experiential learning environments.

We have demonstrated how the three general solution components of (1) learning interleaved decision-making, (2) modularized learning units, and (3) open-ended learning environments address the general requirements. However, these general solution components define only system classes; thus, many degrees of freedom exist for specific solutions. We will now address the specific instantiation in retail financial advice-giving.

5.2 Deriving a Specific Solution

Together with the bank, we chose to exemplarily cover the topic of fund-based saving plans. Although these are standard products, their selection and combination requires decision on the savings and investment strategies to be made, including risk assessment and demands of solvency. In the next subsections, we demonstrate how we derived

the design from the abstract solutions components. Although we solely focus on the educational components, the solution covered all relevant aspects of the service encounter in order to provide continuous ICT support (screenshots and design rationales of these additional components are omitted here, for clarity and focus). The specific design was implemented on a 27-inch multi-touch device (Lenovo Horizon).

5.2.1 *Implementing Learning Interleaved Decision-Making*

The system primarily offers the parameterization of the fund-based saving plans to client needs. Thus, the system provides data input that reflect the outcome of a decision-making process. This involves the selection of an investment strategy (Fig. 3 shows the system in such a state: the client selected *growth* as the desired investment strategy). Directly next to the input options, a link to the corresponding learning modules is available. Implemented as a button, the system switches into the corresponding learning environment, preserving the current system state in the background until learning is achieved.

5.2.2 *Implementing Modularized Learning Units*

For the purpose of demonstrating the system's functionality, we implemented only two learning modules. We strictly aligned these modules' content with the topics presented to the clients in the bank's brochures on fund-based saving products. One topic dealt with diversification (i.e., the investment strategy), and the other one with the question when to invest how much money (i.e., the saving strategy). Together with experts from the bank, we carefully designed the two learning modules. These modules are independent from the data of the advice-giving process and are therefore free of side-effects. Also, no relationship between the learning modules is implied.

5.2.3 *Implementing Open-Ended Learning Environments*

The learning modules provide learning environments grounded in the concept of *educational microworlds* (Rieber 1992) – a special open-ended learning environment type. These microworlds focus on a specific causal model (here, financial models) where the learner is supposed to acquire knowledge by interacting with a simulation of these causal models. We will now show the detailed design of the savings strategy module and show how the client is supposed to interact with the given microworld.

Once the savings strategy microworld is entered (Fig. 4), the client can explore the basic properties of different strategies. The need for a savings strategy is closely related to the question of the cost-averaging effect (Brennan et al. 2005), which is often used to promote certain investment strategies (Williams and Bacon 1993). Here,

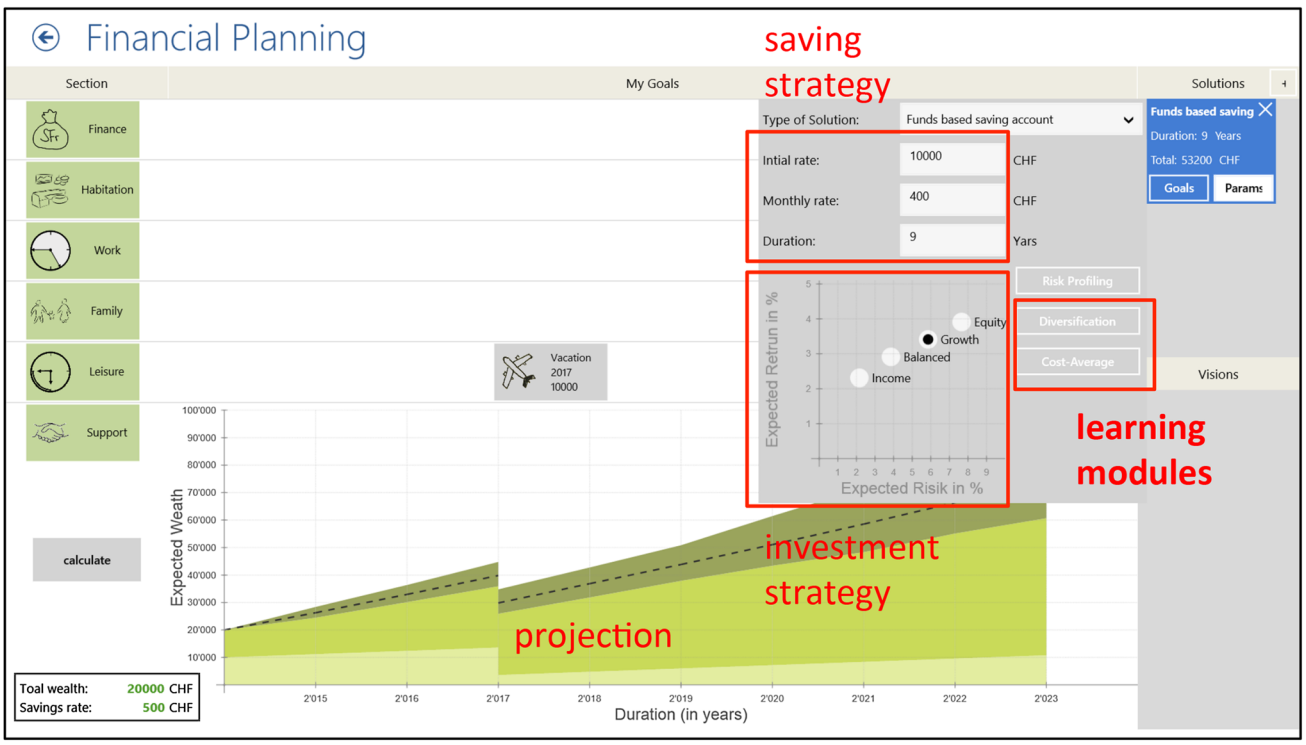

Fig. 3 System in the state of upcoming decision-making (screenshot translated from original implementation in German language)

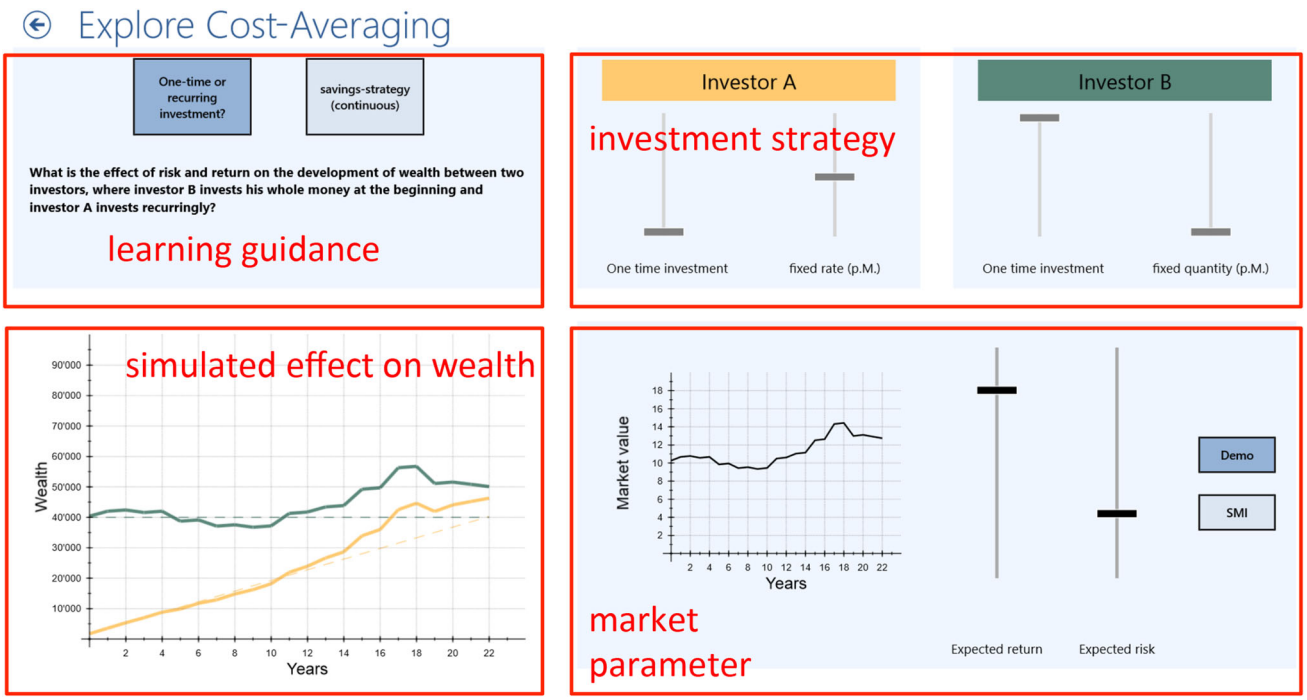

Fig. 4 Screenshot of the savings strategy microworld (the investment strategy microworld (not shown) has a similar design and functionality; screenshot translated from original implementation in German language)

the basic assumption is that when clients regularly buy shares for constant prices (thus getting a variable amount of them), they will automatically buy more shares when their value is low and less of them if they are pricy at the time. The bank's brochures point out that this strategy is always superior to a strategy of regularly buying fixed amounts of shares (thus paying a variable price). However, instead of just believing the information that is given, the client can simply explore this by himself, even without understanding the model's inner mathematical functions (here, the difference between harmonic and arithmetic means) (Brennan et al. 2005). However, under certain circumstances (Fig. 4), it can also happen that a simple buy-and-hold strategy is a superior one to any form of stepwise investment. Thus, the client can independently explore what assumptions the banks' suggestions rely on.

6 Evaluation of the Implementation

The next step in the DSR evaluation framework (Sonnenberg and vom Brocke 2012) foresees the ex post evaluation of the design artifact. Thus, in the lab, we designed an evaluation to test the artifact in a realistic yet controllable environment. The main variable of interest is the knowledge gain induced by the new artifact and advice-giving process. While such an evaluation can tell whether or not the artifact works (Sonnenberg and vom Brocke 2012), it provides few or no insights into the solution's use. While assessing the use (*proof-of-use*) (cf. Nunamaker Jr et al. 2015) would suggest a prolonged field test, we interviewed the participants after the evaluation to get more detailed feedback on how the artifacts were perceived. Both evaluation approaches provide *empirical grounding* (Goldkuhl 2004), which supports (or rejects) the concepts drawn in the abstract domain. The design's utility is compared to the traditional (unsupported) service encounter, for reference. We will now highlight the evaluation design, data collection, and experimental results.

6.1 Evaluation Design and Data Collection

The purpose of the evaluation is to assess the value of the designed solution to the domain. In this case the primary value is the transfer of knowledge. From the perspective of statistics, this corresponds to a difference hypothesis of the means of knowledge transfer between the two settings. A t-test analyses the results on statistical significance. The minimal sampling size for a within-subject design (every participant experiences both treatments) with acceptable parameters on first-degree and second-degree errors [alpha = 0.05 and (1 − beta) = 0.8] is 27 when assuming medium-sized effects (Cohen's d = 0.5). We used G-Power-3 for the calculation (Faul et al. 2007). This value was increased to 36 for reasons of symmetry and robustness in the experimental design. The evaluation further

assessed client satisfaction as a control for perceived service quality to ensure that client education is not traded with it.

6.1.1 Sampling and Subject Priming

The bank nominated 12 experienced financial advisors to match the 36 clients. On each evaluation day (in total, 6 days of evaluation), two advisers came to the university and participated in the tests. All advisors received a link to a 20-min video training as well as extensive text documentation with best practices on how to use the system several days before the evaluation, and were also trained hands-on for 1 h on the evaluation day. Each advisor conducted six sessions: three conventional and three IT-supported service encounters.

Thirty-six undergraduate students from a business informatics course volunteered to participate as clients. Each student was provided with the same fictional financial scenario: They were told to expect an advancement of heritage of CHF24,000 (approx. US$27,300) and a monthly payment of CHF300 (approx. US$340) for the next 10 years. They were also told to envision two specific life goals – one in the near future and one in the far future – they want to realize with this money. Besides these instructions, they were asked not to engage in any sort of role-play and to behave naturally. However, they were not compelled to reveal their real financial situation, for reasons of data protection. We chose this scenario, since it is overseeable for a typical student, and ensures that the client is able to take at least some risks based on the financial situation. Thus, this scenario ensures the possibility to invest money, and the implemented learning environments can cover the client decisions on investment and saving strategies. The advisors, on the other hand, had the task to match a fund-based saving plan according to the clients' needs.

The clients were primed with specific 'issues' to reliably trigger learning episodes (an episode would cover the timespan from asking a question related to a topic until the client is satisfied with an answer) during the encounter. For instance, one such issue to trigger an investment strategy learning episode was: *Let the advisor explain if it is more favorable to invest the money upfront or if a recurring investment is the superior option.*

6.1.2 Treatment Planning

Each client received two treatments: One conventional financial advisory service and one technology-supported service, each one with a different advisor. Each treatment sought to induce different learning episodes, where the advisor would either cover diversification or cost-averaging effects. All treatments (conventional, IT-supported, and learning topics) were permutated. Each client would receive education on both topics – one topic was taught conventionally during the unsupported service encounter while the other topic was taught during its IT-supported counterpart.

6.1.3 Operationalization of Dependent Variables

We operationalized the learning outcome as a difference between the knowledge levels before and after the test. To do so, we created a new test battery of eight questions per learning topic to measure the de facto knowledge differences. Like the content of the learning environments, the topics covered in the questionnaire were strongly based on the material the bank supplies to its clients (brochures). Established questionnaires for measuring financial literacy (Chen and Volpe 1998; Volpe et al. 2002; ANZ Bank 2008) could not be used, since they are too general and did not apply to students, who have a better prior education (e.g., in mathematics).

Client satisfaction was measured using the *yield shift theory of satisfaction's* instrument (cf. Briggs et al. 2008) on a five-point Likert scale. Clients filled this out after receiving both treatments.

6.2 Evaluation Results

6.2.1 Learning Outcome

We saw a positive knowledge gain in both treatments. However, more knowledge was transferred in the IT-supported setting than in the conventional setting (baseline). After both advisory sessions, the participants could on average answer more questions correctly than before the treatments. We measured the knowledge gain by subtracting the number of correct answers before the treatment from the number of correct answers after the treatment. The participants had on average 0.78 additional correct answers (SD = 1.76) after the conventional setting, compared to 1.72 additional correct answers (SD = 1.97) after the IT-supported encounter (Fig. 5). A paired-sample one-sided t-test [md = 0.944, $t(35) = 1.98$, $p = 0.028$] confirms that the IT-supported encounter leads to a significantly higher knowledge gain than its conventional counterpart.

For both learning episodes (LE1 and LE2), participants benefited from the IT system (see Fig. 5). The lines connecting the data points represent the within-setting of the treatment groups (group one: LE1 conventional and LE2 IT-supported; group two: LE2: conventional and LE1 IT-supported).

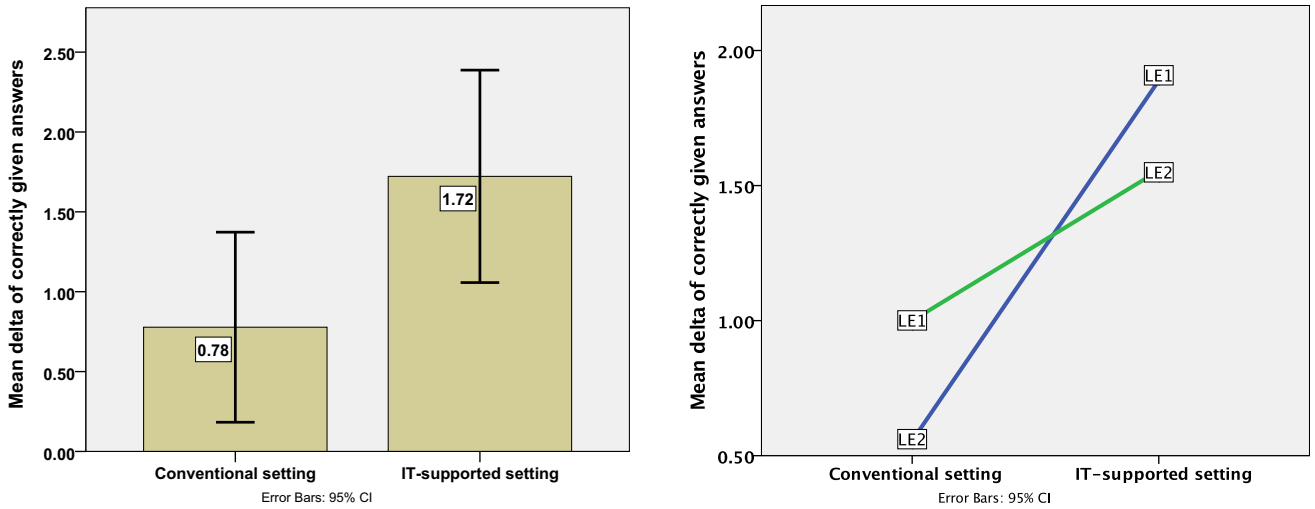

Fig. 5 Average learning outcomes comparing conventional and it-supported settings (left) and the same measurement itemized by the separate learning episodes (right)

The interviews revealed that the test subjects generally enjoyed the IT-supported learning environments. The core arguments in favor of the system were perceived interactivity and control (Int. 1, 3, 6, 8, 9, 10, 18, 26, 29, 32) as well as that they stated that the interactive visualizations helped them to understand the causal relationships (Int. 5, 10, 12, 19, 22, 27, 28). Some participants noted that IT support releases the advisor from manually combining graphics from the brochures and tediously searching for the right material ad hoc. In contrast, some participants also saw risks in using systems like that: For instance, some stated that they would be mistrustful, since banks could intentionally use such systems to transfer false knowledge. Others remarked that verbal interaction with the advisor was superior in the conventional setting and that the advisor has the opportunity to make a more professional impression when he is not supported with such a system.

6.2.2 Satisfaction

Neither clients nor advisors perceived significantly different satisfaction levels for the complete service encounters, regardless of the treatments. For the customers, the satisfaction level was $m = 3.77$ ($SD = 0.80$) for the conventional setting and $m = 3.68$ ($SD = 0.73$) for the IT-supported setting. A paired-sample t-test showed that this small difference is not significant [$m = -0.08$, $t(35) = -0.45$, $p = 0.66$]. Advisors rated their satisfaction level $m = 4.13$ ($SD = 0.72$) for the conventional treatment and $m = 4.03$ ($SD = 0.74$) for the IT-supported counterpart. Again, this small difference is statistically not significant, as a paired-sample t-test revealed [$md = -0.1$, $t(11) = -0.307$, $p = 0.77$].

7 Discussion and Conclusion

With the results of the two evaluations (ex ante and ex post), we have been able demonstrate that (a) there is a relevant and unresolved problem of managed client education in financial service encounters, and (b) that client education can be prepared by experts in advance. The IT artifact in combination with the adapted process could induce a significant positive effect on the client knowledge levels. Both the stable client satisfaction levels and the clients' qualitative feedback suggest the artifact's utility, also outside the laboratory. While there might be other possible ways to convey financial knowledge, this approach features a process of "learning interleaved decision-making" to purposefully embedded learning activities into the service encounter. This just-in-time knowledge transfer scheme (cf. Fernandes et al. 2014) applies learning instead of mere information provision (Burton 2002) and resembles the necessary procedural requirements for informed decision-making (cf. Gafni et al. 1998). Thus, we argue that the evaluation results support an application of this design to a broader range of financial advice-giving services and that the provider-side efforts are justified, especially given the challenges of upcoming regulatory demands (i.e., FIDLEG).[1]

The evaluation has also demonstrated that specific open-ended learning environments can be designed in advance and that they can blend seamlessly into the service encounter. Implemented in an embracing system that supports the whole encounter, learning activities could also

[1] https://www.efd.admin.ch/efd/en/home/themen/wirtschaft–waehrung–finanzplatz/finanzmarktpolitik/fidleg-finig/fb-fidleg-finig.html (Accessed: 25.09.2016).

easily be recorded, making them auditable by banks. This puts service providers back in the loop, since they would have detailed access to the specific client education activities applied by advisors. Knowing what products are offered in these services, the banks would possess the necessary means to manage regulatory compliance.[2] The same is true for clients, who are now in the position to gain the specific knowledge that enables them to better understand the whole decision process. With that knowledge, they can now actively engage in the service encounter in a co-creative manner (Schmidt-Rauch and Nussbaumer 2011), enabling them to make better-informed decisions.

Besides the practical contributions, this article also contributes to the IS literature, since we offer a working alternative to the obstacles of missing client knowledge (cf. Oehler and Kohlert 2009). We further embed an experience-based concept of client learning in a realistic financial service encounter setting, answering the call for action to implement simulation-based and experience-based systems (Bradbury et al. 2015). We also further strengthen the arguments to deliver knowledge directly when it is needed (Fernandes et al. 2014). The evaluation results suggest that knowledge transfer during the service encounter can work if the right tools and training procedures are utilized. Thus, we present a working educational alternative rather than just providing additional documentation (Chater et al. 2010; WpHG 2011), which is known to fail (Chater et al. 2010). By aligning the educational activities with the decision-making process, we offer a natural form of *informed decision-making*. We argue that this moment-specific learning also reduces the risk of *information overload* (Oehler and Kohlert 2009) and respects the time constraints in service encounters, since also no irrelevant knowledge is transferred. Thus, we perceive this design to be superior to the currently widely accepted practice of *perfect agent* advice-giving.

As the next step, we propose a pilot study, which would be necessary to demonstrate the de facto use of the artifact and would thus support the design knowledge by providing additional external validity.

In conclusion, we argue that the solution is novel, because it shows, for the first time, how learning units can be embedded in an advisory service encounter. From the point of view of the specific instance, the solution is relevant because banking advisory services are in a crisis; thus, a fundamental building block of traditional banking business models is endangered. We offer a solution that allows banks to retain their advisory services and still comply with regulations. If clients accept learning during the advisory sessions, the learning sessions can also be recorded and recalled later in case of a dispute. Thus, banks can also better document their compliance. While Swiss consumer protection regulations may not yet be as strict as in other European countries, they point in the same direction. Thus, the general solution approach is also relevant to other domains. While financial advisory services may be uniquely regulated, customer education is also appropriate in other complex life situations. The most challenging may be doctors' advice to patients (Gafni et al. 1998), but other situations are possible as well: Security advice by policemen at citizens' homes (Giesbrecht et al. 2015) and energy savings advice are two of the areas we are currently exploring. All share the traits that collaborative problem-solving processes benefit from the seamless integration of small learning modules that facilitate decision-making.

8 Limitations

The primary limitations of this article relate to the evaluation method. The system was evaluated in a laboratory setting, thus lacking the real-world situation of making decisions about real money. However, we would assume an even higher interest by clients to acquire the relevant knowledge in such an environment. The advisors also had access to the microworlds before the evaluation, for training purposes. Thus, they might have already acquired and prepared strategies to cope with the educational tasks. However, we argue that these limitations do not weaken the results, since they also affect the baseline treatment (conventional setting). The same applies to the students in the role of clients: While we are aware that the students might have a higher knowledge level of these topics, we can also assume that their knowledge level is more homogenous compared to the average investor. But since we aim for high internal validity with this prototype evaluation, we perceive this as beneficial. Regarding the selection of students as test subjects, some studies suggest that the results of behavioral studies performed with students as test subjects usually lead to similar outcomes compared to studies performed with samples from the target population (see Cooper et al. 1999; Fréchette 2011).

[2] Exemplar discussion on regulatory challenges: http://www.finews.ch/news/banken/16937-regulierung-zuercher-bankenverband-clientis-zuercher-regionalbank-fabio-perlini-fidleg-retailbanken-retail-segment-kleinkunden (Accessed: 25.09.2016).

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