

On the Effectiveness of Signaling Strategies in the Field of Online Investing

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Abstract

The area of *online investing* is reshaping the financial industry through the emergence of numerous new providers with innovative concepts. This has led to new challenges for customers, such as how to assess the reliability and trustworthiness of the new providers and their offers. This empirical-experimental study has investigated the effectiveness of signaling strategies in offers for digital service innovations. The results could furnish useful input for the market strategies of the providers of innovative services. At the same time, the study serves to test theory; it can be shown that several of the usual assumptions made in the information economic based signaling theory do not apply in all cases. It is also shown that signals used by real financial service providers in the Internet are, in part, of very limited effectiveness.

Keywords: Digital Finance, FinTech, Robo Advice, Online Investing, Signaling Strategies, Market Signals, Information Economics

JEL-Classification: D10, D82, G41

I. Introduction

Over the last 10 years, the financial industry has been transformed in the *field of online investing* by numerous new providers with innovative concepts.² Less financially well-off retail customers³, who were previously of little interest to traditional asset managers, have benefited from these new investment services. However, these services are associated with new challenges; these include the need to make an assessment of the reliability and trustworthiness of new servic-

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² On the problem of the entry of new, technology-driven providers into financial services markets, see also *Dorfleitner et al. (2016); Oehler (2016); Oehler/Horn/Wendt (2016); Weber/Baisch (2016); Oehler/Horn/Wendt (2018); Reinig/Ebner/Smolnik (2018)*. On the entry of non-industry firms into financial services markets, see further *Singer (1993)*.

³ On retail business in the financial sector, see *Oehler (2005)*, p. 152.

es and provider. In a world of principals and agents, users of online services and advice must expect agency problems and overreaching.

The use of innovative services offered by new market participants can typically be associated with a high degree of quality uncertainty for customers. The cause is their limited ability to form an *ex-ante* or even an *ex-post* assessment of essential service characteristics.¹ In information economics, these information cases constitute *experience* qualities and *credence* qualities. Characteristics that can be assessed *ex-ante* without any problems are called *search* qualities.² Depending on which property dominates in the perception of the buyer when making the purchase, the act can be classified as a search buying process (SK), an experience buying process (EK) or a credence buying process (VK).³

In the case of service offerings in which search qualities dominate, providers can easily communicate quality information to consumers. By furnishing direct information, they can credibly inform the demand side about product characteristics.⁴ In this case, consumers are able to use the properties of a product or service that can be perceived directly to form a judgement on quality before making a purchase decision. However, information asymmetries due to experience and credence qualities can be reduced only by use of information substitutes.⁵ Information substitutes can be regarded as key information or indicators.⁶ *Weiber/Adler* (1995) distinguish between product-related and cross-product information substitution. In the case of product-related information substitution, consumers are supposed to use directly observable qualities as indicators and, on the basis of these, draw conclusions about hidden characteristics.⁷

Consumers can obtain such surrogate information primarily from the characteristics of the capability dimension of services.⁸ The quality of observable capability factors can then be used to draw conclusions about the quality of the processes and (likely) results.⁹ In this context, it is assumed that in the case of classic offline services in brick and mortar environments, customers can derive

¹ Services initially represent a promise of performance. Experience and credence qualities dominate [cf. *Woratschek* (1996), p. 63].

² Cf. *Nelson* (1970), p. 312; *Darby/Karni* (1973), p. 68 f.; *Nelson* (1974), p. 730; *Weiber/Adler* (1995b), pp. 54 and 58 f.

³ Cf. *Weiber/Adler* (1995a), p. 62; *Weiber/Adler* (1995b), p. 59 f.; *Weiber/Adler* (1995c), p. 99.

⁴ Cf. *Kaas* (2001), p. 106 f.

⁵ Cf. *Weiber/Adler* (1995a), p. 66 f.

⁶ Cf. *Stich* (1997), p. 8.

⁷ Cf. *Weiber/Adler* (1995a), p. 66 f.

⁸ Cf. *Roemer* (1998), p. 158.

⁹ Cf. *Kuhlmann* (2001), p. 220.

indications of service quality from the physical service context.¹⁰ In the online context, on the other hand, this possibility does not exist or exists only to a limited extent.¹¹ Classic elements of the capability dimension of services, such as business premises and customer contact personnel, are either not available in the provision of internet-based services, or they are not directly perceptible to the customer.¹²

The non-digital factors undergo a transformation process. If, in brick and mortar environments, these are search qualities of the capability dimension, they are transformed into experience or credence qualities in online environments, while experience qualities may also become credence qualities.¹³ Reliable surrogate information can only be obtained from these elements to a limited extent.¹⁴

In contrast to this product-related information acquisition, ex-ante ascertainable properties are used for quality assessments in the case of *cross-product information substitution*. These are not related to the service offered, but stem from the market context.¹⁵ Cross-product information substitutes essentially include the market reputation of a provider.¹⁶

However, reputation is a problematic instrument, especially for new providers, and particularly when they are offering innovative services. For successful market transactions, reputational information about a provider must be available on the market.¹⁷ There is thus a circularity problem between establishing and using reputation as a differentiation tool. Building a reputation requires that some customers have already had positive experiences with the supplier. In order to win over these customers, the use of reputation presupposes that recourse can be taken to positive empirical values in the market.¹⁸

For *new* entrants in financial services markets, the question is therefore what they can do to gain a foothold in the markets.

A look at the practice shows different approaches: In general, new, strongly technology-driven companies appear to enter the market with a very focused

¹⁰ Cf. Zeithaml (1981), p. 187.

¹¹ Cf. Fließ/Völker-Albert (2002), p. 271; Balasubramanian/Konana/Menon (2003), p. 871.

¹² Cf. Fließ/Völker-Albert (2002), p. 271.

¹³ On the transformation of information economy performance characteristics in the presentation of physical goods on a website, see Gräfe (2005), pp. 80–83.

¹⁴ Cf. Roemer (1998), p. 159.

¹⁵ Cf. Weiber/Adler (1995a), p. 66 f.

¹⁶ Cf. Weiber/Adler (1995a), p. 69. On the particular importance of reputation in information economics, see also Adler (1996), p. 126.

¹⁷ Cf. Aulibauer/Thießsen (2012), p. 59.

¹⁸ Cf. Hoffmann (2009), p. 128.

approach. They only choose the most lucrative sub-elements of a value chain.¹⁹ New providers often enter into sales cooperations with established market participants, thereby gaining access to the partner's customers.²⁰ Other providers cooperate with companies from other sectors – e.g. from industry – which can then offer their own employees services to promote private asset accumulation, for example.²¹ Even sales via traditional face-to-face offline channels have been discovered by providers of Internet-based investment management services.²² In abstract terms, those actions deliberately creates search and experience qualities – namely in the person of the advisor and in the interaction process experienced. However, online investing is thereby reverting to classic investment formats. Personal interaction elements in the service process lead to potential quality variations²³ and reduce cost advantages.²⁴ These are typical approaches of new providers.

If we return to reputation building, the question arises as to how initial “test purchases” are conducted and how a diffusion process of positive experience information begins. In the context of information economic considerations, so-called “signaling” represents a potential solution mechanism for this. That is the focus of this paper.²⁵

Signaling consists of the agent sending credible information respective cues (“signals”) of his own accord. These confirm his willingness to deliver services in the sense of the principal's best interests. Online wealth management offerings are particularly characterized by user uncertainty as to the quality to be expected. The analysis shows that real world providers use instruments in online services that can be interpreted as signals in the sense of signaling theory. These may include, for example, offering a test phase free of charge, or a termination option at any time without penalties. These reflect strategies of product-related information substitution.²⁶ The question become, how effective are such sig-

¹⁹ Cf. *Oehler/Horn/Wendt* (2016), p. 9.

²⁰ Cf. 1822direkt Gesellschaft der Frankfurter Sparkasse mbH (2016); *Jordan* (2016); *Eckert* (2017); ING-DiBa AG (2017); *Schrader* (2017), p. 4.

²¹ Cf. *Schneider* (2017).

²² Cf. Without author (2017).

²³ The qualification of an investment advisor is an important performance characteristic for traditional investment services [cf. de *Lamboy* (2015), p. 78]. However, it is precisely the dependence of service quality on a single individual that can lead to quality variations in the service provision process [cf. *Kohlert* (2009), p. 61]. The result of heterogeneous internal factors in the form of employees of the service provider are thus heterogeneous performance results in the service sector [cf. *Fließ* (2009), p. 14].

²⁴ On the saving of employee costs for robo-advisors, see also *Oehler/Horn/Wendt* (2018), p. 334.

²⁵ Cf. *Tolle* (1994), p. 928.

²⁶ Cf. *Adler* (1996), p.105.

nals? Do they help providers to reduce users' uncertainties and increase their willingness to buy?

The purpose of the present study is therefore to investigate the effectiveness of signaling strategies in the field of online investing. This is of interest because on the one hand, this allows us to derive market cultivation strategies for new providers of innovative service offerings. Secondly, insights can be gained into the strengths and weaknesses of signaling theory. The study suggests that there are problems in the assumptions underlying signaling theory. In addition to this insight into the theory, the study provides concrete recommendations for management in practice.

The article is organized as follows: First, signaling theory is briefly introduced. Then we explain the methodology of the own investigation and discuss the results. Various additional tests back up the results. A discussion of the consequences for banks ends the paper.

II. The Concept of Signaling

The concept of signaling²⁷ goes back to the U.S. economist and Nobel Prize winner *Michael Spence*.²⁸ Signaling is the transmission of quality information via signals from the supplier side to the demand side in order²⁹ to reduce uncertainty about quality that may hinder purchases.³⁰ Signaling thus represents a potential mechanism through which initial purchases of innovative services by new market participants can be triggered. These initial purchases can be the starting point for the dissemination of positive quality and reputation information in the market.³¹

Signaling theory, as an element of information economics,³² is based on the assumptions of New Institutional Economics and assumes incompletely or bounded rational actors.³³ Signals act as a credible indicator of (quality) charac-

²⁷ Cf. *Spence* (1973).

²⁸ Cf. *Borchert/Goos* (2004), p. 1.

²⁹ Cf. *Spence* (1974), p. 11; *Spence* (2002), p. 434.

³⁰ Cf. *Schade/Schott* (1993), p. 20; *Adler* (1996), p. 105; *Kirmani/Rao* (2000), p. 66. On the potentially purchase-inhibiting effect of quality uncertainty, see *Kaas* (1995), p. 5; *Adler* (1998), p. 341; *Sichtmann* (2007), p. 60; *Kollmann/Kuckertz* (2009), p. 54 and the empirical research findings of *Pavlou/Liang/Xue* (2007), pp. 109 and 122; *Zhang/Liu* (2011), pp. 167–169; *Yeh/Hsiao/Yang* (2012), p. 108.

³¹ Cf. *Tolle* (1994), p. 928.

³² Cf. *Aiken et al.* (2004), p. 256; *Biswas/Biswas* (2004), p. 32.

³³ Cf. *Picot et al.* (2012), pp. 40 and 42. It should be noted that some authors see in New Institutional Economics a continuation of neoclassical microeconomics and assume

teristics that cannot be directly determined *ex-ante*.³⁴ Their credibility results from signaling costs, by what means an *ex-ante* investment or potential *ex-post* utility losses of the provider if signaled qualities are actually not present.³⁵ This two-pronged perspective on the credibility mechanism is a distinctive element of modern signaling theory.³⁶ The different signaling mechanisms thus also lead to different financial consequences of signaling measures for the provider as signaler. According to these, *Kirmani/Rao* (2000) distinguish between four default-independent (*ex-ante* signaling investment) and default-dependent (*ex-post* utility loss) signaling types which are listed in *Table 1* below.

Table 1
Typology of Market Signals by Kirmani/Rao (2000)³⁷

<i>Type</i>	<i>Characteristic</i>	<i>Monetary loss</i>	<i>Point in time of the Monetary loss</i>
<i>Default-Independent Signals</i>			
Signaling costs are independent of product quality and agents' behavior			
sale-independent	expenditures occur regardless of a market transaction	fix	before transaction
sale-contingent	expenditures occur at the time of the market transaction	variable/semi-variable	during transaction
<i>Default-Contingent Signals</i>			
Signaling costs occur in the case of bad product quality			
revenue-risking	future revenues at risk	variable	after transaction
cost-risking	future costs at risk	variable	after transaction

individuals to have complete individual rationality [cf. *Richter/Bindseil* (1995), p. 132; *Richter/Furubotn* (2003), p. 4f.].

³⁴ Cf. *Müller* (1994), p. 85.

³⁵ Cf. *Adler* (1996), pp. 90 and 105.

³⁶ Cf. *Schnoor* (2000), p. 27.

³⁷ Own illustration based on *Kirmani/Rao* (2000), p. 69.

III. Methodology of the Study

To determine the effectiveness of signaling activities, an empirical-experimental study with a single-factor between-subjects design was conducted. Using the scenario technique, a written survey questionnaire was used to describe a highly uncertain purchase situation into which the subjects were asked to put themselves: the use of the fictitious service innovation “online wealth management” from a fictitious “Direktbank AG”. As stimuli, signals in the sense of signaling theory were embedded in the fictitious evaluation and buying decision scenario and presented to the subjects as differentiating features. The reaction of the test persons to the respective signals was collected via a questionnaire.

In order to identify potential signaling strategies, we had previously conducted an exploratory study of real websites of online securities service providers. The content dimension of the web pages was analyzed within the framework of a qualitative content analysis. A total of 19 potential signals were identified. This approach enabled us to consider the real signaling behaviour of actual providers, thereby identifying a wide range of potential signals. Signaling theory research has tended to focus on a few, same signals that have already been discussed by other authors. *Gierl/Helm/Satzinger* (1999) criticize that the same signals have been examined too often.³⁸ By focusing on signals that are currently used in practice, this study has a particularly topical character, although it limits somewhat the ability to make generalisations, as this would have required ideal-typical signals in the sense of the signaling theory.³⁹ However, it allows us to provide indications for actual strategies which current innovators can use.

Subsequently, within the framework of an empirical preliminary study (N = 27), we examined, among other things, whether a signal function is perceived with these signals and whether they are therefore suitable as actual signals. Furthermore, the intended signal use of the test persons was ascertained initial evidence about the potential signal effectiveness. Based on these variables, four promising signals were then selected for the empirical-experimental main study. One signal of each type was considered according to the signal classification of *Kirmani/Rao* (2000), so that the different financial consequences of signaling for the provider are represented.

Table 2 lists the signals used in the main investigation. The respective signal type was assigned by the researcher.

- In the case of the signal “*disclosure of securities transactions*”, all securities transactions carried out for a specific portfolio are displayed on the provider’s website.

³⁸ Cf. *Gierl/Helm/Satzinger* (1999), pp. 1192 and 1202.

³⁹ We are indebted to a reviewer for valuable advice on this aspect.

Table 2
Experimental Groups (Main Study)

<i>Group</i>	<i>n</i>	<i>Signal-Type</i>	<i>Signal</i>	
KG	34	n.a.	no signal	
EG1	34	sale-independent signal	disclosure of securities transactions	OWT
EG2	33	sale-contingent signal	free test phase	KT
EG3	32	revenue-risking signal	Option of termination at any time	JKM
EG4	30	cost-risking signal	guaranteed minimum return	GMR

- Within the framework of a “*free test phase*”, the provider temporarily reduces management fees or waives them completely. Alternatively, the provider may grant the investor a “*starting credit*”, which can be invested in the portfolio or offset against the fees incurred.
- The “*option to terminate at any time*” makes it easier for investors to exit the investment and the contractual relationship. Customers can withdraw the invested capital at any time by terminating the contractual relationship.
- The “*guaranteed minimum return*” is a type of performance guarantee in which a certain performance result (minimum return level) is assured, or, if not achieved, compensation is paid.

The five factor levels of the study design resulted in a total of five study groups: One control group (KG) and four experimental or signal groups (EG). The assignment of participants to the individual study groups was randomized. Subjects were recruited according to the quota method (N = 163). The sample was structured according to the quota characteristics of age and gender of regular Internet users aged 16 and over in the Federal Republic of Germany.

IV. Perception of the Signaling Mechanism

For the credibility mechanism of a signal to work, customers must have a basic notion of the relationship between a signal and the qualities that cannot be directly observed.⁴⁰ Presumption about this signal-quality-relationship is expressed in the *perceived signal function*.⁴¹ In signaling theory, demanders establish this connection via the signaling costs. To do this, however, they must rec-

⁴⁰ Cf. Müller (1994), p. 93 f.

⁴¹ Cf. Hogreve (2007), pp. 77, 172 f. and 212.

ognize the initial effort ($SK_{ex-ante}$) to generate a signal and/or the risk ($SK_{ex-post}$) of signaling for the provider.⁴² So they must have a certain level of knowledge and rationality.

Herein lies a major problem: both with signaling in online wealth management formats specifically, and with signaling theory in general. As we will show, people in part do not recognize the reference to hidden qualities of signaling costs.

In the study, the initial effort ($SK_{ex-ante}$) to generate a signal and the risk of signaling for the provider ($SK_{ex-post}$) were mapped by two independent indicators. Through these, the subjects' view of the signaling mechanism is captured via a six-point bipolar response scale. The perceived signal type is then determined by interpreting the difference value (D) between the two indicators:

$$D = SK_{ex-ante} - SK_{ex-post}$$

Indifferent signal perception (IS) is present when $D = 0$. At $D > 0$, the perception of default-independent signal properties (AUS) predominates and at $D < 0$, it is a default-contingent signal (AAS).

Table 3
Perception of Signaling Costs Type

<i>Potential signal</i>	<i>AUS</i>		<i>AAS</i>		<i>IS</i>	
	<i>D > 0</i>		<i>D < 0</i>		<i>D = 0</i>	
		(n = 20)		(n = 58)		(n = 51)
OWT	6	(17.65 %)	13	(38.24 %)	15	(44.12 %)
KT	5	(15.15 %)	13	(39.39 %)	15	(45.46 %)
JKM	7	(21.88 %)	15	(46.88 %)	10	(31.25 %)
GMR	2	(6.67 %)	17	(56.67 %)	11	(36.67 %)

At 39.53 % (IS: n = 51, *Table 3*), a significant proportion of subjects in the experimental groups gave indifferent responses to the perception of the signaling mechanism.

⁴² Cf. Kirmani/Rao (2000), p. 73.

Table 4
Testing the Signal Classification

<i>Signal</i>	<i>Signal-Type</i>	f_{bi}	f_{ei}	df	χ^2	p
OWT:	AUS	6	9.5	1	2.579	.108
OWT:	AAS	13	9.5			
KT:	AUS	5	9.0	1	3.556	.059
KT:	AAS	13	9.0			
JKM:	AUS	7	11.0	1	2.909	.088
JKM:	AAS	15	11.0			
GMR:	AUS	2	9.5	1	11.842	.001*
GMR:	AAS	17	9.5			

* $p \leq .01$

The signal classification was checked using chi-square goodness-of-fit tests. An equal distribution of signal classification was assumed (f_{ei} : AUS=AAS). Individuals with an indifferent view of the signal type (group IS) were not considered in the analysis. As the results in *Table 4* illustrate, the observed frequencies differ significantly from the postulated uniform distribution only in the GMR experimental group ($\chi^2 = 11.842$, $p = .001$). Thus, only the Guaranteed Minimum Return is clearly classified as a default-dependent signal. For the other signals, both default-independent and default-dependent signal properties are conjectured. Overall, it appears that the risk of the signaling is more predominant in the perception of the test persons. This is already shown in *Table 3* for the group sizes with $AAS > AUS$ and in *Table 4* for the empirically observed distribution of signal perception (f_{bi}), likewise with $AAS > AUS$ for all study groups.

According to signaling theory considerations, a positive correlation between signaling costs and the perceived signal function can be assumed. Between which indicators of signal credibility and signal function a correlation is to be assumed sometimes depends on the dominating signal type. Specific correlation analyses are carried out accordingly for each group of subjects:

- In the case of a dominant perception of a signal as a default-independent signal ($D > 0$), the relationship between $SK_{ex-ante}$ and signal function is considered.
- In case of a predominant perception of a signal as a default-contingent signal ($D < 0$), the correlation between $SK_{ex-post}$ and signal function is determined.

- If there is an indifferent view of the signaling mechanism ($D=0$), the relationship between the perceived signal credibility and the perceived quality signal function is examined. Signal credibility is a scale formed by the two indicators $SK_{ex-ante}$ and $SK_{ex-post}$. The scale value is the scale mean of the indicators $SK_{ex-ante}$ and $SK_{ex-post}$.

At the level of the total samples, a positive correlation between the indicators of signal credibility could be statistically demonstrated (Total, Table 5). Compared to the results for the instruments classified more strongly as default-independent (AUS) or more strongly as default-contingent signals (AAS), an indifferent signal perception (IS) showed a clear result also for all single signals (column IS, Table 5).

Table 5

Comparison of the Correlation Strength (r_s) between Indicators on Signal Credibility and the Perceived Quality Signal Function Default-Independent, Default-Contingent and Indifferent Signaling

	AUS	AAS	IS	
Total	N=20	N=58	N=51	IS > AUS
	.538 (.014*)	.447 (<.001**)	.719 (<.001**)	IS > AAS
OWT	n=6	n=13	n=15	IS > AUS
	.677 (.140)	.264 (.383)	.688 (.005*)	IS > AAS
KT	n=5	n=13	n=15	IS > AUS
	.108 (.863)	.601 (.030*)	.630 (.012*)	IS > AAS
JKM	n=7	n=15	n=10	IS > AUS
	.060 (.898)	.403 (.136)	.893 (.001**)	IS > AAS
GMR	n=2	n=17	n=11	IS > AAS
	n.a.	.293 (.254)	.635 (.036*)	

* $p \leq .05$ ** $p \leq .01$ p-Value in brackets

The results show that in principle there is a positive correlation between the perception of the signal investment and risk of the provider associated with the signaling and the suitability of a signal as a quality signal. However, a general statement on this correlation is not possible, and the correlation appears to be dependent on the respective signal or the perceived signal type. Furthermore,

one can see that the correlation between the indicators of signal credibility and signal function is on the one hand stronger with an indifferent view of the signaling mechanism (IS) than with the classification of a signal as a default-independent signal (AUS); and on the other hand, the correlation is also stronger than with a dominant perception of the default-contingent characteristics of a signal (AAS). This relationship is evident in the overall samples as well as in the subgroups (cf. *Table 5*). Since a significant correlation is only found in the global view for signals that are more likely to be perceived as default-contingent signals, only the comparison of the correlation strengths at this level is ultimately reliable. Here, however, the result for the indifferent signal classification also supports the assumption that the perception of signal effort and risk has a positive effect on the perception of a potential signal as an actual quality signal.

In summary, it can be stated that the participants in the study often did not perceive signaling costs in a differentiated manner. A signal systematization from the researcher's or provider's perspective has accordingly no relevance for the signal perception on the demand side. Furthermore, it could be shown that the perception of signaling costs is certainly important for the function of a signal as a quality signal. However, the connection between signaling costs and signal function is often not established or recognized by consumers.

V. Effectiveness of Signaling Strategies

A signal is effective if it reduces the perceived quality uncertainty (WQU), increases the perceived quality (WQ) of a service offer in the eyes of the demander or increases the willingness to buy (KB). However, significant uncertainty problems are found in all study groups. The differences in uncertainty perception between the individual experimental groups ($M=4.17$ to 4.44) and the control group ($M=4.45$) are only slightly pronounced. Thus, the results of a Kruskal-Wallis test also indicate no significant group differences in perceived quality uncertainty ($\chi^2=3.673$, $p=.452$), perceived quality ($\chi^2=8.993$, $p=.061$), and willingness to purchase ($\chi^2=4.740$, $p=.315$). To determine the signaling effect, each experimental group was contrasted with the control group. Thus, the effectiveness of signaling is determined by the change in the dependent variable as a function of the presence or absence of a signal in the study scenario.⁴³ Pairwise Mann-Whitney U tests were conducted as post-hoc tests to calculate the effect size r from the test statistic.

What are the results? Just small effect sizes (r) can be found for all signals (cf. *Table 6*). To be able to classify and evaluate their extent in the context of the present study, the perception of the information economic buying process types

⁴³ Cf. Dutta (2012), p. 157.

Table 6
**Effects of Signaling on Perceived Quality Uncertainty,
 Perceived Quality and Buying Intention (r)**

Variable	OWT – KG	KT – KG	JKM – KG	GMR – KG
WQU	.20	.00	.13	.03
WQ	.01	.06	.28	.02
KB	.03	.17	.11	.01

was recorded and used as a reference variable. Using a measurement concept from Weiber/Adler (1995), it was determined whether the respective respondent located the use of the fictitious investment management service within the framework of a search, experience or credence buying process.⁴⁴ It was assumed that uncertainty and quality perception as well as willingness to buy depend on the buying process type. For the analysis, subjects with the same buying process type were assigned a posteriori to a group. 42.33% of the subjects would use the digital investment solution in the context of an experience buying process (n=69) and 38.65% in the context of a credence buying process (n=63). For only 19.02% of the potential investors, did search qualities (n=31) dominate in the service offering (cf. Table 7).

The Kruskal-Wallis test indicates group differences at a highly significant level for all variables (cf. Table 7). In order to identify differences between the groups, pairwise Mann-Whitney U tests were also performed here (cf. Table 8).

Table 7
**Group Differences between Search-, Experience-
 and Credence Buying Processes**

Variable	SK	EK	VK	χ^2	df	p
	(n=31)	(n=69)	(n=63)			
	M	M	M			
WQU	3.38	4.32	4.84	31.861	2	<.001**
WQ	4.35	3.62	2.86	43.397	2	<.001**
KB	3.35	2.75	2.02	22.590	2	<.001**

** p ≤ .01

⁴⁴ Cf. Weiber/Adler (1995c), pp. 106 – 111.

Table 8

**Pairwise Mann-Whitney U Tests to Analyzing Group Differences
between Search-, Experience- and Credence Buying Processes**

Variable	Search buying process and experience buying process			
	<i>z</i>	<i>p</i>	α_{local}	<i>r</i>
WQU	-3.811	<.001*	.017 (.017)	.38
WQ	-3.323	.001*	.017 (.025)	.33
KB	-1.973	.048**	.017 (.050)	.20
Variable	Search buying process and credence buying process			
	<i>z</i>	<i>p</i>	α_{local}	<i>r</i>
WQU	-5.336	<.001*	.017 (.025)	.55
WQ	-5.771	<.001*	.017 (.017)	.60
KB	-4.515	<.001*	.017 (.017)	.47
Variable	Experience buying process and credence buying process			
	<i>z</i>	<i>p</i>	α_{local}	<i>r</i>
WQU	-2.841	.004*	.017 (.050)	.25
WQ	-3.252	.001*	.017 (.050)	.28
KB	-4.682	<.001*	.017 (.025)	.41

* Significant on Bonferroni and Bonferroni-Holm corrected alpha level.
 ** Significant on Bonferroni-Holm corrected alpha level.
 α_{local} : Bonferroni (in brackets: Bonferroni-Holm) corrected alpha level.

The results of the pairwise comparison tests showed significant differences for all group constellations examined (cf. Table 8). The following ranking could be demonstrated for the degree of quality uncertainty:

Search buying process < Experience buying process < Credence buying process

In terms of the extent of perceived quality and willingness to buy, the following ranking was confirmed:

Search buying process > Experience buying process > Credence buying process

Where no significant differences between the presence and absence of signals could be found, the influence of the buying process type on the perception of uncertainty and quality as well as the willingness to buy is abundantly clear. To further assess the strength of the signal influence, the effect strength of signaling was compared with the effect strength of the buying process type (cf. Table 9).

Table 9
Effects of Signaling and Buying Process Types in Comparison

Effect size (<i>r</i>)	SK-EK			SK-VK			EK-VK		
	WQU	WQ	KB	WQU	WQ	KB	WQU	WQ	KB
	.38	.33	.20	.55	.60	.47	.25	.28	.41
<i>OWT-KG</i>									
WQU	.20	<		<			<		
WQ	.01		<		<			<	
KB	.03			<		<			<
<i>KT-KG</i>									
WQU	.00	<		<			<		
WQ	.06		<		<			<	
KB	.17			<		<			<
<i>JKM-KG</i>									
WQU	.13	<		<			<		
WQ	.28		<		<			=	
KB	.11			<		<			<
<i>GMR-KG</i>									
WQU	.03	<		<			<		
WQ	.02		<		<			<	
KB	.01			<		<			<

It can be seen that the judgment problems expressed in the buying process types exert a greater influence on the perceived quality uncertainty and the willingness to buy than the signaling strategies. The same is also true for quality perception with one exception (cf. Table 9).

VI. Discussion and Conclusion

The empirical-experimental study on the effectiveness of signaling strategies shows no significant differences between the control group and the signaling groups. The effect size of the signaling measures was only slightly pronounced. The signaling effect was even lower than that of the buying types.

Thus, the study first shows that signaling in the online wealth management sector is *not* suitable for competitive differentiation, because the presence of a

signal as a differentiator neither leads to lower quality uncertainty, nor to a better quality judgement or an increasing willingness to buy. This is an important finding for online providers in the field of investing.

What does this mean for new providers in the field of online investing? All in all, the ability of new providers and innovative services to assert themselves in the market is thus highly problematic. Neither can new market offers be directly promoted by signaling, nor can the diffusion process of quality and reputation information in the market be enabled by positive word of mouth by early-stage customers. However, it could also be demonstrated that uncertainty, quality judgement and willingness to buy depend substantially on the subjectively perceived performance characteristics. The influence of the buying process type on these variables is evident. Service providers can take advantage of this. They can use customer- and product-related market strategies to address these findings. There are three possible strategies:

1. The innovator, i. e. the bank in the online business, focuses the sales efforts on *expert buyers*⁴⁵ who, as informed consumers, are in a position to make a good ex-ante assessment of a service offer (search buying process). They can be won over as customers relatively easily.
2. The innovator starts by offering services that are easy and quick to evaluate in order to attract search and experience buyers when or as long as he does not have a sufficient reputation in the market.
3. The innovator reduces the degree of innovation of a service by deliberately partially omitting innovative service elements to keep the share of credence buyers low.

The overall strategy could therefore be as follows: Starting with customers who are search and experience buyers (with appropriate product design), the diffusion of quality information and reputation building in the market takes place gradually. Uninformed customers are addressed and won as credence buyers in later periods when quality information are spread.

Beyond these practical aspects, the study shows the following. Quite generally, it makes visible a problem of the signaling concept in general: on the one hand, the customers in signaling theory are assumed to have an information problem with experience and credence qualities of goods and services, but at the same time it is assumed that they recognize and understand signaling mechanism.⁴⁶ Only then and only in this case can success be achieved with signaling measures. The fact that this does not have to be the case, i. e. that the addressees do not recognise the signaling mechanism at all, can be indicated by the marked

⁴⁵ Cf. *Weiber/Adler* (1995a), p. 70; *Adler* (1996), pp. 133 f.

⁴⁶ Cf. *Kirmani/Rao* (2000), p. 73.

proportion of indifferent responses to the signaling mechanism and the results on signal classification. Indeed, it cannot be assumed, without exception, that rational consumers, although they do not (cannot) judge the products and services, can recognise the underlying mechanisms of a signal without any problems.

Furthermore, the lack of correlation between the indicators of signal credibility and signal function in the various subgroups showed that the perception of signaling costs does not always lead to the assumption of high quality because of the signal. One reason for this may be that demanders perceive the signaling costs, but do not perceive the whole signaling mechanism that ensures quality. However, the reason may also be that demanders do not assume that the provider acts rationally in signaling. In other words: a provider builds a signal into his online offers, which could cause him signal costs later on, but does not design his product or service accordingly. He therefore risks later disadvantages, e.g. because he has not understood the signal logic and only enriches his offer with such elements that he recognizes with other providers – such as a free test phase or the possibility to cancel at any time. However, precisely the assumption that signal providers act rationally is an indirect assumption of signaling theory. Signaling cannot be effective against a background of bounded rationality or even when there is an expectation of irrational behavior on the part of providers.⁴⁷ In this respect, the results indicate rationality expectations of signaling theory that are not given in every case in real markets. However, it must be said here that the contribution of this study allows generalized statements only to a limited extent, because in our empirical study no generalizable, but only very specific signaling measures of current practice were examined. It could be that the findings have a very specific character in this respect. In this case, however, providers should try not to follow well-trodden paths, but to develop improved signaling measures.

References

- 1822direkt Gesellschaft der Frankfurter Sparkasse mbH (2016): vaamo – Ihr digitaler Vermögensverwalter, URL: <https://www.1822direkt.de/blog/vaamo-ihr-digitaler-vermoegenverwalter/>, as at: 19 August 2018.
- Adler, J. (1996): Informationsökonomische Fundierung von Austauschprozessen. Eine nachfragerorientierte Analyse, Wiesbaden.

⁴⁷ There could also be providers who offer classic signals such as termination options, but do not intend to implement them adequately in the event of termination, e.g. by making the termination procedure more difficult or impossible, which the user cannot even determine ex-ante.

- Adler, J.* (1998): Eine informationsökonomische Perspektive des Kaufverhaltens, in: Wirtschaftswissenschaftliches Studium, 27th Vol., No. 7, pp. 341 – 347.
- Aiken, K./Liu, B./Mackoy, R./Osland, G.* (2004): Building internet trust: signaling through trustmarks, in: Internet Marketing and Advertising, 1st Vol., No. 3, pp. 251 – 267.
- Aulibauer, A./Thießén, F.* (2012): Finanzintermediation und Markteffizienz, in: Hockmann, Heinz- Josef/Thießén, Friedrich (eds.): Investmentbanking, 3rd ed., Stuttgart, pp. 42 – 79.
- Balasubramanian, S./Konana, P./Menon, N. M.* (2003): Customer Satisfaction in Virtual Environments: A Study of Online Investing, in Management Science, 49th Vol., No. 7, pp. 871 – 889.
- Biswas, D./Biswas, A.* (2004): The diagnostic role of signals in the context of perceived risks in online shopping: Do signals matter more on the Web?, in: Journal of Interactive Marketing, 18th Vol., No. 3, pp. 30 – 45.
- Borchert, J./Goos, P.* (2004): Analysen von Märkten mit asymmetrischer Information – Zum Nobelpreis von George A. Akerlof, Michael Spence and Joseph E. Stiglitz, Institut für Wirtschaftsinformatik der Georg-August-Universität Göttingen, Arbeitsbericht (Nr. 30/2004), URL: <http://www2.as.wiwi.uni-goettingen.de/getfile?DateiID=536>, as at 25 April 2017.
- Darby, M./Karni, E.* (1973): Free Competition and the Optimal Amount of Fraud, in: Journal of Law and Economics, 16th Vol., No. 1, pp. 67 – 88.
- de Lamboy, Christian K.* (2015): Konzeptualisierung und Relevanz von Interessenkonflikten in der Anlageberatung von Wertpapierdienstleistungsunternehmen in Deutschland, Berlin.
- Dorfleitner, G./Hornuf, L./Schmitt, M./Weber, M.* (2016): The Fintech Market in Germany. Final Report October 17, 2016, URL: https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID2925827_code997849.pdf?abstractid=2885931&mirid=1&type=2, as at 18 February 2018.
- Dutta, S.* (2012): Vulnerability to Low-Price Signals: An Experimental Study of the Effectiveness of Genuine and Deceptive Signals, in Journal of Retailing, 88th Vol., No. 1, pp. 156 – 167.
- Eckert, P.* (2017): Whitebox über die zukünftige Zusammenarbeit mit der Volkswagen Bank, URL: <https://www.extra-funds.de/news/etf-news/whitebox-zusammenarbeit-volkswagen-bank/>, as at 19 August 2018.
- Fließ, S.* (2009): Dienstleistungsmanagement. Kundenintegration gestalten und steuern, Wiesbaden.
- Fließ, S./Völker-Albert, J.-H.* (2002): Going Virtual – Blueprinting als Basis des Prozessmanagements von E-Service-Anbietern, in: Bruhn, Manfred/ Stauss, Bernd (eds.): Electronic Services. Dienstleistungsmanagement Jahrbuch 2002, Wiesbaden, S. 263 – 291.
- Gierl, H./Helm, R./Satzinger, M.* (1999): Technologische Innovationen und asymmetrische Information. Die Eignung verschiedener Signale für Anbieter unterschiedlicher Technologiegenerationen, in: Zeitschrift für Betriebswirtschaft, 69th Vol., No. 10, pp. 1181 – 1205.

- Gräfe, G. (2005): Informationsqualität bei Transaktionen im Internet. Eine informationsökonomische Analyse der Bereitstellung und Verwendung von Informationen im Internet, Wiesbaden.
- Hoffmann, T. (2009): Anreizorientierte Aufsicht über Wertpapierdienstleister. Eine Analyse des Beziehungsgeflechts zwischen Finanzintermediären und ihren Kunden, Wiesbaden.
- Hogreve, J. (2007): Die Wirkung von Dienstleistungsgarantien auf das Konsumentenverhalten. Eine empirische Analyse, Wiesbaden.
- ING-DiBa AG (2017): Partnerschaft zwischen ING-DiBa und Scalable Capital, URL: <https://www.ing-diba.de/ueber-uns/presse/pressemitteilungen/partnerschaft-ing-diba-scalable-capital/>, as at: 19 August 2018.
- Jordan, M. (2016): vaamo launches B2B strategy with N26 (number26), URL: <https://www.extra-funds.de/news/etf-news/vaamo-startet-b2b-strategie-mit-n26-number26/>, as at: 19 August 2018.
- Kaas, K. (1995): Marketing und Neue Institutionenökonomik, in: Kaas, Klaus Peter (ed.): Kontrakte, Geschäftsbeziehungen, Netzwerke – Marketing und Neue Institutionenökonomik, Düsseldorf/Frankfurt am Main, pp. 1 – 18.
- Kaas, K. (2001): Zur “Theorie des Dienstleistungsmanagements”, in: Bruhn, Manfred/Meffert, Heribert (eds.): Handbuch Dienstleistungsmanagement. Von der strategischen Konzeption zur praktischen Umsetzung, 2nd ed., Wiesbaden, S. 103 – 121.
- Kirmani, A./Rao, A. (2000): No Pain, No Gain. A Critical Review of the Literature in Signaling Unobservable Product Quality, in: Journal of Marketing, 64th Vol., No. 2, pp. 66 – 79.
- Kohlert, D. (2009): Anlageberatung und Qualität – ein Widerspruch? Zur Utopie qualitativ hochwertiger Anlageberatung im Retail Banking, Baden-Baden.
- Kollmann, T./Kuckertz, A. (2009): Zur Dynamik von Such-, Erfahrungs- und Vertrauenseigenschaften in komplexen Transaktionsprozessen – eine empirische Studie am Beispiel des Venture-Capital-Investitionsprozesses, in: Zeitschrift für Management, 4th Vol., Nr. 1, pp. 53 – 74.
- Kuhlmann, E. (2001): Besonderheiten des Nachfragerverhaltens bei Dienstleistungen, in: Bruhn, Manfred/Meffert, Heribert (eds.): Handbuch Dienstleistungsmanagement. Von der strategischen Konzeption zur praktischen Umsetzung, 2nd ed., Wiesbaden, S. 213 – 242.
- Müller, C. (1994): Die ökonomische Theorie der Werbung. Gestaltung und Wirkung der Werbung aus informationsökonomischer Sicht, Dissertation Johann Wolfgang Goethe-Universität, Frankfurt am Main.
- Nelson, P. (1970): Information and Consumer Behavior, in Journal of Political Economy, 78th Vol., No. 2, pp. 311 – 329.
- Nelson, P. (1974): Advertising as Information, in: Journal of Political Economy, 82nd Vol., No. 4, pp. 729 – 754.
- Oehler, A. (2005): Zufriedenheit im Retail Banking? Erfolgsfaktoren des Banking der Zukunft, in: Petzel, Erhard (ed.): E-finance. Technologien, Strategien und Geschäftsmodelle – Mit Praxisbeispielen, Wiesbaden, pp. 151 – 192.

- Oehler, A.* (2016): Digitale Welt und Finanzen. Zahlungsdienste und Finanzberatung unter einer Digitalen Agenda. Veröffentlichungen des Sachverständigenrats für Verbraucherfragen, Sachverständigenrat für Verbraucherfragen beim Bundesministerium der Justiz und für Verbraucherschutz, Berlin, URL: https://www.bmjbv.de/SharedDocs/Downloads/DE/News/Artikel/01192016_Digitale_Welt_und_Finzen.pdf;jsessionid=D91CE976D41C8F09FE02CF6A59C11645.2_cid297?__blob=publicationFile&v=2, as at 24 December 2018.
- Oehler, A./Horn, M./Wendt, S.* (2016): Nicht-professionelle Investoren in der digitalen Welt, in: *Wirtschaftsdienst*, 96th Vol., No. 9, pp. 640 – 644.
- Oehler, A./Horn, M./Wendt, S.* (2018): Neue Geschäftsmodelle durch Digitalisierung? Eine Analyse aktueller Entwicklungen bei Finanzdienstleistungen, in: Keuper, Frank et al. (eds.): *Disruption und Transformation Management. Digital Leadership – Digitales Mindset – Digitale Strategie*, Wiesbaden, pp. 325 – 342.
- Pavlou, P./Liang, H./Xue, Y.* (2007): Understanding and Mitigating Uncertainty in Online Exchange Relationships. A Pricipal-Agent Perspective, in: *MIS Quarterly*, 31st Vol., No. 1, pp. 105 – 136.
- Picot, A./Dielt, H./Franck, E./Fiedler, M./Royer, S.* (2012): *Organisation. Theorie und Praxis aus ökonomischer Sicht*, 6th ed., Stuttgart.
- Reinig, S./Ebner, K./Smolnik, S.* (2018): FinTechs – Eine Analyse des Marktes und seines Bedrohungspotenzials für etablierte Finanzdienstleister, in: *HMD – Praxis der Wirtschaftsinformatik*, 55th; No. 6, pp. 1311 – 1325.
- Richter, R./Bindseil, U.* (1995): Neue Institutionenökonomik, in: *Wirtschaftswissenschaftliches Studium*, 24th Vol., No. 3, S. 132 – 140.
- Richter, R./Furubotn, E.* (2003): *Neue Institutionenökonomik. Eine Einführung und kritische Würdigung*, 3rd ed., Tübingen.
- Roemer, M.* (1998): *Direktvertrieb kundenindividueller Finanzdienstleistungen. Ökonomische Analyse und systemtechnische Gestaltung*, Heidelberg.
- Schade, C./Schott, E.* (1993): Kontraktgüter im Marketing, in: *Marketing – Zeitschrift für Forschung und Praxis*, 15th Vol., No. 1, S. 15 – 5.
- Schneider, K.* (2017): *Digitale Vermögensverwaltung: Siemens setzt auf Robo-Advisor*, URL: <https://www.wiwo.de/finanzen/boerse/digitale-vermoegensverwaltung-siemens-setzt-auf-robo-advisor/19266778.html>, as at 19 August 2018.
- Schnoor, A.* (2000): *Kundenorientiertes Qualitäts-Signaling. Eine Übertragung auf Signaling in Produktvorankündigungen*, Wiesbaden.
- Schrader, J.* (2017): *Robo-Advisory geht bislang am Laien vorbei*, in: *Börsen-Zeitung*, No. 12, p. 4.
- Sichtmann, C.* (2007): Buyer-Seller Relationships and the Economics of Information, in: *Journal of Business Market Management*, 1st Vol., No. 1, pp. 59 – 78.
- Singer, J.* (1993): Non- und Nearbanks: Unbekanntes Wesen?, in: *Zeitschrift für das gesamte Kreditwesen*, No. 19, pp. 890 – 893.
- Spence, M.* (1973): Job Market Signaling, in: *Quarterly Journal of Economics*, 87th Vol., No. 3, pp. 355 – 74.

- Spence, M. (1974): Market Signaling. Informational Transfer in Hiring and Related Screening Processes, Cambridge, Massachusetts/London.
- Spence, M. (2002): Signaling in Retrospect and the Informational Structure of Markets, in: *American Economic Review*, 92nd Annual Review, No. 3, pp. 434–459.
- Stich, A. (1997): Herkunftszeichen als Qualitätssignal. Eine Erklärung der Nutzung eines extrinsischen Produktmerkmals als Qualitätssignal durch Konsumenten am Beispiel von Herkunftszeichen, Lohmar/Köln.
- Tolle, E. (1994): Informationsökonomische Erkenntnisse für das Marketing bei Qualitätsunsicherheit der Konsumenten, in: *Zeitschrift für betriebswirtschaftliche Forschung*, 46th Vol.; No. 11, pp. 926–938.
- Weber, R. H./Baisch, R. (2016): Regulierung von Robo-Advice. Neue Herausforderungen für Finanzintermediäre und Finanzmarktaufsichtsbehörden im Kontext der digitalen Anlageberatung und Vermögensverwaltung, in: *Aktuelle juristische Praxis – Pratique juridique Actuelle*, 25th Vol., No. 8, pp. 1065–1078.
- Weiber, R./Adler, J. (1995a): Der Einsatz von Unsicherheitsreduktionsstrategien im Kaufprozess: Eine informationsökonomische Analyse, in: Kaas, Klaus Peter (ed.): *Kontrakte, Geschäftsbeziehungen, Netzwerke – Marketing und Neue Institutionenökonomik*, Düsseldorf/Frankfurt am Main, pp. 61–77.
- Weiber, R./Adler, J. (1995b): Informationsökonomisch begründete Typologisierung von Kaufprozessen, in: *Zeitschrift für betriebswirtschaftliche Forschung*, 47th Vol., No. 1, pp. 43–65.
- Weiber, R./Adler, J. (1995c): Positionierung von Kaufprozessen im informationsökonomischen Dreieck: Operationalisierung und verhaltenswissenschaftliche Prüfung, in: *Zeitschrift für betriebswirtschaftliche Forschung*, 47th Vol., No. 2, pp. 99–123.
- Without Autor (2017): Robo-Berater entdeckt stationären Vertrieb, URL: <http://www.fonds-professionell.de/news/companies/headline/robo-advisor-discovers-stationary-sales-131781/>, as at 19 August 2018.
- Woratschek, H. (1996): Die Typologie von Dienstleistungen aus informationsökonomischer Sicht, in: *der Markt*, 35th Vol., No. 1, pp. 59–71.
- Yeh, J./Hsiao, K./Yang, W. (2012): A study of purchasing behavior in Taiwan's online auction websites: Effects of uncertainty and gender differences, in: *Internet Research*, 22nd Vol., No. 1, pp. 98–115.
- Zeithaml, V. A. (1981): How Consumer Evaluation Processes differ between Goods and Services, in: Donnelly, James H./George, William R. (eds.): *Marketing of Services*, Chicago, pp. 186–190.
- Zhang, G./Liu, Z. (2011): Effects of influential factors on consumer perceptions of uncertainty for online shopping, in: *Nankai Business Review International*, 2nd Vol., No. 2, pp. 158–171.