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ORIGINAL ARTICLE

Integrating management of customer value and risk in e-commerce

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Abstract Increasing turnover in e-commerce is inherently linked with a rising risk of payment fraud. Online retailers (e-tailers) aiming for a company-wide value orientation should actively manage this risk. However, by applying current approaches such as adding an overall risk premium to average prices or restricting accepted payment methods, extra turnover potentials remain unconsidered since customer-specific value and risk properties are neglected. In this contribution, a novel approach for transaction-specific customer management for e-tailers is proposed, taking customer-specific risk and turnover potential into consideration—fully automated and in real time. Therefore, risk-turnover combinations are calculated representing risk and value potentials of a single customer as well as risks associated with different payment methods. Based on these risk-turnover combinations, a new approach for an optimal, customer- and transaction-specific selection of payment methods becomes possible. Finally, calculated risk-adjusted prices aim to realize a given product base price and can be directly used for customer risk management or for adapting an e-tailer's major marketing or pricing strategy.

Keywords Customer management · Risk & value management · Online retailer · Payment fraud risk · Risk-adjusted prices

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1 E-Commerce and increasing risks for e-tailers

Today, e-commerce (online retail) is established as a regularly used distribution and information channel in the business-to-consumer sector (Sackmann and Strüker 2005). Since it still bears enormous potential of increasing turnovers (Eng 2008; comScore 2009), e-tailers try to enhance profits by opening new markets and gaining customers' favor. In Germany, for example, turnover in online retail amounted to 46 billion euros in 2006, whereas 145 billion euros are expected in 2010 (Bitkom 2007). Although awareness regarding global competition, limited resources, and the fact that not all customers are worth keeping is well known (Reichheld and Sasser 1990; Reichheld and Teal 1996), adequate models and tools for managing customers according to their individual value and risk are rare (Ruch and Sackmann 2009). Following a classical customer lifetime value (*CLV*) approach encourages e-tailers to focus on "valuable" customers and to build up long-lasting, profitable relationships to expand profits (Morgan and Hunt 1994). However, experiences show that this appraisement does not automatically result in achieving the aspired goals (Dowling and Uncles 1997). Current research shows that so-called transaction-oriented customers form another profitable segment for e-tailers (Reinartz and Kumar 2000; Reinartz and Kumar 2002). In general, these customers do not feel associated with a company; however, they can form a profitable customer segment and should not be neglected as empirical data show (Rust et al. 2000). On the other hand, as former research discusses (Kundisch et al. 2008a, b), developing new customer segments and technological options for realizing turnover potentials inherently changes an e-tailer's risk situation.

In e-commerce and its usually highly competitive environment with low margins, such customer risks easily overcompensate the increase in turnover and can therefore, massively stress an e-tailer's result. As strategy for managing customer risks and especially payment fraud risks, many e-tailers introduced risk management instruments that prevent financial losses (e.g. by accepting only risk-free payment methods such as cash before delivery) or that reduce incurred damages (e.g. by adding a general risk premium for all customers and building up financial reserves) (Romeike and Finke 2004). From an exclusive risk perspective, such measures are an effective tool for managing payment fraud risks; however, negative effects on company goals such as turnover or profits usually remain neglected (Ruch and Sackmann 2009). A comprehensive survey of German companies shows that an exclusive offering of restrictive payment methods causes massive losses in turnover (Stahl et al. 2008).

These interdependencies between customer potentials and risks result in a trade-off between risk reduction and absorption of customer potentials (Stahl et al. 2008). Therefore, both dimensions should be simultaneously taken into consideration when following value-oriented risk management. The contribution in hand focuses on this gap and extends the approach presented in (Ruch and Sackmann 2009) by developing a systematic evaluation of customer-specific risk and turnover potential. The novel approach provides a methodic basis for automating risk management decisions for e-tailers. The approach firstly quantifies risk-adjusted customer values as well as risks of payment methods. Secondly, it presents a new method enabling

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e-tailers to determine the optimal set of accepted payment methods per transaction for managing the payment risk. This method is based on the four "traditional" phases of risk management process, i.e. risk identification, quantification, management, and control (Schierenbeck 2001), whereby its focus lies on the quantification and management.

Before describing and discussing our approach in more detail in Sects 2, 3 presents a business scenario illustrating the addressed research gap as well as the business context. Subsequently, after the discussion of the results and limitations of the approach, a short summary is given and further developments as well as the outstanding evaluation are outlined.

2 Business scenario: an e-tailer with risk management

The exemplary e-commerce scenario is a non-market dominating e-tailer that aligns its pricing decision with existing market prices. Customers visit the online shop via the e-tailer's website and request product and price information (see Fig. 1). The shop engine collects product-specific data from the product database, and, if available, also queries the customer database for previously collected customer data. If the customer is so far unknown, a new customer account is created. For evaluating the customer-specific risk of payment fraud, a score is obtained from an external scoring provider. This score is, as usual in practice, interpreted as a customer-specific payment fraud probability (Siegl and Sackmann 2008). In this initial scenario, the customer is subsequently provided with the actual price (a general risk premium included) and, based on the drawn score, a predefined selection of accepted payment methods. Such a "traditional" approach to manage the risk of payment fraud is widely used (Siegl and Sackmann 2008). However, negative effects of a restrictive selection of payment methods on customers and on the reachable turnover remain completely neglected.

In order to achieve an integrated management of risk and turnover, an extension of this "traditional" approach by an additional customer risk management service is proposed (see Fig. 2). This service builds on a given customer relationship management (CRM) system. The service can either be implemented in the shop itself or also procured as external web service (Premium-Services 2009). This additional approach includes four separate steps as illustrated in the box "customer

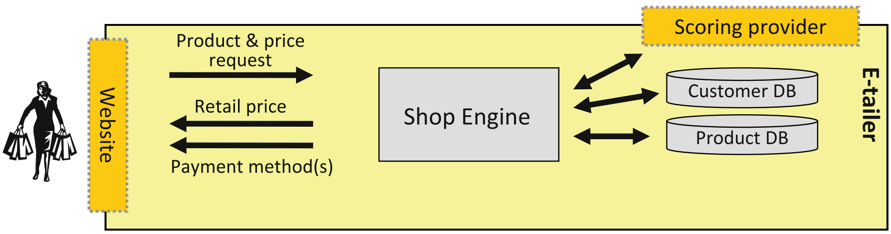

Fig. 1 E-tailer with a "traditional" management of payment fraud risk

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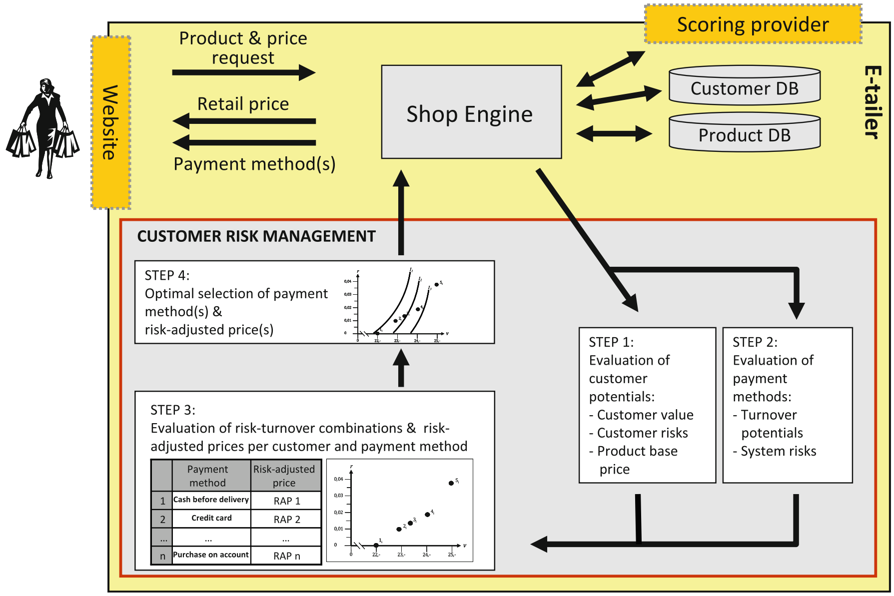

Fig. 2 E-tailer with an innovative customer risk valuation model

risk management" at the bottom of Fig. 2. The first step evaluates the overall customer potential by integrating customer values and risks as well as the value of the current transaction in the form of a product base price (reservation price, e.g. production or procurement costs plus a minimum gross margin). In the second step, all available payment methods offered are rated according to their turnover potentials and system risks. In the third step, customer-specific risk-turnover combinations are calculated for each payment method. This allows an e-tailer to rate a customer for each transaction on an objective basis by risk-adjusted prices. Assuming for a start risk neutral preferences, e-tailers can use these risk-adjusted prices directly for narrowing down and optimizing the selection of payment methods and thus, for improving the management of payment fraud risk. In the fourth step, the payment methods and risk-adjusted prices are discussed as a basis of a decision model for e-tailers with risk proclivity and, the more realistic case, with risk adverse preferences. Furthermore, the risk-adjusted prices reveal the possible scope of pricing according to the pricing strategy of the e-tailer from an integrated risk-turnover view.

3 It-supported real time evaluation & management of customer risks

As (Rust et al. 2000) argue and a survey of 292 companies confirms (Sackmann et al. 2008), payment fraud and customer migration can be summarized as being the most significant risks for e-tailers (Stahl et al. 2007). Since in e-commerce ad hoc decisions, e.g. which price or payment conditions are offered to a customer in the

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online-shop, become inevitable, a customer risk management tool for e-tailers has to evaluate the customer risks in real time, automatically, and separately for each transaction. The following description of our model shows how such a transaction- and customer-specific risk management can be realized without neglecting turnover potentials.

3.1 Evaluating customer values and risks (step 1)

Existing methods for a comprehensive evaluation of customer potentials claim to account for customer-specific value as well as risk aspects at the same time. However, these methods are limited in their ability to take effects of risk management measures, such as restricting payment methods, on value and risk simultaneously into account (Kundisch et al. 2008a, b). Therefore, as a first step, established methods for customer value and risk estimation are analyzed separately as to whether they are feasible and compatible approaches that can be used to calculate values and risks in our model.

3.1.1 Measuring customer value

The concept of customer value is used in both theory and practice to evaluate customer-specific shares that support a company's economic objectives such as turnover or profit (Rudolf-Sipötz 2001). An extensive overview and categorization of the manifold estimation methods can be found e.g. in Schroeder (2006); Krafft (2007) or Kumar (2008). Following the necessary requirements for an integrated, comprehensive, and automated estimation of customer value, the used evaluation approach should fulfill at least the following criteria:

1. **Prospectivity:** Since management decisions should be optimal in the long run, the decision-making process should take a customer's future value into consideration. Therefore, evaluation approaches directed exclusively towards the past, e.g. ABC analyses, are deemed unsuitable for an integrated estimation of customer value.
2. **Analytical approach:** The evaluation approach should be based on analytical methods, i.e. it should provide systematical and comprehensible results. This is required for achieving a consistent scaling, weighting, and, in consequence, an objective comparability of customer values and risks.
3. **Monetary value:** The evaluation of customer values, such as market potential (e.g. turnover and cross-selling potential) or resource potential (e.g. reference and information potential), should be calculated with monetary values, in order to be summarized with risk values in an integrative unit of measurement. This allows different value components to be compared with costs and the resultant values can also be used by other company units.
4. **Customer-specific evaluation:** Aiming at optimal investment and management decisions, the approach should provide values for each single customer and not only offer an overall estimation of a customer segment or customer portfolio.

المنارة للاستشارات

The valuation of each customer is a necessary precondition for (automatically) deriving customer-specific decisions.

An analysis of established valuation methods shows that customer lifetime value (*CLV*) and its extensions best fit these criteria (Ruch 2009). Since *CLV* is increasingly used in companies (Sackmann et al. 2007) and, in particular, e-tailers have extensive possibilities for collecting and processing the required customer data under cost-efficient conditions, *CLV* is proposed in our model as method for evaluating customer values. According to (Schroeder 2006), the *CLV* as analytical, one-dimensional, and monetary method, forecasts for a customer i cash flows R which are discounted by an interest rate d to a net present value less the acquisition costs I according to the equation:

$$CLV_i = -I_i + \sum_{t=1}^{n} R_{it} \cdot (1 + d)^{-t}.$$

3.1.2 Measuring customer risks

Similar to the customer value estimation, various methods exist for quantifying customer risks also addressing risk integration in *CLV* (Hogan et al. 2002; Schroeder 2006; Borle et al. 2008). In a first category of these methods, customer risks are quantified in the form of an overall risk variable for reducing the expected cash flows in order to build up risk reserves (e.g. Jain and Singh 2002; Gupta and Lehmann 2003). These methods are widely used in practice. However, they do not allow risks to be quantified and managed at a customer-specific level and in a transaction-specific context. The same shortcoming applies to the suggestion of increasing the discount rate used in *CLV* to compensate the uncertainty of future cash flows (Eberling 2002). Other methods are built on the Weighted Average Cost of Capital (WACC) as a theoretical, capital market consolidated discounting rate (Dhar and Glazer 2003; Gupta et al. 2004; Hogan et al. 2002). These methods are based on the Capital Asset Pricing Model splitting total risk into the systematic and the completely diversifiable, unsystematic risk. The discount rate is thereby determined by the expected return from the interest rate of a secure investment, plus a segment-specific risk premium (Hopkinson and Lum 2002). However, the usage of the WACC also brings some shortcomings. Relations between enterprises and customers can vary strongly (e.g. individual costs of the relationship setup and maintenance, future cash flows varying from customer to customer). Hence, a planned segment-specific risk premium can—if at all—only be calculated under restrictive assumptions (Hogan et al. 2002). In addition, perfectly diversified customer portfolios cannot be assumed (Kundisch et al. 2008a, b) and, thus, it is disputable whether the unsystematic risk is actually entirely diversifiable.

In contrast to these overall risk approaches, a second category of quantification methods follows a risk segmentation approach dividing the total risk into relevant, preferably uncorrelated single customer risks. To realize such an approach, various methods for quantifying single customer risks are already established (Schmittlein et al. 1987; Berger and Nasr 1998; Dwyer 1997; Gupta and Lehmann 2003). In the

المنارة للاستشارات

context of customer risk, migration risk and payment fraud risks have been identified as relevant for e-tailers, since competitors are only “one click” away and financial losses caused by fraud have been permanently increasing for many years (Sackmann et al. 2007; Stahl et al. 2008). In our model, evaluating risk on a customer-individual level is seen as a promising way for e-tailers, since it allows characterizing risks in a customer- and transaction-specific way. Therefore, the method proposed in this contribution aims at a customer-individual evaluation of risk and integrates both migration risk (*MIR*) and payment fraud risk (*PFR*).

To integrate different *migration risk* quantification methods into the *CLV*, so-called migration and retention models are available (Calciu and Salerno 2002; Berger and Nasr 1998; Dwyer 1997; Gupta and Lehmann 2003). Both assume specific market conditions: retention models presume a lost-for-good situation in which consumers fulfill their needs only via one single supplier; migration models presume an always-a-share situation in which several suppliers fulfill the needs of a single customer (Schroeder 2006). Because of these restrictive market and behavior assumptions, both models are seen as ill-suited for adequately evaluating customer risk in a dynamic e-commerce environment. An alternative with less restrictive assumptions for quantifying migration risk is the NBD/Pareto model (Schmittlein et al. 1987), its extension (Schmittlein and Peterson 1994), and further developments built hereupon (Jerath et al. 2008). The basic NBD/Pareto model generates a probability for non-contractual relationships which can be interpreted as a customer-specific repurchase probability (Krafft 2007). Although the NBD/Pareto model has some minor weaknesses for market segments with long-lasting products, it is used in our model for estimating the migration risk of single customers since e-tailers are seen as capable of collecting and processing the required data regarding a customer’s transaction history (Kundisch et al. 2008a, b; Schmittlein et al. 1987).

Besides the migration risk, the *payment fraud risk* has been identified as relevant customer risk, i.e. the risk of a customer being unable or unwilling to pay for obtained services or products. Currently, several e-tailers already evaluate the payment fraud risk at the level of individual customers, e.g. by various scoring methods which have emerged as best practice approaches (Ryals 2003) and are provided by specialized external providers (Raab and Siegl 2007). For calculating such scores, economically relevant monetary and non-monetary impact factors need to be identified. In most cases, the score value is generated by a simplistic weighted aggregation of these factors (Krafft 2007). Also in our model, scoring values are proposed for the evaluation of payment fraud risk that can be provided by scoring services or calculated by the e-tailer itself.

3.2 Evaluating risks of payment methods (step 2)

The restriction of accepted payment methods is widely used as tool for risk management that also can be used on a customer-individual level (Ruch and Sackmann 2009). The concrete use of payment method selection for risk management varies according to cultural background: while payment via credit card is the prevalent method in many countries, in several countries further methods are equally important. In Germany, for example, over 40 different payment methods

المنارة للاستشارات

are in daily use (Stahl et al. 2008). A recent study on e-tailers and payment methods (Stahl et al. 2008) investigated detailed information about the risk of transaction cancellation and the so-called system risks of payment methods. In comparison to the customer-specific payment fraud risk, these system risks "merely" result in a disruption of the purchase process leading to financial losses that should also be taken into consideration in an integrated risk-turnover view. Therefore, the second step of the proposed method for managing customer risk takes into account the general *system risk* and *risk of transaction cancellations* for different payment methods. In the following, the focus lies on five prevalent payment methods in e-commerce: cash before delivery, credit card, cash on delivery, direct debit and purchase on account. This selection does not limit the generality of the approach, since further payment methods can be easily integrated. From an e-tailer's point of view, with exception of the risk-free payment method cash before delivery, all methods hold specific system risks as Table 1 shows.

Since each payment method has specific risk characteristics, quantifying these risks is a non-trivial problem. Although there are established evaluation schemes for some of these system risks (e.g. Degennaro 2006; Bezuidenhout and Gloeck 2003; Bezuidenhout and Gloeck 2004), for the sake of simplicity, we renounce single risk evaluation at this point of research and use instead first intersectoral empirical results from Stahl et al. (2008) to estimate overall system risks (*SYR*) per single payment method. Table 2 shows system risk results for the considered subset of payment methods:

As mentioned before, using a selection of payment methods for risk management has also impact on the probability of interrupting a transaction or—in other words—on the realizable turnover potential (*TOP*). This negative effect on potential turnover should also be taken into consideration by e-tailers (See-To 2007; Siegl and Sackmann 2008). Empirical experiences show that annual turnover of e-tailers can be increased by offering less restrictive payment methods by about 12.5% by also offering "credit card" and "purchase on account" in addition to the restrictive

Table 1 Exemplary system risks of prevalent e-commerce payment methods

Payment system	Source of system risks
Cash before delivery	No risks for e-tailers
Credit card	Inaccurate credit card data
	Exceeded card limit
	Chargeback (payment revocation)
Cash on delivery	Incorrect delivery address
	Undeliverable mailing, customer not available
	Hoax orders
Direct debit	Incorrect banking accounts
	Exceeded account limit
	Revocation of a debit entry
Purchase on account	Missed term/maturity of payment
	Incorrect billing address

المنارة للاستشارات

Table 2 System risks (*SYR*) values of prevalent e-commerce payment methods

Payment system	System risks (%)
Cash before delivery	0.0
Credit card	0.9
Cash on delivery	1.2
Direct debit	1.7
Purchase on account	3.7

Table 3 Turnover potentials (*TOP*) of prevalent e-commerce payment methods

Payment system	Turnover potentials (%)
Cash before delivery	0.0
Credit card	4.0*
Cash on delivery	7.0*
Direct debit	9.0*
Purchase on account	12.5

* Interpolated values

payment method "cash before delivery" (Stahl et al. 2008). Since there is no further empirical data available yet, the method "cash before delivery" is defined as maximally restrictive and "purchase on account" as minimally restrictive payment method for customers. Values for expected turnover potentials are interpolated as follows: credit card 4%, cash on delivery 7% and direct debit 9% (see also Table 3). If better empirical data becomes available, the results of our model may improve without requirement to change the method.

3.3 Risk-turnover combinations & risk-adjusted prices (step 3)

Efficient and integrated risk-turnover management requires the simultaneous assessment of risk and value potentials of customers and payment methods. The methods for evaluating customer value (*CLV*), customer risks (*MIR* and *PFR*), system risks (*SYR*), and turnover potentials (*TOP*) of payment methods presented in the previous steps fulfill the criteria of monetary value. Therefore, they provide a basis for calculating customer-specific risk-turnover combinations per payment method and risk-adjusted prices. As third step, the results from steps one and two are extended by product costs (*POC*) of the considered transaction (e.g. production or procurements costs), the reservation price or product base price (*PBP*) (e.g. production or procurements costs of a good plus the minimal margin), and aggregated other costs (*OTC*) (e.g. scoring, logistics, administration etc.). In total, our valuation model contains four monetary measures and four probability measures that are processed in the third step (Table 4).

Based on this information, an aggregated, customer-specific risk-adjusted potential v and the payment risk r are calculated for every transaction k. The risk-adjusted customer value v is calculated for a customer i by aggregating the potentials of the current transaction (product base price *PBP* reduced by the product/other costs *POC/OTC* and adjusted by the expected turnover potential

المنارة للاستشارات

Table 4 Input variables for calculating customer-specific risk-turnover combinations per transaction

Input variables	
CLV_i	Customer lifetime value (monetary value)
MIR_i	Migration risk (probability)
PFR_i	Payment fraud risk (probability)
TOP_p	Turnover potential of payment method (probability)
SYR_p	System risk of turnover potential (probability)
PBP_s	Product base price (monetary value)
POC_s	Product costs (monetary value)
OTC_i	Other costs (monetary value)

Customer i, payment method p, e-tailer s

TOP for each payment method p) and the future customer potential (expressed in his *CLV* reduced by other costs for the forecasted relationship duration *OTC* discounted by the interest rate d and adjusted by the migration probability *MIR*):

$$v_k = (PBP_s - POC_s - OTC_i) \times (1 + TOP_p) + \left(CLV_i - \sum_{t=1}^{n} OTC_{it} \times (1 + d)^{-t} \right) \times (1 - MIR_i).$$

For the payment risk r associated with a customer i and the payment method p, the following measures are combined: the payment fraud risk *PFR* of the customer i and the system risk *SYR* for the payment method p. For expressing possible correlations between these two risk types, e.g. because a planned fraud can be realized by manipulating address or bank account data, an additional correlation coefficient α is introduced. Then, the aggregated risk can be calculated as payment risk r as follows:

$$r_k = PFR_i + \alpha \times SYR_p.$$

Of course, the application of our approach requires a more detailed specification of the variables. This is still subject of current research and the adaptation of methods from the financial and insurance sector is analyzed. Since empirical data is not yet available and the focus of this contribution lies on the presentation of the method itself, the plausibility is discussed on a more abstract level by using an exemplified business scenario. Based on the above selected five exemplary payment methods, five risk-turnover combinations can be calculated for each transaction, one for each payment method. These risk-turnover combinations are visualized by a risk-turnover diagram, so that all accessible risk-turnover combinations for a single customer can be directly compared as shown in Fig. 3.

After rating value and risk components, the proposed method envisages to manage the risk by integrating the customer-specific payment risk into transaction-specific prices. By using expected values, the product base price is extended by the payment risk calculated for every customer and payment method as described above. In the case where an e-tailer offers—from his point of view—the secure payment method "cash before delivery", it is not necessary to adjust the product

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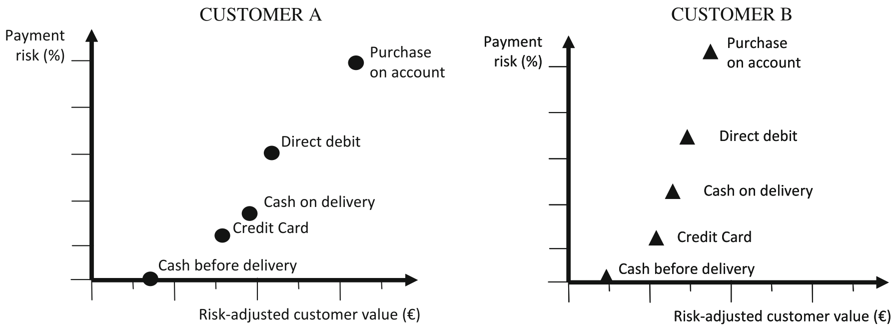

Fig. 3 Risk-turnover combinations for five payment methods and two customers **a** and **b**

Table 5 Risk-adjusted prices for a customer A with exemplary payment risks and an assumed product base price of 22€

Payment system	Payment risk (%)	Risk-adjusted price (€)
Cash before delivery	0.0	22.00
Credit card	6.5	23.43
Cash on delivery	8	23.76
Direct debit	11	24.42
Purchase on account	16.5	25.63

base price. In the example given in Table 5, the product can then be offered at a minimum price e.g. of 22.00€. When offering the most risky method "purchase on account", the calculated payment risk e.g. of 16.5 % should be integrated and a minimum price of 25.63€ should be demanded for reaching on average the product base price (e-tailers' reservation price).

The risk-adjusted price is the minimal price an e-tailer should demand for a product at a given risk level. Of course, in a competitive market environment, the maximal price is restricted by the general market price, therefore e-tailers get another management implication: the gap between a risk-adjusted price and its corresponding market price determine the range for strategic price decisions. If the focus is on attracting new customers, e.g. for reaching the critical mass after the release of a new product, a retail price close to the calculated risk-adjusted one can be adequate. On the other hand, if the maximization of turnover is the goal, the price should be set marginally under the general market price. Even if the calculated risk-adjusted price for a customer is higher than the market price, e-tailers can manage risk by automatically offering more restrictive and ceteris paribus less risky payment methods such as cash before delivery.

3.4 Optimal selection of payment methods & risk-adjusted prices (step 4)

The third step determines the additional turnover reachable under a certain level of risk. Thus, an e-tailer is provided with risk-adjusted prices and an objective decision

المنارة للاستشارات

base for customer-specific risk management, taking turnover potentials into consideration. Up to now, the risk-adjusted prices had been calculated under the assumption of a risk neutral decision-maker. However, experience shows that a more realistic assumption would be to imply risk aversion (Rommelfanger and Eickemeier 2001); but also e-tailers characterized by risk proclivity are imaginable. Thus, step four of our approach aims at an optimal selection of payment methods and corresponding risk-adjusted prices. Therefore, a company's risk preferences are integrated into the risk-turnover diagram (see Fig. 3) to determine which of the payment methods should be provided to the customer under the given value and risk potentials for the specific transaction. Following the Bernoulli principle (Bernoulli 1954), company-specific risk preferences, e.g. determined by the Arrow–Pratt measure (Kreps 1990), are transformed into a utility function called the Risk Preference Curve *RPC* which represents the effective utility *U* under the regard of risk *r* attitudes, i.e. risk neutrality, risk aversion and risk proclivity (see Fig. 4).

Depending on the risk-preference, company-specific iso utility curves *I* can be derived whereby the utility *U* on each point on a single iso utility curve is equal and it is assumed that the utility of $I_1 > I_2 > I_3$ (see Fig. 5) and the utility of I_3 tend to zero. Then the final criteria for an optimal selection from given payment methods is a positive value. As shown in Fig. 5, every payment method with a positive expected utility for an e-tailer should be selected. If, as in the presented scenario, the utility of I_2 would equal zero and the utility of I_3 would be negative, only the payment method one to three would generate positive values and for this specific transaction, e-tailers should limit the offered payment methods to cash before delivery (1_i), credit card (2_i), and cash with delivery (3_i).

At this point we have to underline that all results, i.e. selection of payment methods and risk-adjusted prices, should not be directly communicated to the customer but are intended for internal use and decision-making. The way in which the risk-adjusted prices are finally operated and presented to the customer depends on further factors, such as a general pricing (Schwind et al. 2008), sales or market share strategy. The risk-adjusted price gives new information to the e-tailer: if a risk-adjusted price lies below the market price, this determines the range for pricing from an integrated risk-turnover view. The e-tailer can see this as additional margin or can decide to pass this "premium" onto the customer in the form of a discount—depending on the chosen strategy. Since the model defines the market price as the maximum price and only risk-adjusted discounts down to the minimal base price are addressed, a negative reaction on the customer side to such marketing measures is

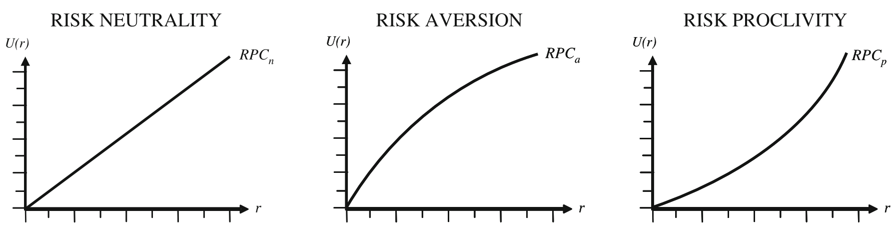

Fig. 4 Risk preference curves (*RPC*) of an e-tailer with different risk preferences

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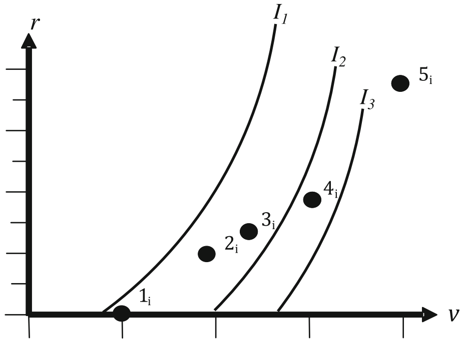

Fig. 5 Iso utility curves for an optimal selection of payment methods and risk-adjusted prices under the consideration of risk preferences (risk aversion)

not to be expected. However, marketing measures based on risk-adjusted pricing are not limited to discounts and remain the subject of further research.

4 Conclusions and outlook

A growing turnover potential in e-commerce inherently goes hand in hand with an increase in risk (e.g. payment fraud and migration risk) which should be managed by value-oriented e-tailers. Existing and applicable approaches either increase average prices by an overall risk premium or manage risks by restricting accepted payment methods to the low risky ones. However, these approaches prevent optimal risk-turnover management, since customer-specific value and risk factors as well as turnover potentials are not taken into consideration. Therefore, a new approach is presented, which generates an objective decision base and calculates an optimal selection of offered payment methods as well as risk-adjusted prices for a customer-specific risk management which integrates turnover potentials. As a result, the approach allows for e-tailers to choose only payment methods with a valuable risk-turnover combination per customer and transaction. The method presented is flexible and open to further, perhaps branch-specific value and risk variables that can potentially raise the forecast accuracy. Furthermore, the modular architecture also allows the evaluation of unknown customers with little or no data available, e.g. typically for new and transaction-oriented customers. Here, average branch or company experiences can be used to calculate risk and value data. Should this be impossible, single variables can be omitted from the model, allowing each customer to be evaluated with less accuracy but still allowing an automated management of risk and turnover for e-tailers. Since the model requires a variety of input data and since optimal risk management decisions can only be made in conjunction with other customer management measures, the proposed approach is seen as an extension of current CRM systems and not as a stand-alone solution.

The presented model is a first step in a new field of e-commerce and requires further research. As a next step, the provision of the model in the form of a prototype is envisaged and an applicability check (Rosemann and Vessey 2008) with small and medium-sized enterprises (SME) is planned. To test the results and

المنارة للاستشارات

performance in the first instance, the prototype is designed as web service before a proof of concept is realized by using real customer data from the shop engine of a German e-tailer. For this purpose, we will calibrate our model at the e-tailer-specific level. An extensive evaluation is part of a current research project supported by the German Federal Ministry of Education and Research and is realized by using three risk management scenarios: firstly, an e-tailer without risk management, secondly, an e-tailer with a current risk management approach, and thirdly, an e-tailer with the new model proposed in this contribution. The findings will be used for an iterative improvement of the model. A further interesting research point is the analysis of how the model can be used to support other company goals, e.g. for identifying valuable customers or for optimizing the whole customer portfolio under risk criteria as proposed in Kundisch et al. (2008a, b).

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