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Article Importance of financial strategy in e-commerce

Ekonomický časopis

**Provided in Cooperation with:** Slovak Academy of Sciences, Bratislava

*Reference:* Svatošová, Veronika (2020). Importance of financial strategy in e-commerce. In: Ekonomický časopis 69 (3), S. 278 - 305. https://www.sav.sk/journals/uploads/0325141003%2021%20Svato%C5%A1ov%C3%A1%20+ %20SR.pdf. doi:10.31577/ekoncas.2021.03.04.

This Version is available at: http://hdl.handle.net/11159/5574

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Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics



# Importance of Financial Strategy in E-commerce<sup>1</sup>

Veronika SVATOŠOVÁ\*

#### Abstract

This paper deals with the issue of financial strategy formulation and available models of financial strategy with a focus on e-commerce. The paper aims at using the financial strategy model to assess current financial strategy for enterprises primarily oriented towards electronic commerce and to propose the optimum financial strategy for this area of business. The research used selected methods of financial analysis (liquidity, profitability, indebtedness, activity) to evaluate current financial standing of a selected sample of enterprises. The results of the financial analysis were used for building of a model of financial strategy in Vensim program. The model, based on selected financial indicators, identifies current financial strategies of enterprises and designs the optimum financial strategy using the principle of dynamics and proposes its development for long-term progress of the enterprise. The financial strategy model is also applicable to e-commerce.

**Keywords:** *financial strategy, e-commerce, e-strategy, small and medium-sized enterprises, Vensim program, dynamic model of financial strategy* 

**JEL Classification:** M00, M21, M19, M29, G39

DOI: https://doi.org/10.31577/ekoncas.2021.03.04

# Introduction

The changes in finance and accounting change this categorisation. The more complex view of financial performance gives rise to a trend towards integration of finance management into strategic management and formulation and implementation

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<sup>&</sup>lt;sup>1</sup> This paper has been prepared in terms of the project IGA of the Mendel University in Brno titled as *Evaluating the Performance of SMEs in the Context of Regional Development* with registration number FRRMS – IGA – 2019/004.

of the principal corporate strategy (Smith, 2014, p. 20). Finance and financial policies help managers assess the available alternatives and monitor decisions to be implemented in the corporate practice (Narayanan and Nanda, 2004, p. 6). Financial strategy must hence be seen as a key element of long-term success of business strategy. Corporate practice lacks a complex view of formulation and implementation of financial policies, finance management and financial strategy (Jindřichovská, Ugurlu and Kubíčková, 2013; Karadag, 2015). This paper deals with the issue of financial strategy formulation and available models of financial strategy with a focus on businesses in e-commerce and then on SMEs in e-commerce. Surprisingly enough, only a couple of relevant sources deal with financial strategy as well as with financial aspects and financial strategy oriented towards e-commerce. No relevant financial strategy or financial management models have been designed before, therefore this paper derives from generally known literature review dealing with the general information for definition of financial strategy and aspects of finance management, further specifying the same for the purpose of application to e-commerce.

# 1. Theoretical Framework

The area of small and medium-sized entrepreneurship is emerging and gaining popularity with its increasing importance in across the whole business field and economy (Cravo, Becker and Gourlay, 2015). The research (Koráb and Poměnková, 2014) investigates whether small and medium-sized enterprises in the Czech Republic, Slovakia, Poland and Hungary experienced a decline in access to external financing during the financial crisis. These firms are more likely to be affected by financing constraints than large, listed firms (Lamont, Polk and Saá-Requejo, 2001). The research (Andries et al., 2016) has revealed that credit supply factors played the most important role in credit availability to small firms. According to Durgulu et al. (2016), SMEs are increasingly compelled to develop strategies to increase their effectiveness and sustainability, in order to gain financial and performance goals.

SMEs primarily focused on e-commerce reflect the same characteristics as the general level of small and medium-sized enterprises (Kunešová and Eger, 2017). Due to the narrow specialization of the products and services offered, SMEs in e-commerce can more precisely identify the target group of customers, including their specific needs (Feindt, Jeffcoate and Chappell, 2002). SMEs in e-commerce typically do not have a specific strategy defined for e-commerce and lack a conceptual and strategic approach to business development in the virtual environment (Grandon and Pearson, 2004; Grandon, Nasco and Mykytyn, 2011).

According to research (Holátová, Březinová and Kantnerová, 2015), most Czech SMEs surveyed (60%) have a formulated strategy. Other research (Skokan, Pawliczek and Piszczur, 2013) performed among 677 SME from the Czech Republic and Slovakia confirmed that bigger enterprises pay more attention to strategic management and more often have made a full detailed strategy (strategic document). Aragón-Correa et al. (2008) confirmed the existence of a direct and positive relationship between financial performance and environmental strategies concerned with the development of preventive and innovative practices and ecoefficient practices. Strategy in SME is defined as a set of (Burke and Jarratt, 2004): planned activities being carried out to achieve stated objectives, resources and capabilities being deployed to action strategic decisions, market being entered, environments providing signals filtered through personal and entrepreneurial networks. According to Zich (2010), strategic continuity of level of goals has several important aspects. Defining goals must be based on the overall imagination of the development of company. An e-commerce strategy is not only for online businesses. It defines both short-term and long-term e-business and e-commerce goals and includes careful and qualified planning (Hernández, Jiménez and Martín, 2009; Yoon and Chae, 2009; Raisinghani, Meade and Schkade, 2007). Strategic management therefore means introducing any measures within the organization to implement these strategies and all work-related activities, including the e-commerce strategy (Halici and Erhan, 2013). Lam and Harrison-Walker (2003) report that fifty models were developed to deal with strategic and decision-making processes for e-commerce ten years ago. Kao and Decou (2003), in their strategic management process in e-commerce model, highlight the main dimensions that influence the design and implementation of an e-strategy.

#### 1.1. Identification of Rule of Finance Management and Financial Strategy

Financial strategy is defined as a unified and channelled set of strategic financial objectives, criteria and rules as the basis for further corporate finance planning (Landa and Polák, 2008). According to Bender and Ward (2012) financial strategy consists of two components: 1. the best ways of fund raising for the enterprise and 2. controlled use of the funds within the organisation, including decisions about their reinvesting or distribution. The main goal of financial strategy formulation is finding balance between control mechanisms, business performance and minimisation of costs of financial operations to achieve effective management of all three mentioned areas of finance (Irwin, 2005). As much as 93% of Czech enterprises say to consider finance decisive for assessment of business performance (Střítestká and Svoboda, 2012). The main aim of financial planning is to assure the needed capital with minimisation of capital costs and

development of the optimum capital structure. Capital-structure-related decisionmaking means to decide whether and in what proportion to use internal and external resources (Fabozzi, Neave and Zhou, 2011, p. 540). The optimum capital structure is based on a combination of long-term sources of financing which minimise total costs of capital building (Jindřichovská, 2001, p. 183). For that reason the corporate structure is designed with the aim to optimise it, i.e. to assure sufficient capital with minimum capital cost (Nývltová and Marinič, 2010).

According to Chmelíková (2014), utilisation of external sources of financing at the expense of internal sources shows the following drawbacks: financial costs of the resulting increased risk of provision of additional external sources of financing or costs resulting from the developing tense relations between business managers, business owners and creditors (costs of provision of additional sources of financing). The financial strategy applied by the enterprise must then be adapted, updated and managed on the basis of changes in the external finance environment, which in effect significantly affects financial stability of the enterprise and contributes to its growth and effectiveness and maximisation of its market value (Grasseová et al., 2010). In harmony with the theory of business there is a positive correlation between the business size and the probability of its bankruptcy, and therefore there is also a positive correlation between the business size and indebtedness (Strýčková, 2015). The tools of financial strategy are (Bhalla, 2004): financial analysis, planning, capital structure optimisation, financial criteria for assessment of effectiveness of decision-making in corporate governance, cash-flow management, management of accounts receivable and accounts payable, budgeting and controlling. Financial strategy is seen as a separate area forming an integral part of business and corporate strategy. According to Mallete (2006) formulation of a successful financial strategy involves there steps: Step 1 - Establishment of a suitable finance capital structure and decision about the size of financial surplus; Step 2 - Finding whether the business is undervalued or overvalued on the market by trying to meet investor expectations; Step 3 - Formulation of a financial strategy and its submission to the board of trustees and the top management for approval, to assure that the business activities will be sufficiently financed.

The main impact on financial strategy can be seen in internal and external limitations. The main argument is the issue of capital structure optimisation, where a certain level of indebtedness creates the effect of a tax shield and the leverage effect. Against this stands the fact that growing indebtedness increases the risk of financial instability. Traditional theories claim that this way of individual activities can be planned and managed with the aim to maximise the business value (Ogilvie, 2009, p. 22 - 23).

#### 2. Materials and Methods

The main goal of the paper is to identify financial standing and financial strategies of enterprises primarily focused on electronic commerce in 2016 in comparison to 2011 and development of a dynamic model of corporate financial strategy for companies with primary focus on e-commerce. To fulfil this objective methods of financial analysis for years 2011 and 2016 are used, drawing from balance sheets of the e-commerce businesses. The year 2016 was chosen for the reason of publication of most up-to-date data of balance sheets in the Commercial Register for that year. The paper further works with the notion of economic performance, for the purpose of the present research defined by the following indicators: Return on Equity (ROE), Return on Assets (ROA), current (total) liquidity, long-term coverage indicator and Weighted Average Cost of Capital (WACC), as the same time used as the input indicators for identification of current financial strategy in the financial strategy model in e-commerce. Economic performance is assessed by further methods of financial analysis, i.e. indicators of profitability, liquidity, indebtedness and activity. The objective of the research was to identify current financial strategies of small and medium-sized enterprises in comparison to large enterprises with primary orientation towards e-commerce with the help of the Vensim program and their impact on economic situation of enterprises primarily focusing on e-commerce and the effect of financial strategy on the role of strategy and strategic management in e-commerce.

#### 2.1. Research Sample

For the purpose of research, a research sample of enterprises was identified according to the following criteria: Enterprises belonging to the category: businesses in e-commerce in general and then their focus on SMEs primarily focused on e-commerce (affiliated stone shops) – defined as e-shops or e-malls. Small and medium-sized enterprises are then compared to large enterprises. Enterprises that trade mainly through websites. Enterprises selling predominantly on the B2C market. Enterprises offering physical products (the most visible segment in the online market, online services not included, difficult to identify and measurable for the research file). Registered main seat in the Czech Republic (enterprises that are only domestic or with a minimum share of debts). Legal form of business: Joint Stock Company, Limited Liability Company. Existence of enterprise on the market – at least 7 years (i.e. established in 2011 and earlier). Prerequisite is the trustworthiness and reliability of the enterprise (membership in Association for Electronic or certification of customer-verified award by Heuréka.cz). Enterprises that have at least one or more full-featured e-shop. Based on the

above-mentioned restrictive criteria, the research sample of enterprises consists of 367 enterprises. All enterprises were found in the Commercial Register. Finally, the research sample consists of 209 enterprises were included to the research as these enterprises had completed financial statement for the years 2016 and 2011. According to Raosoft (2018) at a 95% confidence level and 5% error tolerance, a representative sample of 188 respondents is recommended. The representative-ness of the research sample is therefore ensured. The results of the research are broken down by enterprise size into the following categories: micro enterprises (up to 10 employees), small enterprises (up to 50 employees), medium enterprises (up to 250 employees), large enterprises (up to 500 employees) employees) a large enterprises + (over 500 employees).

#### 2.2. Method of Financial Strategy Model Building

The proposed financial strategy model is based on the basic principles of financial analysis investigating profitability, liquidity and cost and capital effectiveness, already simulated for a research sample of small and medium-sized enterprises (Svatošová, 2015; 2017). Selected financial analysis indicators were used for the financial strategy model building (see Table 1).

Financial strategy indicator	Formula of selected indicator in financial strategy model
ROE	$ROE = \frac{EAT}{Equity}$
ROA	$ROA = \frac{EAT}{Total assets}$
Total liquidity	Total liquidity = $\frac{\text{Current assets}}{\text{Short} - \text{term payables and loans}}$
Long-term coverage	Capitalisation level = $\frac{\text{Equity} + \text{Long} - \text{term payables and loans} + \text{Reserves}}{\text{Assets total}}$
WACC	WACC = $R_{E} * \frac{E}{C} + R_{D} * (1-t) * \frac{D}{C}$
WALL	$R_{\rm E} = R_{\rm F} + R_{\rm B} + R_{\rm FS} + R_{\rm LA}$ $R_{\rm D} = \frac{\text{Cost interest}}{\text{Mean value of bank loans}}$
Financial strategy model	Financial strategy = $\frac{\text{ROE} + \text{ROA} + \text{Total liquidity} + \text{Capitalisation level} + \text{WACC}}{5}$

# Financial Strategy Model Indicators

Table 1

*Note:* ROE – Return on Equity, ROA – Return on Assets, EAT – Earnings after Taxation, WACC – Weighted Average Cost of Capital,  $R_E$  – Cost of Equity,  $R_D$  – Cost of Debts, t – Tax rate, E – Equity, D – Debts, C = E + D (Total Capital,  $R_F$  – risk-free rate,  $R_B$  – business risk,  $R_{FS}$  – risk premium of financial stability,  $R_{LA}$  – risk premium of company size.

Source: Own processing according to (Svatošová, 2015; 2017).

The main reason for selection of these indicators for the financial strategy model was the fact that they were able to provide complex assessment of the overall financial standing and identify the selected enterprise financial strategy in its complexity.

After that the individual indicators were assessed in the financial strategy model (see Table 2). The score of the financial strategy indicators is specified on the scale of 1 - 5, where 5 means excellent result and 1 means very poor result.

#### $T\ a\ b\ l\ e\ 2$

**Financial Strategy Indicator Scoring (1 – 5)** 

Financial strategy indicator	Excellent (5)	Very good (4)	Good (3)	Poor (2)	Very poor (1)
ROE	> 0.50	> 0.30	> 0.10	> 0.00	< 0.00
ROA	> 0.15	> 0.12	> 0.08	> 0.00	< 0.00
Total liquidity	> 1.80	> 1.50	> 1.00	> 0.80	< 0.80
Long-term coverage	> 1.1	> 1	> 0.98	> 0.95	< 0.95
WACC	< 0.05	> 0.05	> 0.15	> 0.25	> 0.30

Source: Own processing according to (Svatošová, 2015; 2017).

The final results of the financial strategy model are specified as arithmetic mean of the financial strategy indicator scoring. On the basis of the total score (see Table 2) the final financial strategy is defined. A detailed description of the individual financial strategies is shown in Table 3.

Table 3 Scores and Final Assessment of Particular Financial Strategies

Assessment based on scores	Financial strategy type	Financial strategy description
4-5	Maximum profit strategy	Aggressive financial strategy: orientation on profit maximisa- tion, low or negative values of working capital, large-volume long-term investment options, potential progressive expan- sion, absolute innovation options.
3 - 3.9	Proportional profit and liquidity strategy	<i>Balanced financial strategy:</i> orientation on adequate working capital value and acceptable profitability, smaller-volume short- and long-term investments, possible but moderate, not progressive expansion.
2 – 2.9	Maximum liquidity strategy	<i>Conservative financial strategy:</i> orientation towards high volumes of working capital, low profit, conservative approach to long-term investment management (without long-term expansion with focus on operation issues)
1 – 1.9	Crisis and rescue strategy	<i>Rescue financial strategy:</i> orientation towards rescuing the company against wind up, poor financial analysis values (liquidity, profitability, indebtedness etc.), i.e. non-existence of a complex progressive corporate financial strategy, change of business strategy, change of business concept in manufacture and other areas of enterprising, search for new resources and opportunities for company rescue and restructuring

Source: Own processing according to (Svatošová, 2015; 2017 and Režňáková, 2012).



On the basis of the above a basic financial strategy model without dynamics was built in Vensim (see Figure 1). The model reveals direct links between selected dependent and independent variables with direct impact on the final results of financial strategy. The model identifies current financial strategy of a business or a group of businesses and using the model dynamics the optimum financial strategy is proposed and followed in time for development.

#### 3. Results and Discussion

Input data for each of the selected enterprises were entered in Vensim with subsequent identification of the current financial strategy for 2011 and 2016. Figure 2 illustrates an example of financial strategy calculation in e-commerce with entries of mean values for all the e-commerce enterprises. The enterprises with identified financial strategy were divided to categories, micro, small and medium-sized enterprises, and common and distinctive features of these categories were studied. The main category for this research is small and medium-sized enterprises, micro and large-sized enterprises were analysed too to make comparison of the observed category.

The data were then summarised for the research sample of enterprises (n = 209) and a general financial strategy was defined for e-commerce businesses (with the help of arithmetic mean and median values). Summary results for financial strategy identification for enterprises with primary orientation towards e-commerce for 2016 are shown in Table 6 with financial strategy in 2011 for comparison shown in Table 7. The result tables are classified by enterprise size. Frequency of individual financial strategies in 2016 in comparison to 2011 in division by enterprise size is shown in Tables 4 and 5. A special category of small and medium-size enterprises (n = 136) has been created that is then used for dynamic model proposal. A histogram of frequencies (see Diagram 1) shows distribution of financial strategy types in e-commerce, which is uneven.

The most frequent financial strategy applied in e-commerce enterprises in 2016 and in 2011 was the conservative strategy, focused on high liquidity and low profitability levels. If companies with primary orientation towards e-commerce focus their e-commerce strategy on development, which is the most common form of e-strategy, they should also change their financial strategy to aggressive. The dynamic model of financial strategy in e-commerce illustrates the stepwise transformation from conservative to aggressive strategy in the course of 7 months. This financial strategy should correspond to e-commerce strategy focused on stabilisation. The comparison between financial strategy evaluations in 2016 and 2011 did not show any significant differences. This comparison revealed no changes in financial strategy in e-commerce during the 5 years have been realised.

# Table 4

Frequency of Individual Financial Strategies in 2016 by Enterprise Size

2016	Aggressive strategy	Balanced strategy	Conservative strategy	Rescue strategy
Enterprises total (209)	15	76	104	14
Micro enterprises	3	18	27	3
Small enterprises	9	25	44	7
Medium-sized enterprises	2	18	19	2
Large enterprises	1	7	4	0
Large + enterprises	0	8	10	2

Source: Own processing.

#### Table 5

# Frequency of Individual Financial Strategies in 2011 by Enterprise Size

2011	Aggressive strategy	Balanced strategy	Conservative strategy	Rescue strategy
Enterprises total (209)	10	80	105	14
Micro enterprises	4	18	24	5
Small enterprises	4	34	43	4
Medium-sized enterprises	2	13	24	2
Large enterprises	0	8	3	1
Large + enterprises	0	7	11	2

Source: Own processing.

# Diagram 1

# **Histogram of Distribution of Frequency of Individual Forms of Financial Strategies** (for 2016)



Source: Own processing (Statistica software).

Data for Financial	l Strateg.	y Identil	fication	in 2016 b	y Enterpri	ise Size						
2016	WACC	ROA	ROE	<b>Current</b> liquidity	Long-term coverage	WACC (score)	ROA (score)	ROE (score)	Current liquidity (score)	Long-term coverage score	Financial strategy (score)	Financial strategy – verbal evaluation
					Enterpris	es total – 2	09 enterp	rises				
Total mean (209)	0.04	0.06	0.17	1.40	0.52	5	2	ю	ю	1	2.8	<b>Conservative strategy</b>
Total median	0.03	0.04	0.13	2.46	0.31	5	7	ю	S	1	3.2	Balanced strategy
Total mode	0.05	0.03	0.12	0.00	0.26	5	2	Э	1	1	2.4	Conservative strategy
Total minimum	0.18	-337.2	0.84	0.00	-403.57	ю	1	5	1	1	2.2	Conservative strategy
Total maximum	0.02	0.05	0.35	0.97	0.78	5	2	4	7	1	2.8	Conservative strategy
Standard deviation	0.06	0.90	1.57	0.54	2.81	4	5	5	1	5	4.0	Aggressive strategy
			Smā	ull enterpris	es + Medium	-sized ente	erprises in	total – 13	6 enterpris	SS		
Total mean (136)	0.04	0.08	0.26	1.54	0.44	5	3	3	4	1	3.2	Balanced strategy
Total median	0.04	0.03	0.14	2.34	0.27	5	7	б	5	1	3.2	<b>Balanced</b> strategy
Total mode	0.02	0.01	0.02	0.00	0.26	5	7	7	1	1	2.2	Conservative strategy
Total minimum	0.07	-209.9	0.78	0.00	-267.95	4	1	5	-	1	2.4	Conservative strategy
Total maximum	0.06	0.42	0.91	0.70	0.87	4	5	5	1	1	3.2	Balanced strategy
Standard deviation	0.01	0.24	0.56	1.03	0.69	5	5	5	3	1	3.8	Balanced strategy
				Micro (	interprises (u	p to 10 em	ployees) –	51 enterp	rises			
Total mean	0.06	0.08	0.10	3.18	0.83	4	2	ю	ю	1	2.8	<b>Conservative strategy</b>
Total median	0.03	0.09	0.31	2.40	0.28	5	7	ю	e	1	2.8	Conservative strategy
Total mode	0.00	0.00	0.00	0.00	0.00	5	2	3	S	1	2.6	Conservative strategy
Total minimum	0.19	-0.86	0.11	0.00	-8.10	1	1	1	1	1	1.6	Rescue strategy
Total maximum	0.06	0.03	0.03	5.62	0.99	5	5	5	5	ю	4.2	Aggressive strategy
Standard deviation	0.08	0.04	0.04	4.76	1.00	1	1	1	1	0	0.6	Rescue strategy

Table 6

$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	16	WACC	ROA	ROE	Current liquidity	Long-term coverage	WACC (score)	ROA (score)	ROE (score)	Current liquidity (score)	Long-term coverage score	Financial strategy (score)	Financial strategy – verbal evaluation
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					Small er	nterprises (ul	p to 50 em	ployees) –	- 85 enterp	rises			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.04	60.0	0.27	1.52	0.43	4	3	3	3	1	2.8	<b>Conservative strategy</b>
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.04	0.04	0.12	1.84	0.34	5	7	б	ю	1	2.8	Conservative strategy
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.05	0.01	0.02	0.00	0.26	5	2	ю	5	1	2.4	Conservative strategy
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.18	-19.07	0.18	0.00	-104.37	1	1	1	1	1	1.4	Rescue strategy
n         0.05         0.12         0.39         0.99         0.48         1         1         1         2         0         0.7         Rescue strategy $Medium-sized$ enterprises (up to 250 employees) - 41 enterprises         0.04         0.08         0.25         1.55         0.45         5         2         3         4         1         2.8         Conservative strategy           0.00         -0.02         0.00         1.08         0.03         5         2         3         4         1         2.8         Conservative strategy           0.00         -0.02         0.00         1.08         0.00         -3.68         4         1         1         2.8         Conservative strategy           0.01         0.03         0.14         0.3         5         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1		0.04	0.10	0.40	0.95	0.38	5	5	5	5	3	4.2	Aggressive strategy
Medium-sized enterprises (up to 250 employees) - 41 enterprises           0.04         0.08         0.25         1.55         0.45         5         3         4         1         2.8         Conservative strategy           0.04         0.05         0.15         1.85         0.36         5         2         3         4         1         2.8         Conservative strategy           0.00         -002         0.00         1.08         0.00         5         5         5         3         4         1         2.8         Conservative strategy           0.07         0.33         0.64         1.02         0.87         5         5         5         3         4.2         Ageresive strategy           0.07         0.33         0.64         1.02         0.88         0         1         1.8         Rescue strategy           0.04         0.11         0.18         0.23         0.06         1.00         3.47         0.06         Rescue strategy           0.06         0.10         0.00         0.00         0.00         0.00         1.1         1         1         1         1         1         2         Rescue strategy           0.04         0.11 </td <td>ſ</td> <td>0.05</td> <td>0.12</td> <td>0.39</td> <td>0.99</td> <td>0.48</td> <td>1</td> <td>1</td> <td>1</td> <td>2</td> <td>0</td> <td>0.7</td> <td>Rescue strategy</td>	ſ	0.05	0.12	0.39	0.99	0.48	1	1	1	2	0	0.7	Rescue strategy
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				N	Aedium-size	d enterprises	s (up to 251	0 employe	ees) – 41 e	nterprises			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.04	0.08	0.25	1.55	0.45	5	3	3	4	1	3	Balanced strategy
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.04	0.05	0.15	1.85	0.36	2	2	ю	4	1	2.8	Conservative strategy
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.00	-0.02	0.00	1.08	0.00	5	7	б	5	1	2.8	Conservative strategy
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		0.21	-2.89	0.78	0.00	-3.68	4	1	1	1	1	1.8	Rescue strategy
		0.06	0.42	0.91	06.0	0.87	5	5	5	5	3	4.2	Aggressive strategy
Image enterprises (up to 500 employees) – 12 enterprises           0.04         0.11         0.18         2.28         0.68         5         2         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         3         Balanced strategy           0.05         0.18         0.22 <t< td=""><td>n</td><td>0.07</td><td>0.33</td><td>0.64</td><td>1.02</td><td>0.88</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0.6</td><td>Rescue strategy</td></t<>	n	0.07	0.33	0.64	1.02	0.88	0	1	1	1	0	0.6	Rescue strategy
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					Large en	tterprises (up	o to 500 em	- (saecoldu	- 12 enter	prises			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.04	0.11	0.18	2.28	0.68	5	3	3	4	1	3	Balanced strategy
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.04	0.14	0.20	3.47	0.72	5	2	ю	5	1	3.1	<b>Balanced</b> strategy
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.00	0.00	0.00	0.00	0.00	5	2	ю	5	1	7	Conservative strategy
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.08	0.01	0.01	697.33	1.00	4	1	1	1	1	2	Conservative strategy
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.05	0.18	0.22	1.38	1.18	Ś	5	5	5	1	4	Aggressive strategy
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	n	0.06	0.18	0.22	1.38	1.18	1	2	2	2	0	1	Rescue strategy
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					Large	enterprises (;	500 + emp	loyees) – 1	20 enterpr	ises			
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.03	0.03	0.14	1.20	0.48	5	2	ю	3	1	2.8	<b>Conservative strategy</b>
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		0.04	0.02	0.07	1.49	0.24	5	2	ю	ю	1	2.8	Conservative strategy
0.20         -4.69         0.84         0.52         -5.61         4         1         1         1         1         1.8         Rescue strategy           0.02         0.05         0.35         0.97         0.76         5         5         5         3         3.8         Aggressive strategy           n         0.03         0.06         0.32         0.84         0         1         1         1         1         0.6         Rescue strategy		0.00	0.00	0.00	0.00	0.00	5	0	6	б	1	3.8	Balanced strategy
n         0.02         0.05         0.35         0.97         0.76         5         5         5         3         3.8         Aggressive strategy           n         0.03         0.06         0.32         0.85         0.84         0         1         1         1         0.6         Rescue strategy		0.20	-4.69	0.84	0.52	-5.61	4	1	1	1	1	1.8	Rescue strategy
n 0.03 0.06 0.32 0.85 0.84 0 1 1 1 1 0.6 Rescue strategy		0.02	0.05	0.35	0.97	0.76	5	5	5	5	ю	3.8	Aggressive strategy
	n	0.03	0.06	0.32	0.85	0.84	0	1	1	1	1	0.6	Rescue strategy

	Financial strategy – verbal evaluation		<b>Conservative strategy</b>	Balanced strategy	Rescue strategy	Conservative strategy	Conservative strategy	Balanced strategy		<b>Conservative strategy</b>	Conservative strategy	Rescue strategy	Rescue strategy	Aggressive strategy	Aggressive strategy		Balanced strategy	Balanced strategy	Rescue strategy	Conservative strategy	Balanced strategy	Balanced strategy	
	Financial strategy (score)		2.4	3.2	1.4	2.2	2.2	3.8		2.8	2.6	1.8	1.8	4.2	4.2		ю	3.2	1.8	2.2	ŝ	3	
	Long-term coverage score		1	1	1	1	1	5	S	1	1	1	1	3	1		1	1	1	1	1	1	
	Current liquidity (score)		3	5	1	1	1	1	66 enterprise	5	ю	1	1	5	5	prises	4	5	1	1	4	4	
	ROE (score)	orises	2	ю	1	5	3	5	ı total – 13	1	ю	1	1	5	5	- 51 enter]	ю	ю	1	S	3	б	
	ROA (score)	209 enterp	2	2	1	-	2	5	erprises ir	ю	2		1	5	5	nployees) -	2	2	1	1	2	2	
ise Size	WACC (score)	ses total -	4	5	ю	С	4	3	n-sized ent	4	4	S	5	ŝ	5	up to 10 en	S	5	5	e	5	5	
by Enterpr	Long-term coverage	Enterpri	0.56	0.25	0.07	-375.70	0.53	2.43	ises + Mediun	0.46	0.47	0.90	-0.28	1.00	0.29	enterprises (1	0.45	0.27	0.00	-25.89	0.64	0.55	
in 2011	Current liquidity		1.32	2.02	0.00	0.00	0.39	0.66	all enterpr	2.05	1.27	0.00	0.00	27.63	3.20	Micro	1.57	3.34	0.00	0.00	1.69	1.56	
fication	ROE		0.10	0.19	0.00	4.18	0.13	1.31	Sm	-0.62	0.19	0.00	-84.35	6.26	7.78		0.25	0.18	0.00	0.56	0.19	0.24	
y Identi	ROA		0.05	0.05	0.00	-15.12	0.06	0.73		0.08	0.05	0.00	-0.32	1.27	0.17		0.07	0.05	0.00	-14.02	0.05	0.06	
Strateg	WACC		0.12	0.04	0.21	0.21	0.14	0.18		0.06	0.06	0.00	-0.08	0.21	0.04		0.05	0.04	0.00	0.21	0.03	0.04	
Data for Financial	2016		Total mean (209)	Total median	Total mode	Total minimum	Total maximum	Standard deviation		Total mean (136)	Total median	Total mode	Total minimum	Total maximum	Standard deviation		Total mean	Total median	Total mode	Total minimum	Total maximum	Standard deviation	

Table 7

2016	WACC	ROA	ROE	Current liquidity	Long-term coverage	WACC (score)	ROA (score)	ROE (score)	Current liquidity (score)	Long-term coverage score	Financial strategy (score)	Financial strategy – verbal evaluation
				Small	enterprises (u	up to 50 em	ıployees) -	- 85 enterp	rises			
otal mean	0.06	0.06	0.17	1.37	0.45	4	2	3	3	1	2.6	Conservative strategy
otal median	0.04	0.03	0.13	1.80	0.24	5	7	б	4	1	ŝ	Balanced strategy
otal mode	0.00	0.00	0.00	0.00	0.00	5	1	1	1	1	1.8	Rescue strategy
otal minimum	0.21	-223.5	1.47	0.00	-157.52	б	1	5	1	1	2.2	Conservative strategy
otal maximum	0.10	0.25	0.48	1.16	0.81	4	5	4	3	1	3.4	Balanced strategy
tandard deviation	0.07	0.18	0.39	1.10	0.67	4	5	4	3	1	3.4	Balanced strategy
				Medium-siz	zed enterprise	s (up to 25	50 employ	ees) – 41 e	nterprises			
Fotal mean	0.06	0.08	0.20	1.60	0.50	4	2	3	4	1	2.8	Conservative strategy
otal median	0.06	0.05	0.13	3.03	0.39	4	7	ю	5	1	ŝ	Balanced strategy
Total mode	0.00	0.00	0.00	0.00	0.00	5	1	1	1	1	1.8	Rescue strategy
otal minimum	0.21	-2.37	-10.50	0.00	0.23	б	1	1	1	1	1.4	Rescue strategy
otal maximum	0.04	0.05	0.23	1.38	0.48	5	2	з	3	1	2.8	Conservative strategy
standard deviation	0.04	0.08	0.26	1.30	0.56	5	2	3	3	1	2.8	Conservative strategy
				Large (	enterprises (u	p to 500 er	nployees)	– 12 enter	prises			
rotal mean	0.05	0.08	0.13	1.80	0.65	4	3	3	4	1	3	Balanced strategy
otal median	0.08	0.09	0.12	4.31	0.75	4	б	б	5	1	3.2	Balanced strategy
otal mode	0.00	0.00	0.00	0.00	0.00	5	1	1	1	1	1.8	Rescue strategy
otal minimum	0.11	-21.13	-21.30	0.00	0.99	4	1	1	1	ю	7	Conservative strategy
otal maximum	0.17	0.09	0.11	0.73	1.01	с	б	с	1	4	2.8	Conservative strategy
tandard deviation	0.17	0.12	0.13	0.73	1.01	3	3	3	1	4	2.8	Conservative strategy
				Larg	e enterprises (	(500 + emp	oloyees) –	20 enterpr	ises			
otal mean	0.15	0.03	0.06	1.11	0.56	ю	2	2	ю	1	2.2	Conservative strategy
otal median	0.08	0.01	0.03	2.24	0.45	4	2	2	5	1	2.8	Conservative strategy
otal mode	0.00	0.00	0.00	0.00	0.00	5	1	1	1	1	1.8	Rescue strategy
otal minimum	-0.68	-14.79	5.71	0.04	-2.59	5	1	5	1	1	2.6	Conservative strategy
otal maximum	0.06	0.06	0.13	0.42	0.53	4	7	б	1	1	2.2	Conservative strategy
standard deviation	0.16	0.08	0.15	0.50	0.64	3	2	3	1	1	2	Conservative strategy
urce: Own processii	ng (Vensim	ı software).										



#### 3.1. Proposed Dynamic Model of Financial Strategy in E-commerce

The above presented results of financial analysis and identification of financial strategy in e-commerce show that the conservative strategy is most common in e-commerce, followed by balanced strategy focusing on proportional levels of liquidity and profitability, both in 2016, and in 2011. The conservative financial strategy should correspond with stabilisation-focused e-commerce strategy. However, questionnaire inquiry results show that most e-commerce-oriented enterprises focus their e-commerce strategy on progress and further expansion, which should correspond to aggressive financial strategy focusing on high profits and low working capital levels, i.e. lower liquidity. The following Figure 3 in the form of case study proposes a dynamic model of financial strategy in e-commerce allowing follow-up of established changes in individual variables and their effects on changes in the main indicators of economic performance and changes in the overall financial strategy. The model of financial strategy in e-commerce was used for illustration (see Figure 2), using mean values of the individual indicators from balance sheets for the summary calculation for all primarily e-commerce oriented enterprises (n = 209) for 2016. The purpose of the dynamic model of financial strategy in e-commerce is to identify targeted changes in economic performance and their impact on the individual variables and the overall result of the dynamic model. The established changes were followed for a period of the following 36 months, which is the period for which strategic changes in e-commerce are usually manifested. This dynamic model is served for illustration for the area of e-commerce; however, it could be used for individual needs of each e-commerce enterprise as the recommendation for its other long-term development. Mean values in models (Figures 2 and 3) are used for the demonstrating the functions of both models in this paper. In this survey, for each selected enterprise individual financial strategy model has been created.

The following Table 8 shows the variables that are subject to change in the dynamic financial strategy model in e-commerce. The purpose is to focus e-commerce strategy on progress and expansion (for example to new foreign markets), achieved by increased value of short-term payables and loans and long-term payables. The increased passive value by CZK 10,000/month in total should reflect in increased asset value on the free cash side by CZK 10,000 and further by purchases of fixed assets the value of which would thus increase by CZK 10,000/month. Further passive increase is assumed by the dynamic model by increase of net profit by CZK 10,000. The increased asset and liability value will also reflect in a change in the capital structure. What may be assumed is that the no-risk rate and the business risk will decrease in the course of the following 36 months by -0.01%/month and the risk premium for financial stability and

business size will decrease as a consequence of the increased asset value by -0.1%/month. The increased value of short-and long-term liabilities and loans will increase costs by 0.2%/month.

#### Table 8

Established Changes in Dynamic Model of Financial Strategy in E-commerce

Change in dynamic model	Subject of change (in the course of 36 months)
Total change of assets	CZK 20,000 thousand per month
Change of cash	CZK 20,000 thousand per month
Change of EAT (net profit)	CZK 10,000 thousand per month
Change of short-term payables and loans	CZK 5,000 thousand per month
Change of long-term payables and loans	CZK 5,000 thousand per month
Change of no-risk rate	-0.01% per month
Change of business risk	-0.01% per month
Change of risk premium for financial stability	-0.1% per month
Change of risk premium for enterprise size	-0.1% per month
Change of costs of debts	0.2% per month

Source: Own processing.





Source: Own processing (Vensim software).

The established changes in the dynamic model of financial strategy in e-commerce were manifested by changes in the main indicators of the model, as shown by the following Diagram 2. The diagram shows changes in the following indicators: ROE, ROA, current (total) liquidity, long-term coverage and WACC in the course of the defined period of 36 months. The changes in the input indicators of the dynamic model will subsequently be manifested in changes scoring of the final financial strategy. Although the dynamic model is simulated for 36 months, the required change of the original financial strategy (2.8) to the current aggressive financial strategy (4) will already be manifested after 7 months. The condition, before and after the change in the dynamic model of financial strategy in e-commerce, is shown by the following Table 9. The model represents a simplification of the reality and the financial standing of the enterprises and yet it is able to simulate how targeted changes in selected financial indicators may reflect in a change of financial strategy, which should be in harmony with the e-commerce strategy. This model has its practical application in the given area and will further be used for construction and simulation of a process model of strategic management in e-commerce.

#### Table 9

Input values in financial strategy model	Value before change (in CZK K) (n = 209, arithmetic mean in 2016)	Value after change (in CZK K) (after 36 months)
Assets total	306,697	1,026,697
Receivables	63,848	63,848
Inventories	102,902	102,902
Cash	0	720,000
Short-term financial assets	35,015	35,015
EAT (Earnings after taxes)	17,190	377,190
Undivided profit	41,414	41,414
Registered capital	31,531	31,531
Funds	10,038	10,038
Change of short-term payables		
and loans	144,006	324,006
Change of long-term payables		
and loans	52,475	232,475
Reserves	5,759	5,759
No-risk rate	0.48	0.13
Business risk	2.63	2.49
Risk premium for financial stability	5.36	1.77
Risk premium for business size	4.94	4.59
Costs of debts	0	7.2
ROE	0.1716 (3)	0.8197 (5)
ROA	0.0561 (2)	0.3674 (5)
Total liquidity	1.4011 (3)	2.8449 (5)
Long-term coverage indicator	0.5164 (1)	0.6802 (1)
WACC	0.044 (5)	0.071 (4)
Financial strategy	Conservative strategy (2.8)	Aggressive strategy (4)*

Original	Values and	Values after	Changes in D	<b>Dynamic Model</b>	of Financial Strategy

Source: Own processing, \*aggressive strategy achieved after 7 months.



For comparison and illustration (Figure 4), another dynamic model of financial strategy only for the area of small and medium-sized enterprises (n = 136 in total) has been created. For e-commerce SMEs category, a conservative financial strategy dominates in the observed year. The input data from Table 10 for this dynamic model has been used based on the same principle as in Table 8, but respecting the value of Assets and other variables for e-commerce SMEs. The condition, before and after the change in the dynamic model of financial strategy in e-commerce, is shown by the following Table 11. The established changes in the dynamic model of financial strategy in e-commerce were manifested by changes in the main indicators of the model, as shown by the following Diagram 3.

#### Diagram 3

Development of Final Indicators in Dynamic Model of Financial Strategy for SMEs in 36 Months



Source: Own processing (Vensim software).

Although the dynamic model is simulated for 36 months, the required change of the original balanced financial strategy (3.2) to the current aggressive financial strategy (5) will already be manifested after 12 months. The condition, before and after the change in the dynamic model of financial strategy in e-commerce, is shown by the following Table 10.

# Table 10

Established Changes in Dynamic Model of Financial Strategy in E-commerce

Change in dynamic model	Subject of change (in the course of 36 months)	
Total change of assets	CZK 2,000 thousand per month	
Change of cash	CZK 2,000 thousand per month	
Change of EAT (net profit)	CZK 1,000 thousand per month	
Change of short-term payables and loans	CZK 500 thousand per month	
Change of long-term payables and loans	CZK 500 thousand per month	
Change of no-risk rate	-0.01% per month	
Change of business risk	-0.01% per month	
Change of risk premium for financial stability	-0.01% per month	
Change of risk premium for enterprise size	-0.01% per month	
Change of costs of debts	0.02% per month	

Source: Own processing.

# Table 11

# Original Values and Values after Changes in Dynamic Model of Financial Strategy for SMEs

Input values in financial strategy model	Value before change (in CZK K) (n = 136, arithmetic mean in 2016)	Value after change (in CZK K) (after 36 months)
Assets total	93,233	163,233
Receivables	19,185	19,185
Inventories	38,643	38,643
Cash	0	70,000
Short-term financial assets	19,098	19,098
EAT (Earnings after taxes)	7,883	42,883
Undivided profit	15,978	15,978
Registered capital	3,484	3,484
Funds	3,201	3,201
Change of short-term payables		
and loans	49,920	67,420
Change of long-term payables		
and loans	9,616	27,116
Reserves	1,161	1,161
No-risk rate	0.48	0.13
Business risk	2.63	2.28
Risk premium for financial stability	4.23	3.87
Risk premium for business size	4.98	4.62
Costs of debts	0	0.72
ROE	0.25807 (3)	0.659439 (5)
ROA	0.0845516 (3)	0.265583 (5)
Total liquidity	1.54099 (4)	2.19267 (5)
Long-term coverage indicator	0.438386 (1)	0.5769 (1)
WACC	0.0408373 (5)	0.0478068 (5)
Financial strategy	Balanced strategy (3.2)	Aggressive strategy (4.2)*

Note: \*aggressive strategy achieved after 12 months.

Source: Own processing,



Source: Own processing (Vensim software). Note: An example of dynamic model of financial strategy in e-commerce and calculation with the help of financial strategy model in e-commerce.

Based on the comparison of both dynamic model (Figure 3 and 4), it can be concluded the principles for dynamic financial strategy modelling could be used for any category of businesses regardless their size. It is generally recommended to apply in aggressive financial strategy that corresponds with a long-term expansion of the e-commerce area.

#### 4. Discussion

Due to the progress in the field of information technologies and new business models e-commerce has found its way to many areas of human activity (education, shopping, travel etc.). There is an obvious difference between businesses using mainly traditional and electronic trading. That is also the reason for the difference between finance management in traditional and e-commerce enterprises. Finance management in e-commerce can use a wider range of options. A study on finance management is very important, especially for sustainable development of e-commerce enterprises. Electronic commerce is often based on a new business model existing in browser and server applications and offering trading activities for people all over the world (Li, 2017). A network financial system is the optimum method of centralised finance management as it helps collectively distribute funds across all branches of a large company. Another important level of finance management in e-commerce is coordination of finance and enterprising, significantly facilitated by the current Internet speed (Tu, 2016).

Deepening and broadening of research on e-commerce requires updating the traditional theories of corporate finance management. The traditional finance management model was difficult to adapt to the needs of e-commerce, and so it is necessary to investigate finance management options in the e-commerce context, and not only on the theoretical level but also, and mainly, on the level of practical implementation (Lili, 2016). The concept of network financing and implementation of an appropriate strategy is a significant innovation in the theory of corporate finance management of e-commerce businesses directly determines whether finance management of e-commerce businesses is effective or not, to a large extent influencing success and failure of e-commerce enterprising. Decentralisation of finance management is the main feature of e-businesses prevailingly trading electronically. A shared finance service centre is an important assumption for building e-commence corporate finance (Jia, 2016).

In the era of information technologies finance management is influential and should be seen as the basis of corporate governance helping capitalise options of business development. Traditional models of finance management are known: centralised type, decentralised type and type fusion of centralisation and decentralisation. E-commerce cannot accept these traditional models anymore. The new financial processes have given rise to a new finance management model with significant theoretical background and accounting procedures: a network of financial services creates an environment for financial and governance processes and corporate integration on all levels. Dynamic Resource Planning (DRP) is different from the current Enterprise Resource Planning (ERP). ERP must be improved to be usable for e-commerce, must be integrated across the financial system and combined with financial networks of e-commerce (Cui, 2016).

E-commerce determines two types of financial strategies and objectives of e-shops. The first is the aim to achieve *maximum profit*. Enterprises should reduce their costs and improve their income with the aim to increase profit to be invested on their further development (Tu, 2016). Global companies possess significant advantage in affecting Internet prices of consumer goods thanks to quantity-based cost-saving. Global companies in developed countries, such as Amazon, can use their resources and network scale to easily weaken local markets in developing countries (Broome, 2016). The other financial strategy aims at maximum corporate value, including long-term stability of market price maximisation (Tu, 2016). These strategies are the same for all prevailingly e-commerce based companies but there are more factors to be considered, for e-commerce enterprises differ from traditional enterprises. They work much more with electronic information sources using them in manufacture, operation and management (Tu, 2016). Critical factors of success in e-commerce include: added value, regional focus, expansion, maintenance of geographic flexibility and segmentation, implementation of appropriate technology for critical perception management, provision of exceptional services, creation of an effective lint to and understanding the culture of the local market (Villa et al., 2018). Depending on the company skills these changes may create new opportunities and offer new challenges such as a shift from manufacturer depending on wholesale companies providing market access to direct dealing with end customers (Broome, 2016). Nevertheless, no coherent models dealing with proposing relevant financial strategy for businesses or even exploring the financial standing or financial strategy in e-commerce have been designed in research field yet. Therefore, the proposed dynamic financial strategy model in e-commerce in this paper could be the solution for main issues of financial models in e-commerce mentioned above.

#### Conclusion

The results of the financial analysis show that the long-term coverage indicator is the most problematic area in both studied years, which means that most enterprises with primary focus on e-commerce are long-term undercapitalised, i.e. part of their fixed assets is partly covered by short-term sources (regardless the enterprise size). This is also connected with unbalanced capital structure where short-term payables dominate in both years (regardless the enterprise size). Another interesting finding is that there were no significant differences between the two years (regardless the enterprise size), which means that the companies focus on high levels of liquidity, achieved by increased levels of short-term receivables. Another discrepancy was found between the receivable turnover and receivable collection period, which may cause cash-flow issues. To summarise, businesses with primary focus on e-commerce, regardless their size, are oriented towards short-term financing, not considering, in most cases, long--term financing of enterprise development. This approach also causes overall lower economic performance, not corresponding to the general progress of electronic trade and the majority development-oriented strategy of e-commerce business. The analysis and evaluation of economic performance, based on the indicators of profitability, liquidity, indebtedness and costs of total capital, in connection with identification of e-commerce financial strategy, was performed with the aim to assess the effect of the selected e-commerce financial strategy on the type of selected e-commerce strategy and strategic management process. At the same time the results of financial analysis in e-commerce assessed the overall financial standing of enterprises with primary focus on e-commerce in connection with evaluation of the role of the strategic management process in e-commerce.

The most common type of financial strategy in e-commerce is the conservative strategy (regardless the enterprise size), focusing on higher values of working capital, higher levels of liquidity with lower levels of profitability. This type of financial strategy should correspond to the e-commerce strategy focused on stabilisation on the market. However, the questionnaire inquiry results show that most enterprises with primary focus on e-commerce orient their e-commerce strategy towards development and expansion (regardless the enterprise size). However, their conservative financial strategy limits them in further strategic development of their e-commerce and also in further increase of their economic performance in the field of their primary orientation, which is e-commerce. Hence the proposed dynamic model of financial strategy in e-commerce, which is able to simulate the intended strategic economic aims across a defined period of time and their changes in time. The dynamic model of financial strategy is at the same time able to identify consequences of the implemented economic changes in time and their impact on overall economic results and change of the original financial strategy in e-commerce. Our dynamic model of financial strategy in e-commerce simulated the change of the conservative financial strategy in sum for all enterprises with primary focus on e-commerce to the aggressive financial strategy, focused on higher profitability and lower liquidity, and corresponding to the prevailing e-commerce business strategy focused on progress. The results of the basic and the dynamic model of financial strategy in e-commerce are subsequently used for proposal and simulation of the basic and the dynamic business process model of strategic management in e-commerce. The business process model defines the level of dependence of the current financial strategy identified on the basis of the financial strategy model in e-commerce on the individual phases of the model of strategic management in e-commerce. The main benefits of this paper for theory and practice are based on financial strategy modelling and its application for the area e-commerce. No relevant researches are dealing with this similar issue. The results of this paper and principles of modelling can be used for other research activities.

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