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# Identifying factors affecting financial technology in small and medium businesses using Grounded theory and structural equation model

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#### Abstract

The purpose of this research was to identify the factors affecting financial technology in small and medium businesses using Grounded theory and structural equation model. The method used in this study was a hybrid method including a qualitative method based on the Grounded theory approach and a quantitative method based on the structural equation approach. In the present study, the data obtained from the text of the interviews were analyzed by MAXQDA software in order to increase the accuracy and speed of the research. Based on the qualitative tactics of content analysis and the foundation's data strategy, 98 initial codes were obtained. Three concepts of economic and employment factors, innovation in the economy and change in customers' behavior were obtained as causal conditions affecting the central phenomenon (formation of the financial technology market). The coefficients obtained from the structural equations show that the variables of economic and employment factors, innovation in the economy and the change in customer behavior have a positive and significant effect on the formation of the financial technology market.

Keywords: Financial technology, Small and medium businesses, Grounded theory, Structural equations 2020 MSC: 91G15

## 1 Introduction

The word fintech is simply a combination of the words finance and technology. This term means using technology to provide financial services and products to consumers. This action can be in the fields of banking, insurance, investment and anything related to finance [2]. Although this term is a relatively new word, the field of fintech is actually not so new. Technology has always changed the financial industry. However, the internet, along with the widespread use of devices such as smartphones and tablets, means that the pace of this change has increased significantly in recent years [7].

Fintech has expanded to include technological innovations in the financial sector, including the advancement of financial literacy, counseling and education, lending and borrowing, banking, money transfer or payment, and investment management. Also, this technology includes the development and use of cryptocurrency such as Bitcoin [10]. Broadly, the term financial technology can be applied to any innovation in how people interact with business,

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from the invention of digital money to double-entry bookkeeping [6]. Due to the internet revolution, as well as the mobile internet and smart phone revolution, financial technology has grown exponentially, and fintech, which originally referred to the computer technology behind the scenes of banks or commercial companies, now includes a variety of technological interventions. describes it as personal and commercial property [1].

Small and medium businesses are private economic enterprises that have a small market share of the local customer base and play an important role in the revitalization of local communities. These businesses usually fight for their survival and are vulnerable in the competition with big companies [5]. On the other hand, these types of businesses lack financial and human resources that can be obtained in large companies for customer management. But new companies create new jobs, open opportunities for greater social mobility, foster economic flexibility, and strengthen competitiveness and economic productivity, they are important for economic growth [9].

By definition, small and medium business is a business that often belongs to the private sector and the number of its employees is limited and the sales of its products are almost small. The concept of small in this definition is variable and depends on the type of activity or the country under investigation [1]. The Georgia Institute of Technology has come up with fifty different definitions in its survey of 57 countries. This number varies from less than 8 people in China to 500 people working in the United States. In Germany, businesses with fewer than 10 employees are considered small [6]. In Iran, businesses with 9 or less employees are considered small businesses; Of course, in the definition of small businesses, in addition to the number of employees, other indicators such as annual sales, financial turnover, asset value, net profit and investment volume are very important.

Small and medium businesses are recognized as important elements in economic-social developments in most countries. These businesses are especially important in creating job opportunities with low investments, regional development, organizational development of companies based on technology principles, product innovation and creating new methods [8]. A look at the economic-social system in many advanced and newly developed countries of the world shows that the creation and support of small and medium businesses is one of the basic priorities in the economic development programs of these countries. Despite the fact that these economic enterprises require less investment, they are more productive and play an important role in creating employment, creating a suitable platform for innovation and inventions, and increasing the exports of these countries. In many countries, these companies have been the main providers of new employment, the cradle of transformation and innovation, and the pioneers in inventing new technologies [9]. On the other hand, these businesses can have many attractions for the private sector due to their unique features. This has been introduced as a successful model for scientific and industrial empowerment, depending on the internal economic conditions of countries, laws and support policies in different countries.

Despite the great importance of small businesses in the economy and employment, these businesses in developing countries face many problems and their full capacity is not used. More than 99% of small and medium-sized companies fail; While they are not paid much attention and all the attention is directed to a few companies that have had significant success [4]. The conducted analyzes confirm that these companies face failure after a short period of time and withdraw from the economic cycle. One of the reasons for this failure is not having a specific marketing model and following the marketing model of big companies. While considering the prominent role of these businesses, it is desirable for these companies to benefit from a specific marketing model [3].

For example, the report of "Business News Daily" site on the views and predictions of experts on the state of small businesses in 2017 shows that the prevailing atmosphere in the business arena is based on increasing investments under the shadow of economic certainty and focusing on specific and small target markets [9]. In the opinion of Carla Ferberg, sales manager of financial services company Balboa Capital, "in 2017, increasing the confidence of small and medium-sized businesses regarding the economic conditions can lead to the formation of new trends related to investment. During the last weeks of 2016, we have seen signs of the strengthening of the global economy and the stock market, and this increases the optimism of business owners. Kyle Golding, director of strategy at Golding Group, points out: "In the coming years, the secret of success for businesses is to focus on specific and small target markets. According to the above explanations, this research identifies the factors affecting financial technology in small and medium businesses?

#### 2 The research method

The method used in this study was a hybrid method including a qualitative method based on the Grounded theory approach and a quantitative method based on the structural equation approach. The research was conducted in three stages. The first step, which was done qualitatively, the data are collected through structured interviews with a statistical sample (experts). In the second stage, key themes were extracted and converted into the corresponding model. In the last step, the extracted model was tested, which was done quantitatively. The current research has two groups of statistical population. In the qualitative part, the statistical population includes all university specialists and experts who have at least a related doctoral degree (management). Also, the statistical population includes small and medium business owners who have been active in fintech for at least 15 years. Also, the interview was conducted with the purposeful sampling method and the sampling continued until the saturation of the data. Data saturation is one of the prominent features of qualitative research in which sampling continues until a certain time; that no new information is obtained for the researcher. For the selection of participants, two criteria of scientific specialization "having sufficient knowledge in the field of fintech" and scientific experience "having at least 15 years of work experience in small and medium business owners and familiar with fintech" were considered. The sample included 7 university lecturers and management experts, 5 small and medium business owners. The data almost reached saturation in sample 12 and the codes became repetitive. The statistical population in the quantitative part is all the employees of small businesses. In the quantitative part of this study, sampling was done according to the condition of the unlimited statistical population using the available non-probability method. It should be noted that the determination of the sample size of the research was determined using the precise determination of the statistical population and the use of Cochran's formula. The nature of Cochran's formula is such that for a high volume of N, it obtains a value between 380 and finally 384 people. For example, if the population size changes from 30 thousand people to 3 million people, the required sample size will change from 380 people to 384 people. Based on this, according to the unlimited statistical population, the default sample size was estimated to be 384 employees and it is possible that this number will increase.

#### 2.1 Grounded theory

Grounded theory is a systematic methodology that has been largely applied to qualitative research conducted by social scientists. The methodology involves the construction of hypotheses and theories through the collecting and analysis of data. Grounded theory involves the application of inductive reasoning. The methodology contrasts with the hypothetico-deductive model used in traditional scientific research. A study based on grounded theory is likely to begin with a question, or even just with the collection of qualitative data. As researchers review the data collected, ideas or concepts become apparent to the researchers. These ideas/concepts are said to "emerge" from the data. The researchers tag those ideas/concepts with codes that succinctly summarize the ideas/concepts. As more data are collected and re-reviewed, codes can be grouped into higher-level concepts and then into categories. These categories become the basis of a hypothesis or a new theory. Thus, grounded theory is quite different from the traditional scientific model of research, where the researcher chooses an existing theoretical framework, develops one or more hypotheses.

#### 2.2 Structural equation model

Structural equation modeling (SEM) is a multivariate, hypothesis-driven technique that is based on a structural model representing a hypothesis about the causal relations among several variables. In the context of fMRI, for example, these variables are the measured blood oxygen level-dependent time series  $y_1, ..., y_n$  of n brain regions and the hypothetical causal relations are based on anatomically plausible connections between the regions. The strength of each connection  $y_i \rightarrow y_j$  is specified by a so-called path coefficient which, by analogy to a partial regression coefficient, indicates how the variance of  $y_i$  depends on the variance of  $y_j$  if all other influences on yj are held constant. The statistical model of standard SEM can be summarized by the equation:

$$y = Ay + \mu \tag{2.1}$$

where y is an  $n \times s$  matrix of n area-specific time series with s scans each, A is an  $n \times n$  matrix of path coefficients (with zeros for absent connections), and u is an  $n \times s$  matrix of zero mean Gaussian error terms, which are driving the modeled system. Parameter estimation is achieved by minimization of the difference between the observed and the modeled covariance matrix  $\Sigma$ . For any given set of parameters,  $\Sigma$  can be computed by transforming eqn:

$$y = (I - A)^{-1}\mu$$
 (2.2)

$$\sum = yy^T \tag{2.3}$$

$$\sum = (I - A)^{1} u u^{T} (I - A)^{-1^{T}}$$
(2.4)

$$Y = (I - \beta) = \varepsilon \tag{2.5}$$

or

$$Y = \varepsilon (1 - \beta)^{-1} \tag{2.6}$$

$$\sum = (y^T y) \tag{2.7}$$

$$\sum = (1 - \beta)^{-T} (\varepsilon^T \varepsilon) (1 - \beta)^{-1}$$
(2.8)

The sample covariance is:

$$S = \frac{1}{n-1} Y^T Y \tag{2.9}$$

where n is the number of observations and the maximum likelihood objective function is:

$$F_{ML} = \ln \left| \sum \left| -tr(S\sum^{-1}) - \ln \left| S \right| \right|$$
(2.10)

where I is the identity matrix. The first line of equation (2.4) can be understood as a generative model of how system function results from the system's connectional structure: the measured time series y results by applying a function of the interregional connectivity matrix – that is,  $(I - A)^{-1}$  to the Gaussian innovations u.

The PLS framework can be summarized into three matrix equations, two for the measurement model component and one for the path model component. For the measurement model component,

$$X = \Lambda_x \xi + \delta \tag{2.11}$$

$$Y = \Lambda_y \eta + \delta \tag{2.12}$$

where x is a  $p \times 1$  vector of observed exogenous variables, and it is a linear function of a  $j \times 1$  vector of exogenous latent variables  $\xi$  and a  $p \times 1$  vector of measurement error  $\delta$ .  $\Lambda_x$  is a  $p \times j$  matrix of factor loadings relating x to  $\xi$ . Similarly, y is a  $q \times 1$  vector of observed endogenous variables,  $\eta$  is a  $k \times 1$  vector of endogenous latent variables,  $\varepsilon$  is a  $q \times 1$  vector of measurement error for the endogenous variables, and  $\Lambda_y$  is a  $q \times k$  matrix of factor loadings relating y to  $\eta$ . Associated with (2.11) and (2.12), respectively, are two variance-covariance matrices,  $\Theta \delta$  and  $\Theta \varepsilon$ . The matrix  $\Theta \delta$ is a  $p \times p$  matrix of variances and covariances among measurement errors  $\delta$ , and  $\Theta \varepsilon$  is a  $q \times q$  matrix of variances and covariances among measurement errors  $\varepsilon$ . For flexibility, PLS describes the path model component as relationships among latent variables,

$$\eta = B\eta + \Gamma\xi + \zeta \tag{2.13}$$

where B is a  $k \times k$  matrix of path coefficients describing the relationships among endogenous latent variables,  $\Gamma$  is a  $k \times j$  matrix of path coefficients describing the linear effects of exogenous variables on endogenous variables, and  $\zeta$  is a  $k \times 1$  vector of errors of endogenous variables. Associated with (2.13) are two variance-covariance matrices:  $\Phi$  is a  $j \times j$  variancecovariance matrix of latent exogenous variables, and  $\Psi$  is a  $k \times k$  matrix of covariances among errors of endogenous variables. With only these three equations, PLS is a flexible mathematical framework that can accommodate any specification of a SEM model. SEM has been typically implemented through covariance structure modeling where the variance-covariance matrix is the basic statistic for modeling. Model fitting is based on a fitting function that minimizes the difference between the model-implied variance-covariance matrix  $\Sigma$  and the observed variance-covariance matrix S,

$$\min f(\sum, S) \tag{2.14}$$

where S is estimated from observed data,  $\sum$  is predicted from the causal and noncausal associations specified in the model, and  $f(\sum, S)$  is a generic function of the difference between  $\sum$  and S based on an estimation method that follows. As Shipley concisely stated, causation implies correlation; that is, if there is a causal relationship between two variables, there must exist a systematic relationship between them. Hence, by specifying a set of theoretical causal paths, one can reconstruct the model-implied variance-covariance matrix  $\sum$  from total effects and unanalyzed associations. Hayduk outlined a step-by-step formulation under the PLS mathematical framework, specifying the following mathematical equation for  $\sum$ :

$$\sum = \begin{bmatrix} \Lambda_y A (\tilde{A} \ddot{O}' \tilde{A} + \emptyset) \dot{A} \dot{A}_y \dot{E}_{a}^* & \Lambda_y A \tilde{A} \ddot{O} \dot{A}_x \\ \Lambda_x \ddot{O} \dot{A} A \dot{y} & \Lambda_x \ddot{O} A_x \dot{+} \dot{E}_{a} \end{bmatrix}$$
(2.15)

where  $A = (I - B)^{-1}$ . Note that in (2.15) the derivation of  $\sum$  does not involve the observed and latent exogenous and endogenous variables (i.e.,  $x, y, \xi$ , and  $\eta$ ). A common method in SEM for estimating parameters in  $\sum$  is maximum likelihood (ML). In ML estimation, the algorithm iteratively searches for a set of parameter values that minimizes the deviations between elements of S and  $\Sigma$ . This minimization is accomplished by deriving a fitting function  $f(\Sigma, S)$ (2.15) based on the logarithm of a likelihood ratio, where the ratio is the likelihood of a given fitted model to the likelihood of a perfectly fitting model. The maximum likelihood procedure requires the endogenous variables to follow a multivariate normal (MVN) distribution, and S to follow a Wishart distribution. Hayduk described the steps in the derivation and expressed the fitting function  $F_{ML}$  as

$$F_{ML} = \log |\sum| + tr(S\sum^{-1}) - \log |S| + tr(SS^{-1})$$
(2.16)

where tr refers to the trace of a matrix and  $\sum$  and S are defined as above. Proper application of (2.16) also requires that observations are independently and identically distributed and that matrices  $\sum$  and S are positive definite. After minimizing (2.16) through an iterative process of parameter estimation, the final results are the estimated variancecovariance matrices and path coefficients for the specified model. The first is the overall model chi-square test based on a test statistic that is a function of the mentioned fitting function  $F_{ML}$  (2.16) as follows:

$$X_M^2 = (n-1)F_{ML} (2.17)$$

where n is sample size and  $X_M^2$  follows a chi-square distribution with degree of freedom  $df_M$  as defined above. Subsequently, a P value is estimated and evaluated against a significance level. The overall model chi-square test is only applicable for an overidentified model, that is, when  $df_M > 0$ . A justidentified model ( $df_M = 0$ ), for example, a path model representation of a multiple regression, does not have the required degrees of freedom for model testing.

The second fit statistic to consider is the Root Mean Square Error of Approximation (RMSEA), which is parsimonyadjusted index that accounts for model complexity. The index approximates a noncentral chi-square distribution with the estimated noncentrality parameter as

$$\delta_M = \max(X_M^2 - df_M, 0) \tag{2.18}$$

where  $X_M^2$  is computed from (2.17) and  $df_M$  is defined above. The magnitude of  $\hat{\delta}_M$  reflects the degree of misspecification of the fitted model. The RMSEA is then defined as

$$RMSEA = \sqrt{\frac{\hat{\delta}_M}{(n-1)df_M}}$$
(2.19)

Lastly, the Joreskog-Sorbom Goodness of Fit Index (GFI) is a measure of relative amount of variances and covariances jointly accounted for by the model, and it is defined as

$$GFI = 1 - \frac{tr(\sum^{-1} S - 1)^2}{tr(\sum^{-1} S)^2}$$
(2.20)

where I is identity matrix. GFI ranged from 0 to 1.0 with 1.0 indicating the best fit.

### 3 Research findings

#### 3.1 Qualitative findings

Based on the qualitative tactics of content analysis and the foundation's data strategy, 98 initial codes were obtained. After determining the primary codes extracted from the semantic units, based on the frequency in the form of the importance coefficient formula, it was checked which of the primary codes have more or less importance coefficient in terms of frequency. According to the results of the codes, the establishment of fintech regulatory laws has the highest coefficient of importance with a frequency of 42. Human resource management codes, correct use of western knowledge, economic innovation, e-commerce development, academic courses in line with technological progress, lack of team spirit, difficult market making process, high operational risk and promotion of entrepreneurship index and development of collaborative economy with only one repetition they were of the least importance. At the beginning, there was a main foundation and structure (institutional vacuum) in the research issue. Therefore, in the phenomenological model, the researcher tried to establish the relationship between the created categories with the desired structure and also with other structures. After the selective coding, the relationship between the categories at different levels, conditional routing and axial coding were done, and in the final step, the final theory and model were explained. According to Glaser's theory, theory creation or hypothesis building between the codes of a set should be done based on the researcher's opinion and in a completely qualitative manner. In developing the model, first

the components are determined, then the relationship between them is explained, and then the logic of selecting the components and the relationship between them is stated. 8 main categories in various sets of conditions for the formation of small and medium-sized businesses based on financial technology (FinTech), in the form of causal conditions, central category, intervening factors, contextual factors, strategies and consequences; was extracted.

Three concepts of economic and employment factors, innovation in the economy and change in customers' behavior were obtained as causal conditions affecting the central phenomenon (formation of the financial technology market). The institutional vacuum as a single idea has been the basis for the formation of the financial technology market, which has the largest share in predicting the behavior of its code with 42 defined codes. Institutional vacuum includes the concepts of lack of agility of companies, inefficiency of companies, uncertain legal environment, emerging market of Iran, inefficient judicial systems, and lack of recognition of customer needs by small and medium businesses (companies). The development of the financial technology ecosystem was considered as a strategy. The development of financial technology ecosystem includes the concepts of human resource management, development of collaborative economy, promotion of entrepreneurship index, support for risky investment, technological products, crisis management, creation of indigenous business model, development of e-commerce and research in the field of financial technology. The development of digital technology challenges are an interfering factor that affects strategies; has been identified. It was identified that financial technology challenges are an interfering factor that affects strategies. This concept includes the categories of cultural and operational problems in business, venture capital, the state and type of Iran's economy, the need for culture and public trust, and the legal prohibition of the growth of financial technology. In the end, the resulting consequences include the model of small and medium businesses.

#### 3.2 Qualitative findings

To evaluate the normality of the distribution of the main variables, the valid Kolmogorov-Smirnov test is used. In interpreting the test results, if the observed error level more than 0.05, in that case, the observed distribution is the same as the theoretical distribution and there is no difference between them. That is, the obtained distribution is normal distribution.

Table 1: Variables Normality Test					
Variable	$\mathbf{Sig}$	Result			
Economic and employment factors	0.272	Normal			
Innovation in economics	0.186	Normal			
changing customer behavior	0.328	Normal			
Financial technology	0.203	Normal			
changing customer behavior Financial technology	0.180 0.328 0.203	Normal Normal			

According to the values obtained from Smirnov-Kolmogorov statistics (table 1), it can be inferred that the expected distribution is not significantly different from the observed distribution for all variables and so the distribution of these variables is normal.

In this research, to identify and measure the latent variables, confirmatory factor analysis has been used. In performing the factor analysis, we must first be sure to use the available data that is required for analysis, to ensure this, the KMO index is used. By using this test, we can ensure the adequacy of sampling. This index is in the range of 0 to 1, if the index value is close to one, the desired data are suitable for factor analysis and otherwise, the results of factor analysis are not suitable for the desired data.

[able]	2: Results of KMO in	dex and Bartlett's test of structures of	<u>research variables</u>
	Sampling adequ	acy ratio coefficient KMW	0.256
	Bartlett's test	Chi-square test	693.7319
Dal tiett 5 test	Sig	0.000	

According to the above results, the amount of sampling adequacy for research structures is 0.256. Therefore, the sample size is appropriate for using structural equations. Generally, high values (close to 1) show that factor analysis is applicable to data. If this value is less than 0.5, the results of factor analysis probably will not be useful for the data. Also, Bartlett's Test of Sphericity is significant (because its significance level is less than the test level), so, the relation between variables or their covariance matrix is suitable for factor analysis. Table 3 shows the research structural model in which the estimated regression coefficients between the variables of research structural model are displayed.

Table 5. The results of fitting the research structural model						
Variables	Coefficient	$\mathbf{t}$	$\mathbf{Sig}$			
Economic and employment factors $\longrightarrow$ Financial technology	0.36	5.38	0.000			
Innovation in economics $\longrightarrow$ Financial technology	0.59	7.18	0.000			
Changing customer behavior $\longrightarrow$ Financial technology	0.19	5.03	0.000			

Table 3: The results of fitting the research structural model

The coefficients obtained from the structural equations show that the variables of economic and employment factors, innovation in the economy and the change in customer behavior have a positive and significant effect on the formation of the financial technology market.

## 4 Conclusion

The purpose of this research was to identify the factors affecting financial technology in small and medium businesses using Grounded theory and structural equation model. The method used in this study was a hybrid method including a qualitative method based on the Grounded theory approach and a quantitative method based on the structural equation approach. The research was conducted in three stages. The first step, which was done qualitatively, the data are collected through structured interviews with a statistical sample (experts). In the second stage, key themes were extracted and converted into the corresponding model. In the last step, the extracted model was tested, which was done quantitatively. At the qualitative stage, the statistical population consists of two groups. The current research has two groups of statistical population. In the qualitative part, the statistical population includes all university specialists and experts who have at least a related doctoral degree (management). Also, the statistical population includes small and medium business owners who have been active in fintech for at least 15 years. The sample included 7 university lecturers and management experts, 5 small and medium business owners. The statistical population in the quantitative part is all the employees of small businesses. In the quantitative part of this study, sampling was done according to the condition of the unlimited statistical population using the available non-probability method. The nature of Cochran's formula is such that for a high volume of N, it obtains a value between 380 and finally 384 people. Based on this, according to the unlimited statistical population, the default sample size was estimated to be 384 employees. In the present study, the data obtained from the text of the interviews were analyzed by MAXQDA software in order to increase the accuracy and speed of the research. Based on the qualitative tactics of content analysis and the foundation's data strategy, 98 initial codes were obtained. Three concepts of economic and employment factors, innovation in the economy and change in customers' behavior were obtained as causal conditions affecting the central phenomenon (formation of the financial technology market). The institutional vacuum as a single idea has been the basis for the formation of the financial technology market, which has the largest share in predicting the behavior of its code with 42 defined codes. Institutional vacuum includes the concepts of lack of agility of companies, inefficiency of companies, uncertain legal environment, emerging market of Iran, inefficient judicial systems, and lack of recognition of customer needs by small and medium businesses (companies). The development of the financial technology ecosystem was considered as a strategy. The development of financial technology ecosystem includes the concepts of human resource management, development of collaborative economy, promotion of entrepreneurship index, support for risky investment, technological products, crisis management, creation of indigenous business model, development of ecommerce and research in the field of financial technology. The development of digital technology as a background condition that affects strategies; has been identified. It was identified that financial technology challenges are an interfering factor that affects strategies. This concept includes the categories of cultural and operational problems in business, venture capital, the state and type of Iran's economy, the need for culture and public trust, and the legal prohibition of the growth of financial technology. In the end, the resulting consequences include the model of small and medium businesses. The coefficients obtained from the structural equations show that the variables of economic and employment factors, innovation in the economy and the change in customer behavior have a positive and significant effect on the formation of the financial technology market.

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