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Functional Competencies of CEOs of New Technology-Based Firms: Present a Model

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ABSTRACT

The main purpose of this paper is to present a functional competencies model of CEOs' technology-based firms. The relationship between functional competencies variables of: marketing management competency; financial management competency; technological management competency; and additionally, four technology capabilities of: research, development and innovative decisions; marketing; manufacturing; and capital capabilities are examined. To fulfill these objectivities, the structural equation modeling (SEM) is used. The sample basis for survey related to the research is 121 Iranian new technology-based firms. The results showed a significant direction relationship between the study variables and the acceptable fit. Moreover, there is a significant relationship between functional competency and capital capabilities in 99% confidence level. Functional competencies predict 17% to 41% of the variance in capital capabilities. Cronbach's alphas for each of the 5 study variables were greater than 0.7. Functional competencies predict 33% of the variance in research, development and innovation decisions capabilities, 41% of the variance in marketing capabilities and 17% of the variance in manufacturing capabilities.

1. Introduction

To begin, the researchers ask why and how technology spillovers economic growth. With the rise of new economy, the New Technology-Based Firms (NTBFs) have been widely recognized among the public. NTBFs are important for the long-term development and growth of an economy [1, 2]. According to Solow 1957, technology-based innovation accounts for more than 80% of long term economic growth [3]. NTBFs normally start with a limited output of product s and services, and need to grow in order to survive in the long run [4].

In order to better understand why some firms succeed and remain in the market while others fail, researchers have studied the impact of fundamental conditions on firm growth including, for example; social capital and knowledge acquisition of the company founders, resource management, and the business environment [5]. NTBFs face several internal and external challenges. The human factor is one of the most frequently recognized problems in this context. Empirical evidence shows that the competency of a founder or management team has a significant performance effect [6].

Competence is a set of behaviors, skills, knowledge, attitudes, personality traits, which has more relevance to successful performance [7]. Companies are not seriously interested in using competencies as an organizing factor, till they do not understand how competencies can add more values to their products and services [8]. NTBFs same as other organizations need effective managers to be successful in today's highly competitive and dynamic business environment. Every successful manager needs several competencies enabling him/ her to perform efficiently and effectively at different managerial levels. Now several questions arise concerning the competencies of managers in NTBFs. What kind of competencies the managers need? Which are the relevant competencies needed to lead a NTBFs? How do the different competence models describe needed skill and knowledge of NTBF's managers?

Competency models are often highly tailored to the organization. Customization includes not only the specific competencies developed but also the way in which the competencies are described [9]. More specifically, due to the importance of technological knowledge for NTBF, this study focuses on the concept of technological capital, which is understood as the sum of different technological knowledge,

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such as research, development and innovative decisions, marketing, manufacturing and capital capabilities.

The management competence literature presents competence to consist of three fundamental domains: functional, social, and general [6]. In this study we focus on the functional competency. More specifically, the main purpose of this paper is to present a functional competence model of CEOs' technology-based firms. We argue that, this is the first time this type of study is done in an Iranian context.

Despite passing over 7 years of the legislation of knowledge-based firms, there is not any research about these companies and the supportive approaches in the creation and sustainability of these type firms.

2. Literature Review

2.1. Competency

The competence is most frequently defined as distinguishable and measurable ability of an individual to hold a post in work, personal and social life [10]. Competency and job performance theories claim that to be an effective leader, manager or professional, a person needs to apply knowledge in order to influence people toward desired outcomes [11]. Table 1 shows the competency definitions.

2.2. Managerial competency

The concept of managerial competence has been introduced in 1973 by McClelland. This concept was further developed by Boyatzis in 1982, and L. M. Spencer and S. M. Spencer in 1993 [12]. Researches published over the last 30 years shows us these leaders, managers, professionals and people in key jobs, from sales to bank auditors, appear to require three clusters of behavioral habits as threshold abilities and three clusters of competencies as distinguished performance. The threshold clusters of competencies are:

1. Expertise and experience is a threshold level of competency.
2. Knowledge -i.e. declarative, procedural, functional and metacognitive- is a threshold competency.
3. An assortment of basic cognitive competencies, such as memory and deductive reasoning are threshold competencies [11].

The management competence literature presents competence to consist of three fundamental domains which are: functional; social; and conceptual in combination with the actuation focused competencies delineated by some studies. Thus, these three domains form a comprehensive competence framework [6].

Functional competencies

A variety of relevant functional competencies can be identified, depending e.g. on the industry, business-model or strategic orientation [6]. Pagon et al., define functional competencies as the skills that managers use when they solve a problem or perform an activity [13]. Functional competencies are defined as necessary knowledge and skills for employees to perform their jobs successfully. These functional competencies are based upon the employees' tasks and roles and, hence, they differ according to the industry and function [14].

Cheetham and Chivers define functional competences (skills or know-how), those things that 'a person who works in a given occupational area should be able to demonstrate' [15]. The importance of these competencies is very high, since they are significantly linked to firm performance [13]. "Bolt and Lee" 2003, define functional competencies (relate to the technical competencies), which are most closely aligned with the value contributed by competency - *Hard Competency -a type* of capacity relates to the functional capacity of the work. It mainly deals with the technical aspect of the job [16]. The functional competencies can be structured in different ways.

Due to the multitude of functional competencies, it is almost impossible to thoroughly investigate all functional competencies in one study [6]. Most of the past research on complementarities has focused on establishing synergetic effects between customer/marketing and technological firm capabilities [17]. Yet, not all of functional competencies have the same relevance. Thus, instead of including all possible functional competencies, it seems reasonable to focus on a selective set of central functional competencies and investigate those in detail [6].

Moorman and Slotegraaf find that firms that combine technological and marketing competencies are more likely to make faster improvements to their products compared to their rivals [17]. According to Brinkmann, marketing management, financial-management, and technological-management competencies are selected to be central functional competence domains.

Marketing management competence

As the first key constituent of functional competences, marketing competences are defined as the processes designed to apply the collective knowledge, skills and resources of a firm to the market-related needs of the business, which add value to goods and services of the firm so as to meet the competitive demands of customers [18]. Kohli and Jaworski, 1990; Narver and Slater, 1990; Sanchez and Elola, 1991; Day, 1994; Griffin and Hauser, 1996; Li and Calantone, 1998; Li and Cavusgil, 2000; and Douglas, 2000; believe the marketing competences are based on a profound understanding of customers' current and future needs, preferences, factors affecting them and knowledge of competitors' possible actions [18]. There are diverse indicators of marketing competence.

Vorhies *et al.* identify six dimensions of marketing competences: marketing research capabilities, pricing capabilities, product development capabilities, channels/ distribution capabilities, promotion capabilities and marketing management/planning capabilities. For each dimension, several items are used to measure effectively [18].

Summarizing the research in this domain, no study is found which specifically addresses marketing-management competence in NTBFs. However, the literature illustrates that marketing-management aspects are important for business success in NTBFs [6].

Table 1. Competency Definitions

Authors	Competency
Boyatzis 2007	Competencies are a behavioral approach to emotional, social, and cognitive intelligence[11]
Jokinen, 2005	Competencies have been defined with terms describing certain personal traits, behaviors, skills, values, and knowledge, and many existing frameworks are combinations of these.[47]
Boyatzis 1982	competency is an "underlying characteristic of the person that leads to or causes effective or superior performance[48]
Jackson &Schuler 2003, Gartner 2001& The Treasury Board of Canada Secretariat 1999	knowledge, skills, abilities and behaviours that an employee applies in performing his/her work and that are the key employee-related levels for achieving results that are relevant to the organization's business strategies[49]
Carr 2006	a practical implementation of individual abilities characterized by practical skills and attitudes required to ensure successful professional.[49]
Seale et al 2010	a capability or ability that leads to a successful outcome. ".[49]
Rittera, Gemunden 2002	is used to mean not only having knowledge or possessing skills and qualifications, but also using those qualifications[21]
Spencer and Spencer 1993	define competences as "internal characteristic of an individual that allow to perform effectively and well".[10]

2.3. Financial Management competence

Mbat defines financial management as "the planning, organizing, directing and controlling of the firm's financial resources" [19]. In the financial management domain, financial competence enables effective financial management activities, which, in consequence, impact the development of NTBFs. In accordance with the financial management concept presented earlier, financial management competence comprises a bundle of four related skill areas: (1) strategic financial management competence; (2) competence in external financing; (3) competence in financing through operations; and (4) competence in financial controlling [20]. In this study, the ability to manage the acquisition of financial resources and assuring their economic application is defined as financial management competence [6].

2.4. Technological management competence

Technological competences refer to the superior and heterogeneous technical assets and ability to combine and transform a set of pieces of knowledge consisting of both practical and theoretical know-how, methods, procedures, experience and physical devices and equipment of a firm into designs and instructions for the creation of desired outcomes, which is closely related with product, design, process and information technologies and determines the capability to integrate various streams of technologies [18]. This competence enables a company to become a market pioneer through new product development and the use of new production processes [21].

Technological competencies are crucial for successful innovative performance of firms working in the field of consumer goods industry because they operate in markets characterized by short product life-cycles and high rates of new product introductions [17]. Tyler argued that technological competences represent an important potential source of competitive advantage in technologically competitive markets.

Only if aligned with customer demand, this potential source can become a powerful tool for success [18]. Technology management competence encompasses different subdomains like strategic technology management, technology analysis, or technology development [6].

According to Brinkmann, the functional competence is formed by a bundle of related skill areas:

Technological capability

Technological capability defines the roots of a firm's long-term competitive advantage. Therefore, technological capability is a vital strategic resource for firms, especially high tech firms, to stay at the leading position [22]. A firm's technological capability is a major component of its knowledge base [23]. Marjolein et al. described technological capability as the ability to make the right investment choices; increase production capacity; and engage in continuous upgrading of product quality [24]. A firm's technological capability is developed over time and accumulated through its past experience. It reflects the firm's abilities to employ various technical resources [25]. Firms can quickly identify new technological trends, experiment with emerging designs, and engage in product innovations beyond the current technological boundaries [26]. Many researches only zoomed in the field of promotion of technological capability and explanation of the structure

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Table 2. functional Competencies dimention

Functional Competencies	Dimension
Marketing management competence	Importance of marketing, Positioning, Strategy to overcome entry barriers, Precise target market ,Holistic marketing approach, Customer need analysis, Analysis of market potential, Analysis of competitor's strength/weakness, Create attractive offerings for the customer (4Ps),Communication of value proposition, Flexibility to respond to customer wants, Knowledge of sales channels, Presentation of a professional corporate image, Early customer contact, Judgment of customer typology, Adoption to different customer-types.
Financial management competence	Importance of financials, Strategic financial goals, Know-how of bank Funding, Assessment of financial, Needs, Know-how of public funding, Liquidity incorporates, negative scenarios, Procedures for short-term, liquidity assurance, Liquidity evaluation of customers, Know-how of payment, morals of industry, Know-how of invoicing, procedures, Evaluation of profitability, Know-how of financial, indicators, Business success, controlling, Know-how in taxation issues.
Technology Management Competence	Importance of technology Management, Technological background, Technological strategy focus, Technological development, Analysis of technology competition, Analysis of technology needs, Technology opportunity and threat identification, definition of product characteristics, time and budget definition, Synchronization of product and production development, Knowledge about management of complex projects, Knowledge of customer integration, Workforce education, Collaboration with institutions, Knowledge transfer, Competitive protection Tech. employee tying, Employee knowledge sharing.

Afuah 2002, argued that when a firm builds its technological capability, it invests substantial resources in research and development (R&D), which involves the discovery of new products, the accumulation of knowledge stores, and the training of technical personnel [25]. Some like Kim, 1997; Lall, 1992; 2001 and Morrison et al., 2007; Ernst et al., 1998; Ariffin and Figueiredo 2003, have emphasized on the technological empowerment process aspects and have considered it as a set of routines and organizational processes in line with technological changes [27] [28, 29] [30, 31].

There are many indicators for measuring technological capabilities, at the firm level. These are based on the level of complexity and functionality of the four main categories of technological capabilities which include investment, production, innovation and linkage capabilities [24]. Primarily, process-oriented approach, due to a more comprehensive look at the issue of technology development and its relationship with organizational and strategic context. It was the dominant approach in the field of technological capability and was considered by most researchers in this field. In the meantime, Sanjaya Lall approach has a particular importance and is used by many researchers [28, 32]. The purpose of technological capability in this research is based on the framework provided by Wang et al. consisting of research, development and innovative decisions capabilities; marketing capabilities; manufacturing capabilities; capital capabilities [33].

3. Research methodology

The functional competence model of this study is developed based on Brinckmann functional competency model and Wang et al. framework technological capabilities. According to Brinkmann marketing management, financial-management, and technological-management competences are selected to be central functional competence domains. Technological capability in this research is based on the framework provided by Wang et al. consisting of research, development and innovative decisions capability, marketing capability, manufacturing capability, and capital capability.

- H1: Is the presented functional competency model fit?
- H2: Is there any relation between functional competency and research, development and innovation decision capabilities?
- H3: Is there any relation between functional competency and marketing capabilities?
- H4: Is there any relation between functional competency variable and manufacturing capabilities?
- H5: Is there any relation between functional competency variable and capital capabilities?

This study combined quantitative and qualitative research designs (mixed research). Mixed research, in its recent history in the social and behavioral or human sciences, is started by researchers and methodologists who believed qualitative and quantitative viewpoints and methods were useful as they addressed their research questions [34].

Structural equation modeling or SEM, is a very general statistical modeling technique, which is widely use in the behavioral sciences [35]. SEM is a tool for analyzing multivariate data. Structural equation models go beyond ordinary regression models to incorporate multiple independent and dependent variables as well as hypothetical latent constructs that clusters of observed variables might represent [36].

Table 3. Technological capabilities

	Aspect	Criteria
Technology capabilities	R&D capabilities	Percentage of researchers to overall employees Success rate of R&D products Self-generated innovative products Number of patents R&D intensity
	Innovation decision capabilities	The degree of Innovativeness of R&D ideas Intensity of collaboration with other firms or R&D centers R&D knowledge sharing ability Forecasting and evaluating technological innovation Entrepreneurial innovation initiatives
	Marketing capabilities	Marketing share Degree of new product competitiveness Monitoring the market forces Specialized marketing unit Export percentage
	Manufacturing capabilities	Advanced manufacturing technology Product quality level Commercialization success rate Production staff quality level Product cycle time
	Capital capabilities	Fundraising ability Optimal capital allocation Intensity of capital input Return on investment (Wang & Ahmed, 2007)

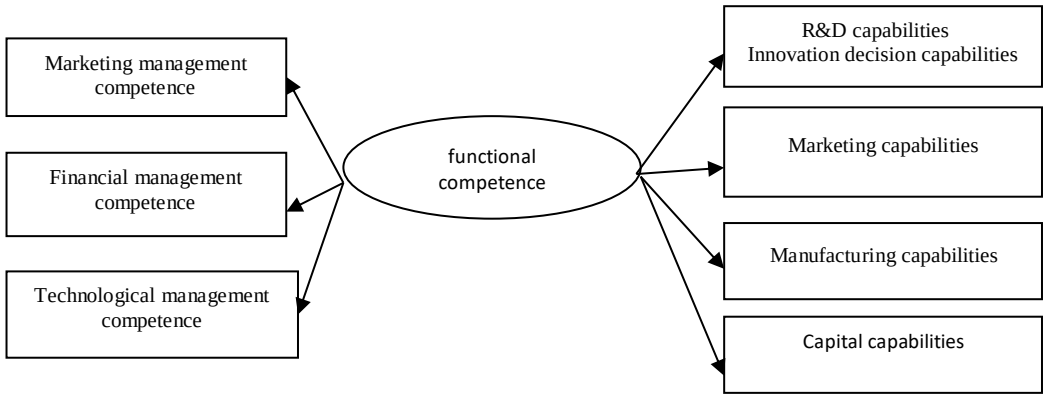

Fig.1. Conceptual Model

SEM has a unique ability to simultaneously examine a series of dependence relationships (where a dependent variable becomes an independent variable in subsequent relationships within the same analysis) while also simultaneously analyzing multiple dependence variables [37].

In this mixed research, we used the triangulation. In social research in its broadest sense, triangulation implies combining together more than one set of insights in an investigation, and there are many early implicit uses[38]. In mixed methods research, triangulation has been used to construct validation typically takes the form of assessments of convergence based on expert and/or respondent judgments [39]. Researchers can also choose to enhance validity by triangulating various approaches to form a more complete picture of the issue of interest. Through ascertaining the complementarity of various data sources, we can expose [40].

In this investigation, triangulation is used based on the classification provided by Creswell and Clark 2007. According to Jack and Ratory triangulation of this research is the combination of two methods, first observer triangulation (Using more than one researcher to analyze the data [41], Using different observers to record data from a given method [42] and Data-analysis triangulation (is the combination of two or more methods of analyzing data. These techniques can include different families of statistical testing or different statistical techniques to determine similarities or validate data [43].

The next step is focus group. Focus groups, like other qualitative methods, are used across a wide variety of different fields [44].

3.1. Sample

The research population for the study consisted of all CEOs' and top managers of new technology-based firms [1] in the Science &Technology Parks of Iran. some Science &Technology Parks (Pardis Technology Park, University of Tehran Science & Technology Park, Isfahan Science & Technology Town, Shahid Beheshti Incubator, Ferdowsi University of Mashhad Science & Technology Park, Persian Gulf Science & Technology Park, NTBFS that Participated in science festival (2012) were selected. The 380 questionnaires were sent to firms listed in the Vice-presidency for Science and Technology (Islamic Republic of Iran). 121 complete valid replies were received. In this paper, we consider a sample composed of 121 Iranian NTBFs. (More than 80% of companies surveyed had a lifespan up to 20 years. They are active in the areas of information technology (IT), nanotechnology, biotechnology, aerospace and renewable energy. It was important to determine the validity and reliability of the questionnaire.

Validity of the research

Traditionally, three types of validity may be demonstrated: content, criterion, and construct validity. Researchers can receive invaluable information by conducting a content validity study. using a panel of experts provides constructive feedback about the quality of newly developed measure and objective criteria with evaluate each item [45]. For this study, Experts population were (n=100). The questionnaire was sent to all experts; 46 complete valid replies were received. The instrument was validated by 100 experts.

Reliability of the research

According to Hocking, the Cronbach's Alpha coefficients should at least be 0.9 for a research instrument to be reliable However, coefficients of between 0.7 and 0.9 are also acceptable in instances where new research instruments are developed. Cronbach's alphas for each of the 5 analyzed variables are shown in Table 5. Based on the results outlined in Table 5, one can conclude that the questionnaire for reporters was a reliable research instrument.

Table 4. experts

Executive master	8.6%
PhD students	36.95%
PhD (Professor)	36.15%
Unknown	7%

Table5. Cronbach's alpha test for the study variables

Variable	Cronbach's alpha
Functional competence	0.825
R & D and innovation decision capabilities	0.651
Marketing capabilities	0.754
Manuafacture capabilities	0.899
capital capabilities	0.717

The Normality Test

The Kolmogorov-Smirnov goodness-of-fit test measured corrosion data compatibility (α = 0.05). The plotting of Kolmogorov-Smirnov p-values showed that the test-data are normally distributed function according to the Kolmogorov-Smirnov criteria in (α= 0.05) significance level.

The coefficient of correlation

The correlation coefficient can range in value from −1 to +1. The larger the absolute value of the coefficient, the stronger the relationship between the variables.

For the Pearson correlation, an absolute value of 1 indicates a perfect linear relationship. A correlation close to 0 indicates no linear relationship between the variables.

The results show that there are:

- A meaningful, direct relation between all variables.
- A strong relation between marketing capabilities with the R & D and innovation decision capabilities, according to $(p < 0.01, 0.774 = r)$ in 99% confidence level.
- A good relation between functional competency and R & D and innovation decision capabilities, according to $(p < 0.01, 0.284 = r)$ in 99% confidence level.
- A good relation between functional competency and marketing capabilities, according to $(p < 0.05, 0.210 = r)$ in 95% confidence level.
- A weak relation between functional competency variable and manufacturing capabilities, according to $(p < 0.05, 0.190 = r)$ in 95% confidence level.
- A good relation between functional competency variable and capital capabilities according to $(p < 0.01, 0.318 = r)$ in 99% confidence level.
- A good relation between manufacturing capabilities and R & D and innovation decision capabilities according to $(p < 0.01, 0.380 = r)$ in 99% confidence level.
- A good relation between manufacturing capabilities and marketing capabilities, according to $(p < 0.01, 0.363 = r)$ in 99% confidence level.

- A good relation between capital capabilities and R & D and innovation decision capabilities according to ($p < 0.01, 0.460 = r$) in 99% confidence level.
- A good relation between capital capabilities and manufacturing capabilities ($p < 0.05, 0.269 = r$) in 95% confidence level.
- A good relation between capital capabilities and marketing capabilities ($p < 0.01, 0.588 = r$) in 99% confidence level.

Table 6. Kolmogorov-Smirnov test for the study variables

Variable	Test value
Functional competence	0.127
R & D and innovation decision capabilities	0.172
Marketing capabilities	0.127
Manufacturing capabilities	0.053
Capital capabilities	0.107

Table 7. Correlation matrix

The research Variables	Functional competency	R & D and innovation decision capabilities	Marketing capabilities	Manufacturing capabilities	Capital capabilities
functional competencies	1.00				
R & D and innovation decision capabilities	*0.284	1.00			
Marketing capabilities	*0.210	**0.774	1.00		
Manufacturing capabilities	*0.190	**0.380	**0.363	1.00	
Capital capabilities	**0.318	**0.460	**0.588	*0.269	1.00
Significant level of correlation coefficient of research variables $\boldsymbol{p < 0.05}$ * $\boldsymbol{p < 0.01}$**					

3.2. Structural equation modeling:

After specifying the model, determining that the model is identified, collecting data from a sufficiently large sample of participants, researchers are finally at the point of estimating the model. Estimation involves determining the value of the unknown parameters and the error associated with the estimated value. As in regression, researchers include both unstandardized and standardized parameter values, or coefficients, as output [46].

The standardized coefficient is analogous to β in regression. Researchers generate estimates of the free (unknown) parameters using an SEM software program. Figure 2 shows the standardized results for the structural portion of the full model. Most SEM software programs provide standardized and unstandardized output, which is analogous to standardized betas and unstandardized B weights (accompanied by standard error) [46].

Standardized Parameter Estimates

In regression analysis, Researchers typically present standardized estimates but determine significance by examining the unstandardized portion of the output. Although the critical ratio ($i.e., z\ score$) is automatically calculated and provided with output in LISREL and other programs, researchers can easily determine whether the coefficient is significant ($i.e., z \geq 1.96\ for\ p \leq .05$) at a given alpha level by dividing the unstandardized coefficient by the standard error. Here, all of them are greater than the critical z value at ($p > 0.05$) of 1.96, indicating that the parameter is significant.

The unstandardized coefficient is analogous to a *"B"* weight in regression. Dividing the unstandardized coefficient by the standard error produces a z value that is analogous to the t value associated with each B weight in regression [46].

Multiple indices are available to evaluate model fit. We present the fit indices reported by LISREL software program, which have been shown to be the most accurate in a variety of conditions.

GFI: is analogous to $R2$, used in regression to summarize the variance explained in a dependent variable, yet GFI refers to the variance accounted for in the entire model.

CFI: CFI ranges from $0\ to$ 1.0, with values closer to 1.0 indicating better fit ($CFI = .94$).

RMSEA: A $RMSEA$ value of .00 indicates that the model exactly fits the data ($RMSEA = .0660$) [46]. Other fit indices are reported:

Fit indicators included a CFI greater than 0.90, RMSEA less than 0.10 with a maximum upper bound of the 90% $CI\ of$ 0.10,

and RMR less than 0.10 and other indicator shown the acceptable fit.

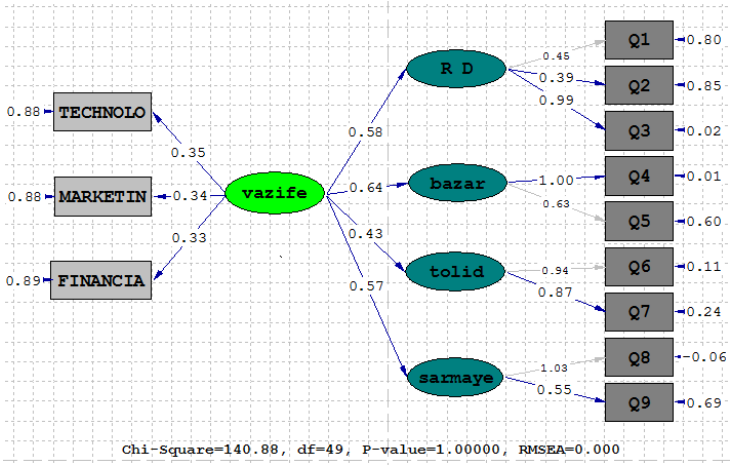

Fig. 2. Structural equation modeling of conceptual model (standard)

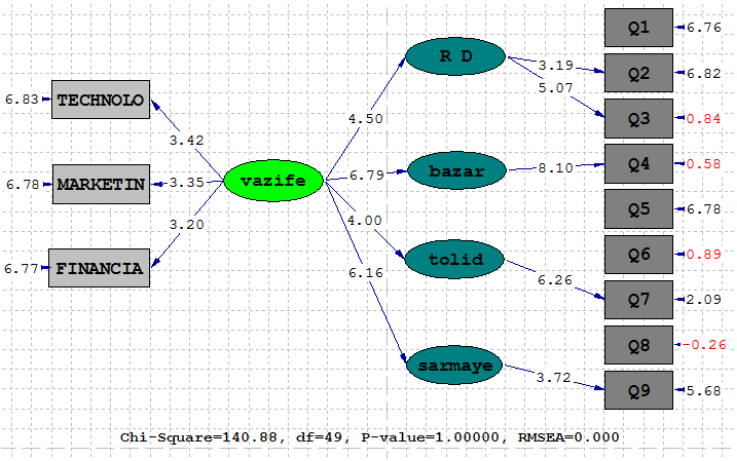

Fig. 3. Structural Equation Modeling of conceptual model (significant coefficients)

Table 8. Fit indicators

Indexes	RMR	RMSEA	AGFI	GFI	CFI	NFI	IFI	NNFI	RFI	PGFI	PNFI
Result	0.006	0.066	0.91	0.944	0.94	0.92	0.96	0.90	0.93	0.90	0.91

In addition to considering overall model fit, it is important to consider the significance of estimated parameters, which are analogous to regression coefficients. As with regression, a model that fits the data quite well but has few significant parameters would be meaningless.

As it is shown in Table 11, there are:

- A significant relationship between functional competency and R & D and innovation decision capabilities ($\beta = 0.58, p < .01$ and, $t - statistic = 4.50$) in 99% confidence level. Functional competencies predict 33% of the variance in R & D and innovation decision capabilities.
- A significant relationship between functional competency and marketing capabilities ($\beta = 0.64, p < .01\ t - statistic = 6.79$) in 99% confidence level. Functional competencies predict 41% of the variance marketing capabilities.
- A significant relationship between functional competency and manufacturing capabilities ($\beta = 0.43, p < .01\ t - statistic = 4.00$) in 99% confidence level. Functional

competencies predict 17% of the variance in manufacturing capabilities.

- A significant relationship between functional competency and capital capabilities ($\beta = 0.57, p < .01\ t-statistic = 6.16$) in 99% confidence level. Functional competencies predict 32% of the variance in capital capabilities.

Table 9. Path analytic results of the theoretical model

The dependent variable	Path coefficient (β)	Statistics t	Total coefficient of (R^2) determination
R & D and innovation decision Capabilities	0.58	**4.50	0.33
Marketing capabilities	0.64	**6.79	0.41
Manufacturing capabilities	0.43	**4.00	0.17
Capital capabilities	0.57	**6.16	0.32

$p < 0.05$ * $p < 0.01$ **

4. Conclusion

The competence is most frequently defined as distinguishable and measurable ability of an individual to hold a post in work, personal and social life [10]. The management competence literature presents competence to consist of three fundamental domains which are: functional; social; and conceptual in combination with the actuation focused competencies delineated by some studies.

Technological capability defines the roots of a firm's long-term competitive advantage. Therefore, technological capability is a vital strategic resource for firms, especially high tech firms, to stay at the lead position [22].

This research aimed at exploring the relationship between functional competency factors and technological capabilities of technology-based firms in Iran. The functional competence model of this study is developed based on Brinckmann 2008, functional competency model and Wang et al. framework technological capabilities. According to Brinkmann, marketing management, financial-management, and technological-management competence are selected to be central functional competence domains. Technological capability in this research is based on the framework provided by Wang et al. 2007, consists of research, development and innovative decisions capabilities, marketing capabilities, manufacturing capabilities, capital capabilities. After specifying the model, determining that the model is identified, collecting data from a sufficiently large sample of participants, we are finally at the point of estimating the model.

We present the fit indices reported by LISREL software program, which have been shown to be the most accurate in a variety of conditions. Indicator's fit shown the acceptable fit.

In addition to considering overall model fit, it is important to consider the significance of estimated parameters, which are analogous to regression coefficients. We can conclude that there is a significant relationship between functional competencies and R & D and innovation decision capabilities ($\beta = 0.58, p < 0.01\ , t\ statistic = 4.50$) in 99% confidence level. Functional competencies predict 33% of the variance in R&D and innovation decision capabilities.

There is a significant relationship between functional competence and marketing capabilities ($\beta = 0.64, p < .01\ t-statistic = 6.79$) in 99% confidence level. Functional competencies predict 41% of the variance marketing capabilities. There is a significant relationship between functional competence and manufacturing capabilities ($\beta = 0.43\ p < .01\ t-statistic = 4.00$) in 99% confidence level. Functional competencies predict 17% of the variance in manufacturing capabilities. There is a significant relationship between functional competencies and capital capabilities ($\beta = 0.64\ p < .01\ t-statistic = 6.79$) in 99% confidence level. Functional competencies predict 41% of the variance in capital capabilities. Each of the competency component predicts a small percentage of technological capabilities. The focus group attended by six of the competence and technology experts was formed and specified. In their opinion, factors affecting on the capabilities of technology include 7 factors of (1) the technological strategy, (2) technological competency, (3) financing, (4) organizational environment, (5) networking, (6) business strategy, and (7) the government support policies. Thus, all these could explain the low prediction relation of a manager's competence on the technological capabilities.

Having a good CEO is one of the most important requirements for improved capabilities. It is necessary to consider the competency of these companies' managers for providing supportive services to firms and the support will be done from companies that their managers are competent. Defining the functional competence according to the technology and circumstances of each sector (nanotechnology, renewable energy, medicinal plants and traditional medicine, information and communication technology, micro-electronics, bio-technology, aerospace, water and the environment) are other offers of the research. Furthermore, adopting competencies and attention to them in assessment forms of knowledge-based firms are including practical suggestions of this research to technology policy and planning research center. It is recommended that by

forming a competency assessment center, evaluator specialists of managers and companies' competency will be trained.

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