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# The Role of Process Maturity on Innovation and Performance of Entrepreneurial Opportunistic Organizations: A Case Study on Nano Firms

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**Abstract**

The present paper aims to study the relations among variables of innovation, process maturity and firm's performance. Along with this purpose, it first investigates the relationship between innovation and performance and second hypothesizes a positive relationship between process maturity and both innovation and performance. Several empirical studies examine these relations. The results from a questioner which was obtained from individual interviews in 253 firms were analyzed in order to identify the right variables for measurement. Then the causal relations of these variables were defined through Structural equation modeling (SEM) and AMOS 18. The results show that two variables of process maturity and innovation positively affect the efficiency of business environment. Innovation and performance are also under the effect of process maturity. One of the other results of this paper demonstrates that firm's age moderates this effect.

**Keywords:** Innovation, process maturity, firm's performance.

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## 1. Introduction

The current literature in management emphasizes the key role of both innovation and process maturity as factors which enhance competitive advantage and entrepreneurial opportunities (Kearney et al., 2008). Since 1980's a new dimension of entrepreneurial activity known as corporate entrepreneurship was raised in business field. This kind of entrepreneurship is very similar to individual entrepreneurship (in the shape of establishing a new business) and the only difference is that entrepreneur works in an already-running business. In fact, the entrepreneurs in the large organizations act like individual entrepreneurs and their activities consist of offering new products, services or processes in the framework of an already-running organization and help them towards growth and profit (Urbano, 2013).

Some studies demonstrate that process maturity and its output, agile organization, seem to be an initiative for process innovation (Gorschek et al., 2012). The basic hypothesis is that the process maturity projects play an important role in enabling the firms to achieve the higher performance measures and flexibility in process innovation. There is a positive relationship between process maturity and process performance. Therefore few studies have examined the interactive relations among process maturity, innovation and performance simultaneously (e.g. see Lockamy and McCormack, 2004). The present paper focuses on innovation in firms and this also shows a significant level of organizational culture which promotes and also supports the innovation and focuses on the analysis of product innovation (Keeley, 2013).

Previous studies just provide a detailed description of innovation and process maturity. Similarly, most organizational innovation research works consider cultural vision for measuring this concept, and few studies analyze organizational innovation process (Tian, 2011) .Since cultural values are difficult for changing a special task, focus of this process is more useful for experts. This paper reviews the literature with an objective to overcome the weaknesses of previous approaches and investigate the relations among three variables of process maturity, innovation, and performance in order to suggest a unified model. It focuses on maturity and perfect measuring of innovation. Moreover, this paper also examines the effect of moderators such

as firm's size, firm's age, sector, and ecological chaos in the relations among the variables process maturity, innovation and process performance.

The structure of this paper is as follows. Firstly we have tried to review the empirical researches in order to form a theoretical framework for the suggested model. In the next section, the main hypotheses are tested. Next, the results are presented and then the paper concludes and suggests some practical implications.

## 2. Theoretical framework

### *2.1 Innovation and performance*

Current literature on innovation has argued innovation as a process, as an output, and as both a process and output (Jimenez et al., 2011). Most definitions describe innovation as a new idea and/or behavior. The literature suggests different typologies for innovation. Some authors believe that an innovation is defined as a technology, strategy, or management practice that a firm is us- ing for the first time (Li and Atuahene-Gima, 2001). Rowlet (2011) provides the most comprehensive adopted typology and makes a distinction between technical and administrative innovation. While technical innovation includes a new process or new products and services, administrative innovation refers to new business approaches, policies, and organizational shapes.

Since the main objective of this paper is to investigate the way process maturity affects the overall innovative activities in an organization, we adopted a compressive definition for innovation which include developing new products, processes and also administrative innovation. In this definition innovation helps the organizations to be successful in spite of the uncertainties in external environment. Hence, innovation is one of the key factors for the firms' long-term success in the business environment, especially in the competitive markets. Organizations must be able to change themselves as fast as they can to sustain competitiveness in uncertain business environment (York et al, 2010). As a result, more innovative firms can address to environmental challenges and exploiting market opportunities than less innovative firms.

Many empirical studies have identified a positive relationship between innovation and performance (e.g. Roberts, 1999; Thornhill, 2006). On the contrary, Simpson et al (2006) determine innovation as a risky and expensive process which has negative effect on a firm's performance including exposure to higher risks in the market, cost increase, dissatisfaction of employees, and irrational changes. Therefore various studies have contradictive results. For example using a sample from small enterprises, Menguc et al (2010) found that product innovation has a positive effect on performance in stable business environments but a negative effect in unstable environments.

Segarra-Blasco (2010) conducted a research on service businesses in the US and concluded that innovation services have a positive effect on firms' growth but a neutral effect on productivity. Finally, Damanpour et al (2009) found a special type of innovation (services, process, and administrative innovation) in each year was disadvantageous for organizations offering general services in England. Stability in making a special type of innovation in all years is neutral and selection of innovation type base on the norms of the industry has a positive effect on performance. Accordingly, the relations between innovation and performance, it is complex and needs more investigation in the future. Despite the possible harmful effects of innovation and some contradictive evidences, most empirical studies and theories still demonstrate a positive relationship between innovation activities and process performance. Therefore we posit the hyphotesis;

$H_{1:}$ Organizational innovation has a positive relationship with performance.

*2.2 Process maturity and performance*

Business process maturity concept is derived from adopting a process orientation in organizations based on the understanding that processes have a life-cycle or development stages which can be defined, managed, measured and controlled within time. Higher maturity level in any business process can have the following outcomes (Davenport et al. 2003).:

- Better controlling of results,
- Improved prediction of goals, costs, and performance,

- More effectiveness in achieving to the defined objectives,
- Improvement in managerial skills for proposing better and newer goals for performance

Business process maturity model describes an evolving development path in which organizations move form immature processes towards more mature processes. Business process maturity models organize these stages in a way that development in each phase provides a basis for further development. Development strategy offers a road map for constant improving of processes (Dijkman, 2008).

Skrinjar and Bosilj-Vukic (2008) examined the effect of process orientation on the financial and non-financial performance of firms and found positive effect. Their study was conducted on startups and confirmed that business process orientation significantly leads to improved performance of the firms which itself was measured with fewer failures.

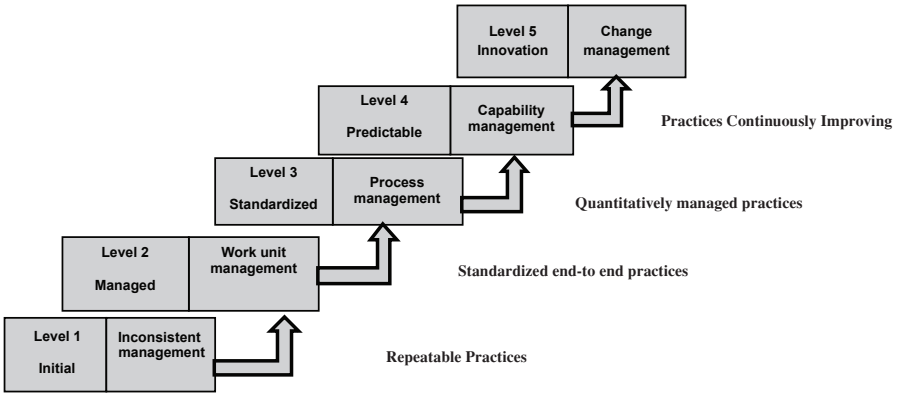


**Fig 1. Five levels of maturity in business process maturity (Dijkman, 2008)**

Some usages of process maturity are as follows (Dijkman, 2008):

- Administrative managers can use business process maturity model to understand the necessary actions for starting and keeping the process improvement program in their organizations.

- Evaluation teams can benefit from this model in order to give qualifications to the current business processes and identify the strengths and weaknesses.
- The organization improved by the team of evaluators use this model to assist to the selection of the appropriate suppliers and monitoring the performance of suppliers

In sum, empirical findings are compatible with theories which support from a positive relationship between organizational maturity and performance. H2 posit as follows;

$H_2$: Maturity has a positive relation with performance.

*2.3 Process maturity and innovation*

Since the samples and predictions for both process maturity and innovation are very different, this conclusion could not be definite. Therefore, more studies in this field can lead to better advantages. Second hypothesis is formed according to theoretical reasoning and the findings of empirical researches. The literature in this study suggests several models to define the relation between processes' improvement and innovation (Utterback, 1975; Davenport, 1993;).

Organizational processes enhance the similar abilities of the firm. Innovation also needs a change and exploitation of the organizational knowledge. Accordingly, employees share knowledge and information with others. For example, Nonaka (1994) argue that innovation takes place when employees share knowledge within an organization and when this shared knowledge creates a new common insight to the organization. Therefore, process maturity or development path promotes acquiring, transferring, and using the new knowledge which enhance the organizational innovation. Whereas conceptual literature supports the relationship between process maturity and innovation, the previous studies cannot propose enough empirical evidence (Harter, 2000). Moreover, the results of previous studies are hardly generalizable because of substantial differences in their objectives, samples, methodologies, and approaches.

Some of the qualitative studies show that reengineering enhances innovation. For example, Lockamy (2004) found a positive relation between process maturity and innovation in comparing them with the purpose of costs reduction. Some of the quantitative studies also investigated the relation of process innovation and product innovation, and most of them selected a cultural approach to measure the process maturity (Boer et al. 2001). Therefore previous studies mostly focus on the direction of innovation and argue how much organizational culture can encourage and support the innovation (Martins, 2003).

$H_3$: Process maturity has a positive relation with organizational innovation in entrepreneurial firms.

*2.4 Moderators in the relation of process maturity with performance*

This study examines the probable effect of age of firm as moderator in order to investigate the in depth relations of three variables; process maturity, innovation and performance. The literature confirms the probable moderating effect of firm age in the relationship of process maturity and performance (Jiang, 2004). King (2001) found organizational experience and competencies as the effective factors in firm age to move towards enhanced innovation. Common immature organizations can be confined in their innovation by young firms. Therefore, firm age may improve the effect of innovation on performance and also process maturity on both innovation and performance.

As seen in the Figure 2, firm age moderate first the relation of process maturity with both innovation and performance, and second the relationship between innovation and performance.

$H_4$: Firm age moderate the relations of process maturity, innovation, and performance.

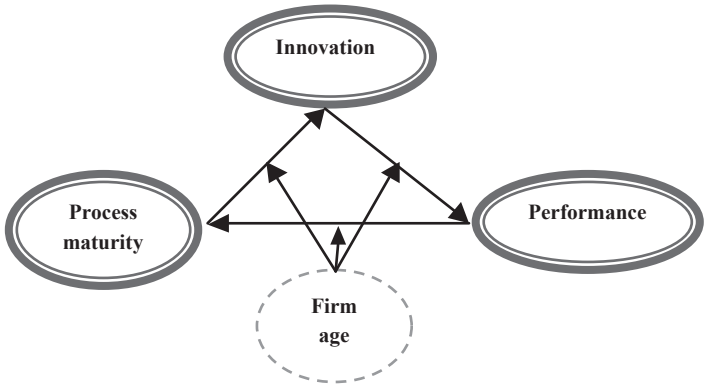


**Fig 2. The conceptual model**

### 3. Research methodology

This paper investigates the relations of three variables, process maturity, innovation, and performance. The sample of this study is Iranian small and medium enterprises (SMEs) registered in Nano Iranian Association. Cluster sampling was used as there was no access to all number of firms which is 500. Then the questioners were distributed among the selected firms. According to the Table 1, 283 out of 500 questioners (56%) were answered by the interviewers and were examined. 63% of these answered questioners had been filled In Tehran, 22% in Karaj and 15 % in Esfahan.89% of the overall firms were less than 10 years old (taken as the first sample in this study), and 11% of the sample size were those firms older than 10 years old.

**Table 1. Descriptive analysis of the study**

| | Variable | Quantity | Percentage | Accumulative Percentage |
|---|---|---|---|---|
| Place of Study | Tehran | 178 | 63 | 63 |
| | Karaj | 62 | 22 | 85 |
| | Esfahan | 43 | 15 | 100 |
| | Total | 283 | 100% | 100 |
| Firm's age | Less than 10years old | 31 | 11.2 | 11.2 |
| | More than 10years old | 252 | 88.8 | 100 |
| Gender | Male | 261 | 92.2 | 92.2 |
| | Female | 22 | 7.8 | 7.8 |
| Official Post | Manager | 47 | 16.6 | 16.6 |
| | Expert | 236 | 83.4 | 83.4 |

The research hypothesis was tested by structural equation modeling (SEM), a statistical technique for testing and estimating causal relations using a combination of statistical data and qualitative causal assumptions. Confirmatory modeling usually starts out with a hypothesis that gets represented in a causal model. Then Using AMOS 18, the indicators of the selected sample were estimated and the degree of validity of measurement was calculated in the relations of process maturity, innovation, and performance. This comprehensive and precise evaluation technique is using convergent validity of the variables.

Based on OMG model and by employing the results of the designed questioner, it was found that the process levels of 1, 2, and 3 have more capacity to define process maturity. The variables which can be used for defining corporate innovation include: product innovation, process innovation, administrative innovation, internal results, logical results and human results were considered as the definers of organizational performance. Finally error variables which show all effective factors other than unobserved variable were considered in our measurements.

Cronbach alpha was used to measure the reliability of the questioners. This method is used to calculate the internal consistency of measurement tools such as questioners. Cronbach alpha is 0.83, which is high and acceptable.

## 4. Results

The constant and free parameters should be determined in order to validate a model. Constant parameters in a structural equation model often consist of regression weights of error variables. Furthermore, for any unobserved variable, one of the regression weights has been held constant to 1 value. Since inspection of structural relations among unobserved variables is defined more significant and more logical when measuring unobserved variables be acceptable according to practical criteria. Therefore, the structural model which consists of 3 measurement models has been divided into three sections in this research, and then any of the measurement models were tested separately. After gaining partial trust on the approval of the present measurement models in the determined structural equation model, the whole model was tested. Correlation matrix gained from SPSS software was used to analyze the output information of AMOS, brought in the table below.

**Table 2. Correlation matrix with variables' mean and variance**

| | Mean | Variance | Level 1 | Level 2 | Level 3 | Product innovation | Administrative innovation | Internal results | Logical results | Human results |
|---|---|---|---|---|---|---|---|---|---|---|
| Level 1 | 3/3 | 90/0 | 00/1 | | | | | | | |
| Level 2 | 9/2 | 90/0 | 69/0 | 00/1 | | | | | | |
| Level 3 | 8/3 | 95/0 | 40/0 | 42/0 | 00/1 | | | | | |
| Product innovation | 4/3 | 80/0 | 59/0 | 43/0 | 43/0 | 00/1 | | | | |
| Administrative innovation | 5/3 | 71/0 | 46/0 | 32/0 | 25/0 | 65/0 | 00/1 | | | |
| Internal results | 9/3 | 56/0 | 37/0 | 48/0 | 48/0 | 32/0 | 40/0 | 00/1 | | |
| Logical results | 7/3 | 74/0 | 34/0 | 38/0 | 22/0 | 38/0 | 44/0 | 36/0 | 00/1 | |
| Human results | 5/3 | 88/0 | 31/0 | 24/0 | 13/0 | 29/0 | 33/0 | 21/0 | 46/0 | 00/1 |

Three categories of indices were used to approve that the applied model is confirmable include Absolute fit indices (i.e. indices which are calculated based on the difference between observed variances and covariances, and predicted variances and covariances), Comparative fit indices (i.e. indices which are calculated based on a comparison between the defined model with a base model), and parsimony normed fit indices (i.e. indices which

emphasis on the degrees of freedom). Table 3 shows any of the indices as well as the amount which they should be for the model to be confirmable.

**Table 3. Fit indices of the proposed model**

| The type of index | Index | Index value One sample model | Value of two-sample model index | | | Significance level of the index for the model to be confirmed |
|---|---|---|---|---|---|---|
| | | | First sample | Second sample | Third sample | |
| **Halter** | **Sample size** | 283 | 168 | 115 | 283 | Obtained value from halter index |
| | **Halter .05** | 79 | 121 | 89 | 192 | Less than sample size |
| **Absolute fit indices** | | | | | | |
| | **Chi-squared** | 164/951 | 64/081 | 59/620 | 123/720 | Less than 0.05 |
| | **DF** | 32 | 32 | 32 | 64 | … |
| | **P-value** | 0/000 | 0/000 | 0/002 | 0/002 | Less than 0.05 |
| | **Root mean square residual** | 0/047 | 0/039 | 0/024 | 0/032 | Better to be close to 0 |
| **Comparative fit indices** | **Normed Fit or Bentler-Bonett** | 0.874 | 0.904 | 0.883 | 0.895 | More than 0.9 |
| | **Relative fit** | 0.822 | 0.865 | 0.836 | 0.852 | Better to be close to 1 |
| | **Incremental fit** | 0.896 | 0.949 | 0.942 | 0.946 | More than 0.9 |
| | **Tucker-Lewis index** | 0.852 | 0.927 | 0.916 | 0.923 | More than 0.9 |
| | **Comparative indices** | 0.894 | 0. | 0. | 0. | More than 0.9 |
| **Parsimony normed fit indices** | **Economy ratio index** | 0.711 | 0.711 | 0.711 | 0.711 | Better to be close to 1 |
| | **Parsimony normed fit** | 0.621 | 0.643 | 0.628 | 0.636 | More than 0.6 |
| | **Parsimony comparative fit** | 0.636 | 0.674 | 0.669 | 0.672 | More than 0.5 |
| | **Normed chi-squared** | 5/155 | 2/003 | 1/863 | 1/933 | Between 1-5 |

As shown in Table 3, when total sample size was taken into account – without separating older firms from those less than 10 years old – the proposed model was confirmed by 7 indices: Halter, Chi-squared, root mean square residual, relative fit, economy ratio index, parsimony normed fit, parsimony comparative index. However, in order to confirm a model, using 3 – 5 indices is usually enough (Tabatabaei, 2005).

It is noteworthy that when the proposed model was tested with two separate samples grouped as firms older/younger than 10 years old, it was confirmed by the 12 indices given in Table 1. Furthermore, since root mean square residual and relative fit scored better in two-sample model, it could

be said that the two-sample model describes the variables relationship better than the one-sample model.

From the above mentioned results, it can be conclude that, each of the variables process maturity and innovation has a positive effect on performance.

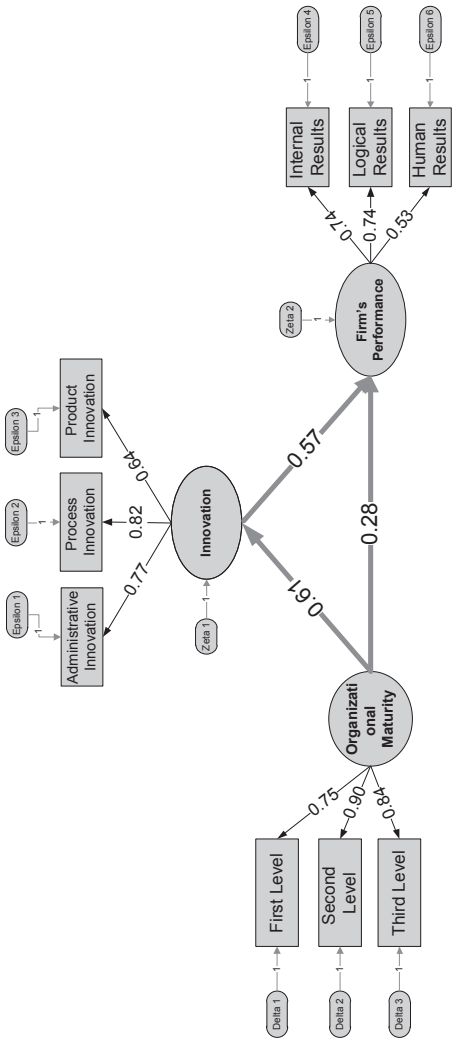


**Figure 3. One-sample model of direct standard relationship between process maturity, innovation and performance**

Figure 3 shows the standardized estimations for regression weights such as factor loading, and impact factor. They also demonstrate the effects of observed variables on process maturity, innovation and performance.

**Table 4. Regression weights**

| **Model Type** | **One-Sample Model** | | | **Two-Sample Model** | | |
|---|---|---|---|---|---|---|
| **Variables** | Non-standardized Estimation | P-Value | Standardized Estimation | Non-standardized Estimation | P Value | Standardized Estimation |
| **Effect of process maturity on performance** | 0.191 | 0.001 | 0.278 | 0.210 | 0.039 | 0.278 |
| **Effect of innovation on performance** | 0.554 | 0.000 | 0.610 | 0.570 | 0.000 | 0.594 |
| **Effect of organizational maturity on innovation** | 0.429 | 0.000 | 0.566 | 0.488 | 0.000 | 0.570 |

When P-value is less than 0.05, the meaningfulness of a relation is acceptable. As Table 4 shows, P-value regression weights for process maturity on firm's performance is 0. Since we hypothesized that process maturity directly affects the firm's performance, the results of this relation is approved which means that independent variable -process maturity - directly affects dependent variable - firm's performance.

Since P is less than 0.05 for the effect of process maturity on innovation and since innovation affects performance, we can conclude that the second and the third hypothesis -which claim that process maturity has a positive relation with organizational innovation and organizational innovation has a positive relation with firm's performance-, are approved.

Among 3 maturity levels, the 3rd level scale of process maturity holds the maximum correlation with process maturity based on estimated standardized values for parameters and thus holds the maximum weight in the

calculations related to this unobserved variable; and level 2 and 1 scales are in the 2nd and 3rd place, respectively.

Also, among three variables of product innovation, process innovation and administrative innovation based on estimated standardized values for parameters, process innovation holds the maximum correlation with organizational innovation and therefore has more weights in calculation related to this unobserved variable. Besides, product innovation holds the minimum correlation with organizational innovation and therefore has less weight in defining this unobserved variable.

Accordingly, among three variables of internal results, logical results and human results based on estimated standardized values for parameters, internal results and logical results were more related to organizational performance value, and therefore has more weights in calculation related to this unobserved variable. The human results variable has a minimum correlation with organizational performance and thus has less weight in defining this unobserved variable.

To analyze hypothesis 4 (which indicates that age moderates the relations among process maturity, innovation and performance), we applied the structural analysis of means.

The hypothesis under investigation state that free parameters in the above-mentioned measurement model are the same for the two groups (the first one includes those firms with less than 10 years experience –called type 1- and the second group includes those which have been registered for more than 10 years –called type 2-). Regarding methodology, this hypothesis indicates that Reproduced Covariance Matrix based on parameters estimated for each of the two groups is the same and there is no significant difference between them.

To test such null hypothesis is subject to this matter that first, base model Chi-squared $\left(\chi^2_{Model\ A}\right)$ should be estimated and then the defined free factor loading should be considered as unequal.

At this point, model's Chi-squared value should be calculated as of holding equality constraint $\left(\chi^2_{Model\ B}\right)$. If we entitle the model without equality constraint as model A and the one with equality constraint as model B,

then in order to approve the null hypothesis which is actually in front of us, we expect that the two models' chi-squared difference value for the degree of freedom obtained from the difference between two models' degrees of freedom should be less than critical value of Chi-squared distribution in the significance level of %95.

$$\Delta\chi^2 = \chi^2_{Model\ A} - \chi^2_{Model\ A}$$
$$\Delta df = df_{Model\ A} - df_{Model\ B} \quad (1)$$

Chi-square valued and degrees of freedom for the two models including equality constraint and excluding equality constraint are summarized in table 5 for our two sample study.

**Table 5. Difference between Chi-squared in models including/excluding equality constraint and its significance**

| Model | Chi-squared | DOF | P |
|---|---|---|---|
| Excluding equality constraint | 123/727 | 64 | 0.000 |
| Including equality constraint | 164/951 | 32 | 0.000 |
| Difference | -41/224 | 32 | 0.000 |
| Critical value for a 32 DOF and cronbach alpha equal to 0.05 | 44/971 | | |

The most significant result obtained from presented information is about main parameters' being different in measurement models of the two groups. Two types' Chi-squared is -41/224 which is less than Chi-squared distribution's critical value in the significance level of %95 with DOF of 32, thus the null hypothesis is not supported. Therefore, we can confirm the moderating role of company's age on relations among process maturity, organizational innovation and firm's performance.

## 5. Conclusion and Discussion

Using a sample of 283 small and medium-sized enterprises located in Iran, we examined the relationship between process maturity, innovation and performance. The first finding of present study is that it investigates

the relation between variables and demonstrates that in addition to previous studies' regarding the positive effect of innovation on performance, other relations are examined. Some studies also confirmed this finding (e.g. Thornhill, 2006). Furthermore, this study shows a positive relation between process maturity and performance and process maturity and innovation (e.g. see. Tabatabaei, 2005).

Our findings prove that the effect of maturity on performance is stronger than the effect of process maturity on innovation. This result may convey that process maturity may affect innovation facilitation by firm's performance in a significant way.These findings are in accordance with previous theories by Fraser (2003), Ramasubbu (2005), and Trkman (2012).

Another contribution of this study is related to performance and organizational performance measurement scales. This study measures a wide range of innovation instead of adopting a cultural viewpoint by covering a number of administrative products, processes and innovations, active or proactive properties of these innovations and also the sources these companies allocate to innovation and process maturity' process initiatives. Although innovation requires that cultural values of a company's process should be reinforced, organizational performance process should be developed effectively. Thus, its result might be interesting to those who do their best to enhance innovation in a professional way. As a changing initiative, this is far way easier than changing the values.

Besides, the present study leads to helping the future research to analyze the probable effect of firm's age on the relations among process maturity, innovation, and performance. The results of this study showed that these relations are significant and positive among the variables, but moderators can change the strength of these relations. This effect of moderator factor, firm's age, confirmed the results of Trkman (2012). Age helps businesses to have better performance and do their activities in more effective way. Therefore younger businesses need to try harder by process maturity to have more effective approaches.

In sum, the present study contributes to the related research corpus: firstly, the model simultaneously reviews process maturity, innovation, and performance and their relationships. Secondly, this study strongly supports

these relationships and shows that regardless of firm's age, those are always meaningful and positive; even though firm's age affects the intensity of such relationships. Thirdly, using a sample of Nano firms, the present study provides results in a field where there is little empirical research. The research findings have implicit meanings for the specialists, even though they have already embraced the idea that innovation affects performance. The present study also shows that maturity facilitates innovation process. Thus, organizations hoping to improve performance through innovation need to improve organizational maturity process. This implication appears to be especially important for younger firms. Some of the suggestions in the field are as follows. Focusing on management and continuous improvement of organization processes and especially entrepreneurial organizations facilitates access to performance and innovation level. Reviewing process models and business processes could have positive results on the innovation and performance improvement of the firms. Thus, as the firms accept the process approach, the concept of process maturity draws more attention (Marsteller et al.,2011) and consequently, by specialization and precise definition of their business processes in order to reach higher maturity levels, entrepreneurial firms can attain higher performance and innovation.

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