Development and Validation of a Questionnaire for Measuring Factors Affecting Labor Productivity in Iranian and Turkish Private Banks Using the Analytic Hierarchy Process

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***Abstract*— Improving productivity is one of the most important strategies for socioeconomic development. The purpose of this research was to develop and validate a questionnaire for measuring factors affecting labor productivity in Iranian and Turkish private banks using the Analytic Hierarchy Process (AHP). The population consisted of the employees of Türkiye iş Bankası in Ankara and Eghtesad Novin Bank in Tehran. A 29-item questionnaire was developed based on the AHP technique with 5 main factors, each comprised of several components. Face, content, and construct validity of the instrument was examined. Also Cronbach's alpha was used to determine its reliability, and an alpha of 0.819 was obtained. Overall, the results showed the effectiveness of the questionnaire for measuring labor productivity in banks**

***Index Terms*— Questionnaire, validity, reliability, labor productivity, bank, AHP**

I. INTRODUCTION

The mission and goal of managers in each organization is to make effective and optimal use of resources, including workforce, capital, materials, energy, and information [12]. Optimal use of resources has become a national priority in all countries and survival is closely linked to productivity [11]. Productivity is a measure of the efficiency of production, expressed as the ratio of output to inputs used in the production process [16]. The concept of "productivity" was first introduced by Quesnay in 1766. In 1776, Adam Smith, the founder of classical economics, considers productivity as a factor that increases profit. Many scholars in management and economics fields believe that empowering employees is the most important element for improving productivity and ultimately achieving socioeconomic development [14]. The evolution of the concept of productivity over time is summarized in Table 1.

Table 1. Evolution of the concept of productivity

Scholar	Definition
Littre (1883)	Faculty to produce
Early (1907)	Relationship of the data used by output and produced output
Aftalion (1911)	Relationship between output and factors used to produce output
Organization for European Economic Cooperation (OECD) (1950)	Quotient obtained by dividing output by one of the factors of production
Davis (1955)	Change in product obtained for the resources expended
Fabricant (1962)	Ratio of output to input
Kendrick & Creamer (1965)	Ratio of real gross output to a combination of all corresponding inputs
Siegel (1976)	A family of ratios between production and input
Sumanth (1979)	The ratio of tangible production divided by tangible inputs
Easterfield (1994)	The ratio of a measure of output to a measure of one or more of the inputs used to produce the output

It can be gathered from these definitions that improving productivity requires optimal use of financial and human resources, reduction of costs, expansion of markets, and improvement in employee compensation and quality of life, so as to serve the interests of investors, employees, and consumers.

Factors affecting productivity can be divided into two general groups: external (e.g. state and infrastructure, natural resources, and structural changes) and internal factors (e.g. human resources and technology). External factors are not controlled by managers and thus usually affect all organizations similarly, while internal factors are controlled by the managers and can be effectively used to improve performance and productivity. Managers can affect various internal factors, including human resources, processes and procedures, organization and systems, skills, behaviors, efficiency, entrepreneurship, and management practices [15]. Organizations are made of human, technological, technical, structural, and cultural factors that interact to achieve a common goal. Human resources are the most important assets of an organization, and identifying the factors that affect labor productivity has been a major subject of interest for researchers. Productivity is as important for banks as for any other organization. Due to intense competition, banks must be able to make maximum output (e.g. profit, employee satisfaction, customer satisfaction) from specific inputs (e.g. assets, capital, workforce).

In recent decades, banks were operating in a relatively stable and non-competitive environment, but today this paradigm is changing and operational and decision-making processes have become faster and more dynamic. As a result, labor

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productivity has been gaining increasing importance, especially in developing countries such as Iran and Turkey that are faced with employee underperformance and reduced public investment.

Productivity measurement, if done systematically, is an effective tool for analyzing the performance of an organization and identifying areas that require improvement. As there are no standard instruments for measuring labor productivity in banks, the present research aims to develop and validate a questionnaire based on the Analytic Hierarchy Process (AHP) in Iranian and Turkish private banks. The results can be useful to researchers and the banking industry in these and other countries.

II. Literature Review

To improve labor productivity, the first and most important step is to identify the factors that affect it [6 & 7]. The important role of human capital in productivity growth is widely recognized in the economic literature since the seminal contributions of Schultz (1961), Becker (1964), Welch (1970) and Mincer (1974). Human capital has always been considered as a major source of growth by economic theory. Human capital theory rests upon the assumption that education raises the marginal physical product of workers.

Various factors have been shown to affect labor productivity, including training, motivation, opportunities for creativity and innovation, reward systems, work ethic, social behavior, and systems and processes [18]. Classical research on labor productivity considered work environment and financial incentives as the most important factors that affect it [21]. The human relations school introduced non-financial incentives to this set. On the other hand, the contingency theory of management does not posit that a specific factor or set of factors improves productivity; rather, by emphasizing on the diversity and abundance of human needs, argues that there are various ways tom improve productivity that depend upon the external and internal situation. Due to significant differences in the culture and status quo of organizations, it can be argued that different strategies are needed to improve productivity in each organization. Examples of such strategies include meeting the basic needs of employees, involving employees in decision making, using participatory management, encouraging teamwork in the workplace, paying fringe benefits, and having appropriate evaluation systems [21].

Hersey and Goldsmith (1980) have identified seven factors that affect employee performance in their 'ACHIEVE' model, namely Ability (knowledge and skills), Clarity (understanding or role perception), Help (organizational support), Incentive (motivation and willingness), Evaluation (coaching), Validity (procedures, practices, rules, and regulations), and Environment (outsider or external factors) [20]. Kim (2004) showed the significant positive effect of IT on labor productivity [7]. Ellis and Dick (2003) examined organizational behavior and showed that participatory management can improve productivity in group tasks [3].

Papadogonas and Voulgaris (2005) studied the determinants of labor productivity growth at the firm level in the Greek manufacturing sector. The results showed that labor productivity growth is positively related to growth of net fixed assets per employee, export orientation and R&D activity. Firm size, employment growth and industry age negatively affected labor productivity growth [10]. Wright et al. (2008) examined the effect of the Chinese cultural architecture on motivating workplace behavior for enhanced productivity in Chinese workplaces. They showed that practicality is the basic value driving and emotion is the most important contingent factor driving Chinese workplace behavior [13].

Leung et al. (2008) studied the relationship between firm size and productivity. They found a positive relationship between firm size and both labor productivity and total factor productivity was observed in both manufacturing and non-manufacturing sectors. Nayeri et al. (2004) found that effective evaluation can improve labor productivity in nurses [9]. Hejazi (2005) showed that better training is associated with higher workforce productivity [4].

The AHP Technique

The Decision-making has become very complex in today's turbulent world. Various methods have been proposed for multiple-criteria decision-making. Analytical hierarchy process (AHP) is one of the most-widely used methods. It was developed by Thomas L. Saaty in the 1970s as a structured technique for organizing and analyzing complex decisions. AHP is based on pairwise comparisons [26].

The procedure for using the AHP can be summarized as follows:

- Modeling the problem as a hierarchy containing the decision goal, the alternatives for reaching it, and the criteria for evaluating the alternatives;
- Establishing priorities among the elements of the hierarchy by making a series of judgments based on pairwise comparisons of the elements;
- Synthesizing these judgments to yield a set of overall priorities for the hierarchy;
- Examining the consistency of the judgments;
- Coming to a final decision based on the results of this process [25].

Saaty lists four axioms as the basic principles in AHP:

1. Reciprocal axiom: If $PC(A.B)$ is a paired comparison of elements A and B with respect to their parent element C, representing how many times more the element A possesses a property than does element B, then $PC(B.A) = \frac{1}{PC(A.B)}$.
2. Homogeneity axiom: The elements being compared should not differ by too much in the property being compared; otherwise, large errors in judgment could occur.
3. Synthesis axiom: Judgments about, or the priorities of, the elements in a hierarchy do not depend on lower level elements.
4. Expectation axiom: Individuals who have reasons for their beliefs should make sure that their ideas are adequately represented for the outcome to match these expectations.

III. Methodology

The present research was a descriptive survey, covering the first half of 2015. The population consisted of all the branches of Türkiye iş Bankası in Ankara (N = 127) and Eghtesad Novin Bank in Tehran (N = 104). Using cluster sampling,

these cities were divided into 4 parts, 4 branches were randomly selected from each part, and 4 employees with the highest experience and academic degree were selected from each branch. Overall, 128 employees participated in this research. From a review of the literature, the factors that affect labor productivity were identified. Data were collected using a questionnaire that consisted of two section. The first section recorded the demographic data (i.e. gender, position, experience, and education). The second section included a part for paired comparison of identified factors (i.e. psychosocial, individual, management, environmental, and cultural factors) and a part where the components of each factor were compared pairwise. This instrument was used to rank labor productivity factors in Türkiye iş Bankası and Eghtesad Novin Bank. Table 2 shows the pairwise comparison of the five labor productivity factors, while illustrating the format of the questionnaire. Here the question was: "*Which of the following factors are more important for improving labor productivity in banks?*"

Table 2. Pairwise comparison of the factors that affect labor productivity in banks

Column A	Importance									Column B
	5	4	3	2	1	2	3	4	5	
Management Factors										Psychosocial Factors
Management Factors										Cultural Factors
Management Factors										Environmental Factors
Management Factors										Individual Factors
Psychosocial Factors										Cultural Factors
Psychosocial Factors										Environmental Factors
Psychosocial Factors										Individual Factors
Cultural Factors										Environmental Factors
Cultural Factors										Individual Factors
Environmental Factors										Individual Factors

Table 3 shows the pairwise comparison of the components of management factors. Here the question is: "*Which of the following management components are more important for improving labor productivity in banks?*"

Table 3. Pairwise comparison of management components

Column A	Importance									Column B
	5	4	3	2	1	2	3	4	5	
Competent Supervisor										Merit-Based Promotion
Competent Supervisor										On-the-Job Training
On-the-Job Training										Merit-Based Promotion

Table 4 shows the pairwise comparison of psychosocial components. Here the question was: "*Which psychosocial components are more important for improving labor productivity in banks?*"

Table 4. Pairwise comparison of psychosocial components

Column A	Importance									Column B
	5	4	3	2	1	2	3	4	5	

Employee-Manager Relations										Job Security
Employee-Manager Relations										Perceptions of Justice in the Workplace
Employee-Manager Relations										Workplace Friendship
Employee-Manager Relations										Job Satisfaction
Job Security										Perceptions of Justice in the Workplace
Job Security										Workplace Friendship
Job Security										Job Satisfaction
Perceptions of Justice in the Workplace										Workplace Friendship
Perceptions of Justice in the Workplace										Job Satisfaction
Workplace Friendship										Job Satisfaction

Table 5 shows the pairwise comparison of cultural components. Here the question was: "*Which cultural components are more important for improving labor productivity in banks?*"

Table 5. Pairwise comparison of cultural components

Column A	Importance									Column B
	5	4	3	2	1	2	3	4	5	
Work Ethic										Opportunities for Growth and Development
Work Ethic										Compliance
Opportunities for Growth and Development										Compliance

Table 6 shows the pairwise comparison of environmental components. Here the question was: "*Which environmental components are more important for improving labor productivity in banks?*"

Table 6. Pairwise comparison of cultural components

Column A	Importance									Column B
	5	4	3	2	1	2	3	4	5	
Physical Work Environment										Workplace Hygiene and Safety
Physical Work Environment										High-Quality Equipment
Physical Work Environment										Workplace Vitality
Physical Work Environment										Ergonomics
Workplace Hygiene and Safety										High-Quality Equipment
Workplace Hygiene and Safety										Workplace Vitality
Workplace Hygiene and Safety										Ergonomics
High-Quality Equipment										Workplace Vitality
High-Quality Equipment										Ergonomics
Workplace Vitality										Ergonomics

Table 7 shows the pairwise comparison of individual factors. Here the question was: "*Which individual components are more important for improving labor productivity in banks?*"

Table 7. Pairwise comparison of individual factors components

Column A	Importance									Column B
	5	4	3	2	1	2	3	4	5	
Fit between Personal Skills and the Job										Fit between Personal Interests and the Job
Fit between Personal Skills and the Job										Work Experience
Fit between Personal Interests and the Job										Work Experience

Since the views of bank employees are not similar and are a function of various factors such as experience, position, and education, a weight was assigned to their responses: a weight of 1 for experience, a weight of 2 for education, and a weight of 3 for position [1 & 2]. The same weights were applied to the responses of employees of both Türkiye iş Bankası and Eghtesad Novin Bank.

$$Response\ Weight = (Weight\ Normalized\ to\ Experience \times 1) + (Weight\ Normalized\ to\ Education \times 2) + (Weight\ Normalized\ to\ Position \times 3)$$

Findings

The demographic data of the employees of Türkiye iş Bankası are provided in Table 11.

Table 11. Demographic data for the employees of Türkiye iş Bankası

Variable		N	Percentage
Gender	Female	38	59.37
	Male	26	40.63
Position	Bank Tellers and Analysts	42	65.62
	Vice President	13	20.31
	President	9	14.07
Experience	6 months to 2 years	13	20.31
	2-5 years	19	29.69
	5-12 years	23	35.94
	12-22 years	8	12.50
	> 22 years	1	1.56
Education	Bachelor's Degree	51	79.69
	Master's Degree	11	17.19
	PhD	2	3.12

Table 12 presents the demographic data for EN Bank employees.

Table 12. Demographic data for EN Bank employees

Variable		N	Percentage
Gender	Female	23	35.94
	Male	41	64.06
Position	Bank Tellers and Analysts	41	64.06
	Vice President	14	21.87
	President	9	14.07

Experience	6 months to 2 years	3	4.69
	2-5 years	10	15.62
	5-12 years	49	76.56
	12-22 years	2	3.13
	> 22 years	0	0
Education	Bachelor's Degree	39	60.94
	Master's Degree	21	32.81
	PhD	4	6.25

Face and content validity of the instrument was evaluated by a panel of experts from both countries and the questionnaire was modified based on their comments. Moreover, construct validity of the instrument was examined using factor analysis. First, Bartlett's test of sphericity and Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) were performed. The KMO for the correlation matrix of the items was 0.83 and Bartlett's test statistic was 3415.1, which was significant at the 0.01 level. Then, the items were analyzed using principal component analysis (PCA). The scree plot and the percentage of variance supported an eight-factor matrix. After Varimax factor rotation, the content of each factor was specified based on the factor loading of each item and the factors were labeled after being examined by experts. Eigenvalues were calculated for each factor, which overall explained 69.81% of variance in labor productivity. The explanatory power of each individual factor was as follows:

- Management Factors (3 components) = 19.29%
- Psychosocial Factors (5 components) = 14.91%
- Cultural Factors (3 components) = 13.25%
- Environmental Factors (5 components) = 11.07%
- Individual Factors (3 components) = 11.29%

Table 10 provides the factor loading of each item with Varimax rotation based on the results of factor analysis.

Table 10. The results of factor analysis (factor loadings with Varimax rotation)

Factor		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	Component 1	0.79				
	Component 2	0.63				
	Component 3	0.72				
Factor 2	Component 1		0.61			
	Component 2		0.56			
	Component 3		0.5			
	Component 4		0.69			
	Component 5		0.54			
Factor 3	Component 1			0.59		
	Component 2			0.64		
	Component 3			0.62		
Factor 4	Component 1				0.53	
	Component 2				0.59	

	Component 3				0.51	
	Component 4				0.67	
	Component 5				0.61	
Factor 5	Component 1					0.62
	Component 2					0.52
	Component 3					0.57
	Eigenvalue	4.87	4.23	4.04	2.37	3.61
	Variance	19.29	14.91	13.25	11.07	11.29
	Total Variance	69.81				

Table 11 provides the matrix of Pearson correlations between factor scores and total score (0.01 significance level).

Table 11. Correlations between factor scores and the total score of the labor productivity questionnaire

Factors	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Total Score
Factor 1	1					
Factor 2	0.39	1				
Factor 3	0.32	0.34	1			
Factor 4	0.23	0.29	0.41	1		
Factor 5	0.37	0.24	0.33	0.26	1	
Total Score	0.76	0.71	0.67	0.61	0.50	1

Cronbach's alpha was used to determine the questionnaire's reliability. An alpha of 0.819 was obtained for the entire questionnaire, indicating the high reliability of the instrument. Table 12 provides the Cronbach's alphas obtained for the questionnaire and its individual factors.

Table 12. Cronbach's alpha for the entire questionnaire and each KM success factor

Factors	Management	Psychosocial	Cultural	Environmental	Individual	Total
Number of items	3	10	3	10	3	29
Cronbach's alpha	0.862	0.827	0.784	0.751	0.798	0.819

Discussion and Conclusion

Productivity contributes to the wealth of organizations and nations. It allows organizations to maintain a high level of return on capital [14]. In today's world only countries with high productivity can economic and industrial leaders, as productivity is a major factor in economic growth and development. The human factor is the most important aspect of productivity. Today, almost all advanced countries consider labor productivity as the main source of economic growth and national welfare [21].

Before taking any measures to improve productivity, it is imperative to evaluate the status quo and prioritize strategies. To understand changes in productivity and evaluate efforts undertaken to improve it, productivity must be measured using different indices at specific periods. The results can be used as a basis for long-term planning at the organizational level.

The purpose of this research was to develop and validate a questionnaire for measuring the factors that affect labor productivity in banks. The results showed that the instrument has high validity and reliability. The results of exploratory factor analysis supported a five-factor model: management factors (3 components and 3 items), psychosocial factors (5 components and 10 items), cultural factors (3 components and 3 items), environmental factors (5 components and 10 items), and individual factors (3 components and 3 items). These 29 items explained 69.81 percent of the total variance, which is relatively high. Moreover, the correlation of the factors with the total score indicates the high validity of the instrument. The present findings are consistent with the results of Kim (2004), Hejazi (2005), Papadogonas and Voulgaris (2005), Wright et al. (2008), Bahrami et al. (2013), and Bahrami et al.

(2016), all of whom examined the factors affecting labor productivity in different settings.

Overall, the results show that the independent variables affect labor productivity in banks and the developed questionnaire which is based on the AHP technique can be used to prioritize and rank these factors. Given the lack of a standardized questionnaire for measuring labor productivity in Iran and Turkey, the proposed questionnaire seems capable of filling this gap. Therefore, it can be normalized and used in public and private banks and organizations.

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