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AN INVESTIGATION OF WIDEBAND MIMO CHANNEL CHARACTERISTICS IN RECTANGULAR TUNNEL

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ABSTRACT

In this paper, the power delay profile (PDP) and root mean square delay spread (RMS-DS) relationship is demonstrated to satisfy the LTE-M criteria for rectangular tunnel area at 1.8GHz. The leaky coaxial cable (LCX) was exploited as a transmitting antenna for both single-input single-output (SISO) and multi-input multiple-output (MIMO) systems. The effect of changing the received antenna (Rx) distance on the variation of received power using the Ray-Tracing Method is investigated. The reflected (NLOS) and line of sight (LOS) paths between the LCX and receiving antenna for both vertical and horizontal polarizations are deliberated and it was found that the horizontal polarized LCXs accomplish better performance than the vertically polarized cables used for both SISO and MIMO systems under tunnel environment. Furthermore, it was determined that the minimum distance between transmitting and receiving antennas can acquire higher received power.

1. INTRODUCTION

Long-Term Evolution for the metro (LTE-M) technique is recognized as a firm communications tactic for the future city rail transit systems because of a small number of shortcomings of wireless local area networks (WLAN) in the communication-based train control (CBTC) structure. The key consequences of LTE-M structures are better data rates and higher spectral efficiency based communications. In order to provide long term and steady communications, LTE-M mostly uses LCX for indoor environments such as tunnels, malls, subways, etc (Nakamura et al., 1996; Schwarz & Rupp, 2016). In small areas when the conventional antenna system is used, the attenuation of

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radiated waves' gets severe after many times of scattering and reflection. The radiation characteristics and antenna parameters have substantial effects on the field coverage (Li & Wang, 2016). LCX has been used for many decades due to its massive advantages under indoor environments over orthodox antenna such as easy installation, confirming limited interference between the cells, and steady coverage (Wang et al., 2016). LCXs have principally consistent linearly slotted arrays having static-phases delay between two adjacent slots, moreover the periodic slots are slash in vast metallic planes having slight impact on scattered field (Wang et al., 2012).

Radio communications in the underground area rely on the environmental circumstance nearby the LCX, neighboring electromagnetic field intensity (EMI) and installation arrangement of LCX (Zhao et al., 2008). Ray Tracing (RT) methodology is widely applied for a meticulous approximation of the radio channels limitations and substantial accuracy of the neighboring field estimation for indoor atmosphere. The proper modification of the slots period of LCXs and configuration w.r.t the receiving antenna (Rx) can reduce the uncertainties of field. Ray-based transmission analysis such as multiplication to diffused scattering, multi-dimensional radio channel characterization, MIMO capacity assessments is deliberated in Fuschini et al. (2015). In underground tunnel situation, the physical wall material properties have vital impact on the electromagnetic features. The coupling losses (CL) of LCXs decrease under the condition where the dielectric coefficient of some material of the sidewall or roof gets higher or the operating frequency rises (Kim & Eom, 2007). Normally, single LCX is utilized as single transmitting antenna w.r.t single receiver antenna (SISO). Therefore in order to achieve higher performance, more than single LCX is lined up to design the MIMO system. In Emami et al. (2016), the two different LCXs were used to propose 2x2 underground corridor scenarios and office landscape based MIMO system. The experimental and theoretical results by Medbo & Nilsson (2012) reveal that LCX is appropriate for the MIMO channel in underground or tunnel environment. Furthermore, (Medbo & Nilsson, 2012) also disclose that the quality of MIMO channel gets poorer from the i.i.d channel when the LCXs were separated much closer.

In Ruisi et al. (2011), the three-dimensional (3D) frequency transfer function (FTF) was acquired based on an experimental campaign conducted in three different zones and power delay profiles (PDPs) were estimated. The PDPs in the line of sight (LoS) path meets very well to the exponential distribution. Due to the increment of measuring distance for the indoor tunnel, the line of sight component vanishes and several reflections stay because of the obscuration in tunnel. The root-mean-square delay spread (RMS-DS) is very important parameter that is widely used to describe the time-based dispersive attributions of multipath MIMO channels. As a matter of fact, the existence of obstacles in tunnel atmosphere has unpredictable special effects at the multipath channel (Shuang-de et al., 2017; Collonge et al., 2003). Moreover for radio channels, the RMS-DS rises when scattering and reflections induce greater transmission delay times. In Liao et al. (2013), a 3D image technique was presented to calculate the wireless local area network (WLAN) channel impulse response (CIR) for many locations of receiving antenna. Based on the CIR, the RMS-DS and the number of multipath components were computed. It was found that the RMS-DS for arched straight corridor was smaller than all other corridors regardless of their shapes. However, the previous studies deliver numerous results but most of these studies have insufficiency of real-time experiments in tunnel environment.

In this paper, the PDP and RMS-DS are explained thoroughly in the rectangular tunnel atmosphere at the 1.8GHz frequency. The RT approach was applied to explore the LCXs positioning impact on the SISO and MIMO channel characteristics. The horizontal and vertical polarized LCXs are under consideration. The paper is arranged as follows. Section II discusses the channel modeling. The methodology of PDP and RMS-DS estimation is given in Section III. Section IV deals with the simulated results and discussions of SISO and MIMO channels by considering both horizontal and vertical polarized LCXs and section V demonstrates the conclusion.

2. CHANNEL MODELING

The radiated field gives a brief introduction related to transfer of the energy/power from any source to the absolute destination in some specific pattern of the electric rays. The electric field complies the distance law of Inverse Square to some particular source. LCXs have periodic slots on the outermost conducting layer which facilitates the waves to radiate from the surface. Lately, various kinds of periodic slots of LCXs are fabricated based on the environmental condition and desires of users but in this work we deal with only vertical and horizontal polarized LCXs. Horizontal polarized LCXs slots are configured horizontal to propagation direction of LCX, and inverse case is considered for vertical polarized LCX (Zhang et al.,2006).The field from the circumferentially polarized LCX is estimated as follows

$$E_{\varphi} = V(\theta,\varphi)\frac{e^{-jk_0 r}}{r} sin\theta \quad (1),$$

where $V(\theta,\varphi) = \frac{jVcos\theta}{\pi^2\, bk_0 sin^3\theta}\sum_{n=-5}^{n=+5}\frac{ne^{jn\varphi}j^{n+1}}{H_n^{(2)'}(bk_0 sin\theta)} \times \frac{sinn\alpha}{n} - \frac{m\, sinm\alpha\, cosn\alpha - ncosm\alpha\, sinn\alpha}{(m^2-n^2)\cos m\alpha}$ with $m = k_0 b$. E_z stays constant alongside z-axis due to the very smaller width w of the slot, p is the period of the slot, $H_n^{(2)'}$ is the Hankel function of n^{th}ranked, φ is angle amongst x-axis and r', and θ is angle amongst z-axis and r. The distance from origin o to some location in space is r and it has the projection r' in xoy plane as shown in Figure. 1. The vertically polarized portion of E_{φ} can be calculated by introducing the Ray-Tracing method.

$$E_y = V(\theta_i,\varphi_i)\frac{e^{-jk_0\ (r_i+r_{i1})-\ j\beta_i P}}{r_i+r_{i1}}\ sin\theta_i\ cos\varphi_i\ \Gamma_h \quad (2),$$

where $r_i = \sqrt{{x_o}^2+{y_0}^2+{z_0}^2}$, $r_{i1} = \sqrt{{x_0}^2+(h-h_0)^2+(ip-z_0)^2}$

$\varphi_i = arccos\ (\frac{x_0}{\sqrt{{x_0}^2+{h_0}^2}})$; $\theta_i = arctan\ (\frac{\sqrt{{x_0}^2+{h_0}^2}}{z_0})$

$\beta = k_0\sqrt{\epsilon_r}$; $\gamma = \arctan(\frac{x_0}{\sqrt{{z_0}^2+{h_0}^2}})$.

The term Γ_h is reflection coefficients of horizontally polarized rays, z_0 is residual distance initiating from existing slot to the remaining z-axis, where h_o are perpendicular distance amongst the incident point and cable, x_o is the horizontal distance among the cable and the left-hand metope of space, and finally $(\epsilon_1 - j\epsilon_1')$ is the dielectric coefficient along the tunnel walls. The vertical

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polarized wave's reflection coefficients are calculated:

$$\Gamma_v = \frac{(\epsilon_1 - j\epsilon_1')sin\gamma - \sqrt{(\epsilon_1 - j\epsilon_1') - cos^2\gamma}}{(\epsilon_1 - j\epsilon_1')sin\gamma + \sqrt{(\epsilon_1 - j\epsilon_1') - cos^2\gamma}} \quad (3)$$

The horizontal polarized wave's reflection coefficients are written as

$$\Gamma_h = \frac{sin\gamma - \sqrt{(\epsilon_1 - j\epsilon_1') - cos^2\gamma}}{sin\gamma + \sqrt{(\epsilon_1 - j\epsilon_1') - cos^2\gamma}} \quad (4)$$

The total field is assessed by adding the effects of all other slots of LCX:

$$E_{y\Sigma} = \sum_{i=1}^{N} V(\theta_i, \varphi_i) \frac{e^{-jk_0(r_i + r_{i1}) - j\beta_i P}}{r_i + r_{i1}} sin\theta_i \, cos\varphi_i \Gamma_v \quad (5)$$

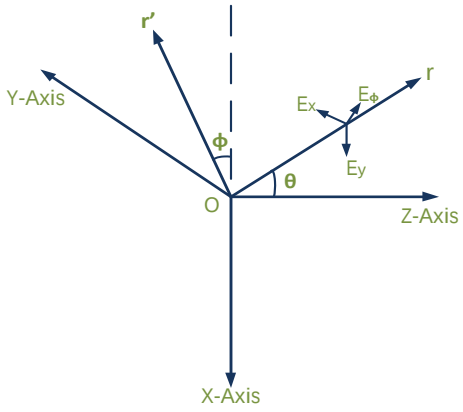

Figure 1: The radiated field pattern of LCX

3. ENERGY CONSERVATION

The geometry of the surrounding area, i.e., structure, density and the size of the building's cars, trees, etc., effects the propagation through the wireless channel. The conservation of energy indicates that the energy density integral for every closed surface nearby the transmitters (Tx) should be equivalent to transmitting power. Assuming that there exists a closed surface that follows a spherical shape with a radius d and having a transmitter at its center, and assuming that the transmitting antenna is isotropic, the energy density of the surface is $P_{Tx}/\left(4\pi d^2\right)$. The "effective area" of the receiving antenna is expressed as A_{Rx}. We can assume that the energy that is incident onto the area is received by the receiving antenna so that the energy that will be received is given as (Fontan & Espieira, 2008)

$$P_{Rx}(d) = P_{Tx} \frac{1}{4\pi d^2} A_{Rx} \quad (6)$$

If the transmitting antenna is not isotropic, the power density required to multiplied by antenna gain in the direction of Rx, which is assumed as

$$P_{Rx}(d) = P_{Tx} G_{Tx} \frac{1}{4\pi d^2} A_{Rx} \quad (7)$$

The product of the power of the transmitting antenna and the desired directional gain is known as the corresponding isotropic radiant energy (Equivalent Isotropically Radiated Power, EIRP). For

a given power density, the effective antenna area is proportional to the power received from the antenna connection. It can be proved that the effective area of the antenna has a simple relation with the antenna gain:

$$G_{Rx} = \frac{4\pi}{\lambda^2} A_{Rx} \tag{8}$$

Among them is the carrier wavelength, the formula (3.3) is brought into (3.2), and the receiving energy is obtained from the function with a transceiver distance d in the form of the variable, also known as the Friis Law:

$$P_{Rx}(d) = P_{Tx} G_{Tx} G_{Rx} \left(\frac{\lambda}{4\pi d} \right)^2 \tag{9}.$$

Friis's law points out that attenuation in free space increases with frequency.

3.1 POWER DELAY PROFILE

The PDP directs the received power of signal against the time delay, i.e., through indicating the relative extent of receiving power at the Rx antenna during the time duration of $(\tau, \tau + d\tau)$ (Molisch, 2006; Cui & Tellambura, 2006). In several communications systems, such as the OFDM, sub-channels and noise variance, PDPs are required for frequency offset valuations and channel approximation (Cui & Tellambura, 2005). Owing to the significance of PDP, many experimental performances have been established for it, including for different outdoor and indoor and vehicle to vehicle channels.

In the research of wireless channels, channel pulse response can be considered as a generalized stationary stochastic process in any short time. Because the channel studied in this paper is a quasi-static channel, the average power delay spectrum (PDP) can be achieved directly through the squares of the amplitude of N impulse response in time mean (Cox & Leck, 1975):

$$\mathrm{PDP}(\tau) = \frac{1}{N} \sum_{i=1}^{N} \left| h(\tau, t_i) \right|^2 \tag{10}$$

The resulting PDP can reduce the impact of noise. This is because the signal is coherent, and the noise is random, and for Gaussian white noise with a zero-average variance, the noise variance after the average period data is theoretically reduced, similar to the increment in the signal-to-noise ratio.

3.2 ROOT MEAN SQUARE DELAY SPREAD

Delay spread (DS) is another important channel constraint. There exists no general definition for the DS. Rigorously, it is the second central moment of PDP, but the explanation of mean/average time and the averaging aspect is very important for limited data archives of a non-stationary procedure. Because of its moment property and estimation from averaging, it is more vigorous to estimate the technique when associated to the power delay profile. In order to compare different multipath channels and summarize some common design principles of wireless systems, the methods of quantifying some parameters of multipath channels, RMS-DS is used, which can be calculated from PDP. The delay spread (DS) is normally the measure of multipath abundances of a communication channel. Moreover, it can be unstated as the difference among the time of arrival (TOA) of the first substantial multipath component (generally the LOS component) and the TOA of

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the last multipath component. DS is widely used in the characterization of a wireless channel, but it is also used for other multipath channels. Because it is a LOS channel, the first diameter (reference diameter) must be the PDP peak point, similar to the literature (Molisch, 2012). According to the sampling interval of the receiver to define the value of each sampling point as a valid diameter, the sampling point greater than the threshold value is considered as a valid diameter for the estimation of parameters. The time dispersion characteristics of broadband multipath channels are usually described quantitatively by average excess delay (ED) and RMS-DS. The average ED is a first-order moment for the power delay distribution, defined as (Molisch et al, 2012):

$$\bar{\tau} = \frac{\sum_k a_k^2 \tau_k}{\sum_k a_k^2} = \frac{\sum_k p(\tau_k)\tau_k}{\sum_k p(\tau_k)} \tag{11}$$

RMS-DS is basically the square root for second-order moments of PDP, defined as

$$\tau_{RMS} = \sqrt{\overline{\tau^2} - (\bar{\tau})^2} \tag{12}$$

whereas

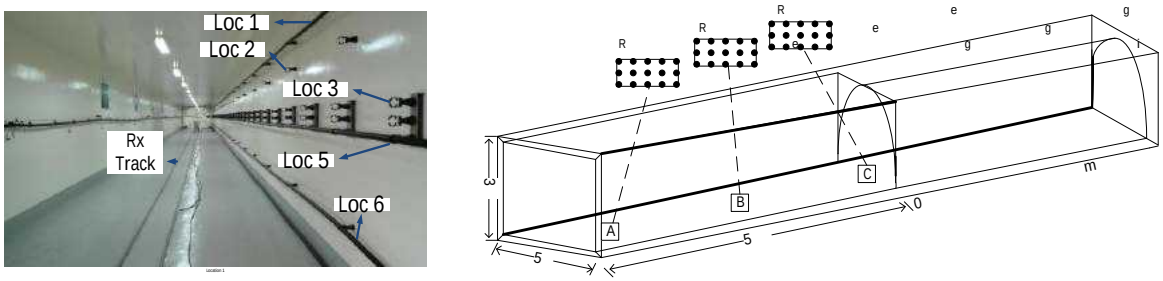
$$\overline{\tau^2} = \frac{\sum_k a_k^2 \tau_k^2}{\sum_k a_k^2} = \frac{\sum_k p(\tau_k)\tau_k^2}{\sum_k p(\tau_k)} \tag{13}$$

The power $p(\tau_k)$ and delay τ_k are related to the diameter of the K-section respectively.

4. RESULTS AND DISCUSSIONS

For facilitating the complete understanding of this article, we insert the Nantong Tunnel environment for the SISO and MIMO channel measurement scheme of the two-dimensional plane map, respectively. The simulated campaign was accomplished in an empty subway tunnel at Zhongtian technology company (ZTT), Nantong, China, that is mostly functioned for a complete understanding of field realizations. This tunnel was basically 100m long and contains two parts: the initial part consists of arched tunnel with 50m length and the second part is rectangular tunnel of 50m length. The tunnel walls are protected with concrete material. We choose the rectangular-shaped tunnel for simulations. The cables are fixed along z-axis and beside tunnel walls, the elevation from the ground was considered along y-axis and the space between the Rx and the LCX was taken along$x$-axis. The total volume of rectangular shaped tunnel is specified as 50m (*length*) x 5m (*width*) x 3m (*height*). The dipole antenna was considered as a receiver antenna and *Wireless Insite* (*WISE*) software was used for measurements in the tunnel area. The WISE software is used to estimate both indoor and outdoor radio channel features by using the ray-tracing method. Moreover, it provides some antenna patterns such as Lambert's Law, half-wave dipole, isotropic and automatic (Fortune et al., 1995; Jimenez et al., 2017). The radiuses of outermost and innermost conductors of LCXs are given as 16mm and 6mm. The Nantong tunnel real-time inner view (Saleem et al., 2019) and WISE based tunnel construction are shown in Figure.2 and the configurations of static parameters are given in Table.1. Loc1, Loc2, and Loc3 are three different

positions of LCXs at 2.7m, 1.9m and 1.15m high from the ground level.



(a) (b)

Figure 2: (a) The real-time Nantong tunnel inner view, (b) the tunnel construction in Wireless Insite.

For SISO and MIMO channel measurement scheme of PDP in the Nantong tunnel for the two-dimensional plane map are given in Figure 3 (a) and (b). When the SISO channel is measured, the LCX is placed 2.7m high from the ground of tunnel along z-axis, and the receiver is measured at 2m away from the distance of the LCX along x-axis. In SISO system, we divided it into three regions as Region1, Region2, and Region3, respectively; whereas each region has three rows of receiving antennas and each row have 25 locations of receiving antennas. So, in each region, we have 75 receiving antennas and each row is apart 0.5m distance from others. Also, in each row, the distance between two consecutive antennas is 0.5 λ and the slot period of LCX was considered as 0.6m. Region1 contains from 0m to 2m, Region2 contains from 24m to 26m and Region3 contains from 48m to 50m in rectangular Nantong tunnel. For the MIMO system, the first LCX working as Tx-1 is at 2.7m high from ground and second LCX working as Tx-2 is 1.9m high from ground.

Table 1: The Measuring Parameters.

Unit	Parameter
Carrier Frequency	1.8GHz
Transmitted Power	20dBm
Bandwidth	40.8MHz
Tx-Antenna	ZTT-LCX of 50m length
Rx-Antenna	UHA9125D Dipole Antenna
Antenna Gain	2.15 dBi
Height of LCX at Loc 1	2.7m
Height of LCX at Loc 3	1.9m
Height of LCX at Loc 5	1.5m
Height of Rx-Antenna	1.6m
LCX spacing	Loc 1 and Loc 3, 0.8m
LCX spacing	Loc 1 and Loc 5, 1.2m
LCX spacing	Loc 3 and Loc 5, 0.4m
Slots period of LCX	0.6m
Sampling Rate	81.6MHz
Resistance	50ohm
Measurement Time	50ms

Moreover, we considered three receiving antennas arrays as Rx-1, Rx2 and Rx-3 at 0m, 24m, 48m distances away from start of tunnel, respectively. Each receiver consists of 75 virtual receiving antenna arrays, whereas distance between two consecutive receiver antenna arrays is 0.5 λ.

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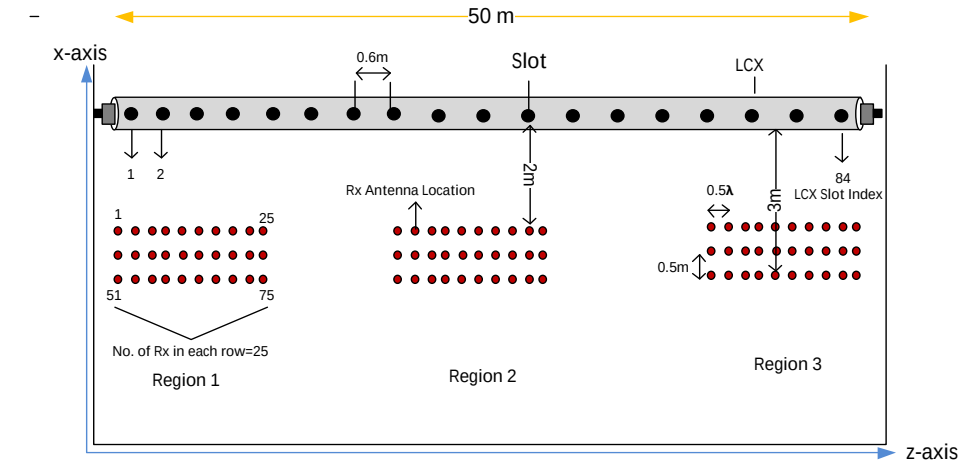
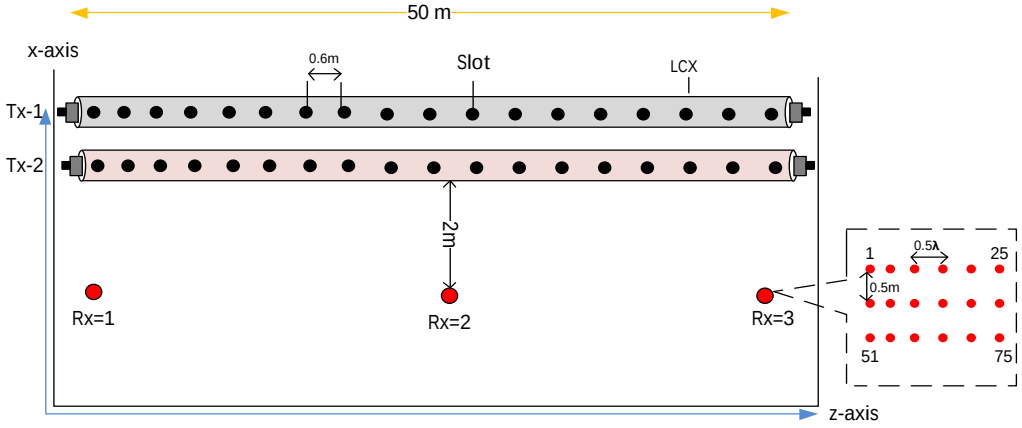


(a)



(b)

Figure 3: The transmitting and receiving antenna locations
(a) for the SISO system, (b) for the MIMO system.

In this paper, 2,150 cycles of channel impact response, that is, N=2150, are measured. By averaging the data of 2150 frames, the PDP of each sub-channel is obtained, and Figure 4 shows the PDP's comparison of Rx antennas with the horizontal and vertical polarized LCX slots in Region1. In each region, there are 3 arrays of Rx antennas and each array contains 25 Rx antennas, whereas the period of LCX slots is 0.6m for 50m long LCX. In comparison, we have found that horizontal polarized LCX has superior performance for PDP than the vertical polarized LCX by using (10). The first array of slots has higher received power between Tx and Rx than other arrays due to less distance as can be seen in Figure 4. It is clear the first array in each region has improved PDP than the other two arrays of receiving antennas.

Similarly, we considered the other two regions (Region2 and Region3) for PDP's comparison for both vertical and horizontal polarized LCX slots in Figure 5 and Figure 6, respectively and we have found that Region1 has relatively strongest power than others and horizontal polarized LCX performs superior to vertical polarized LCX for the SISO system.

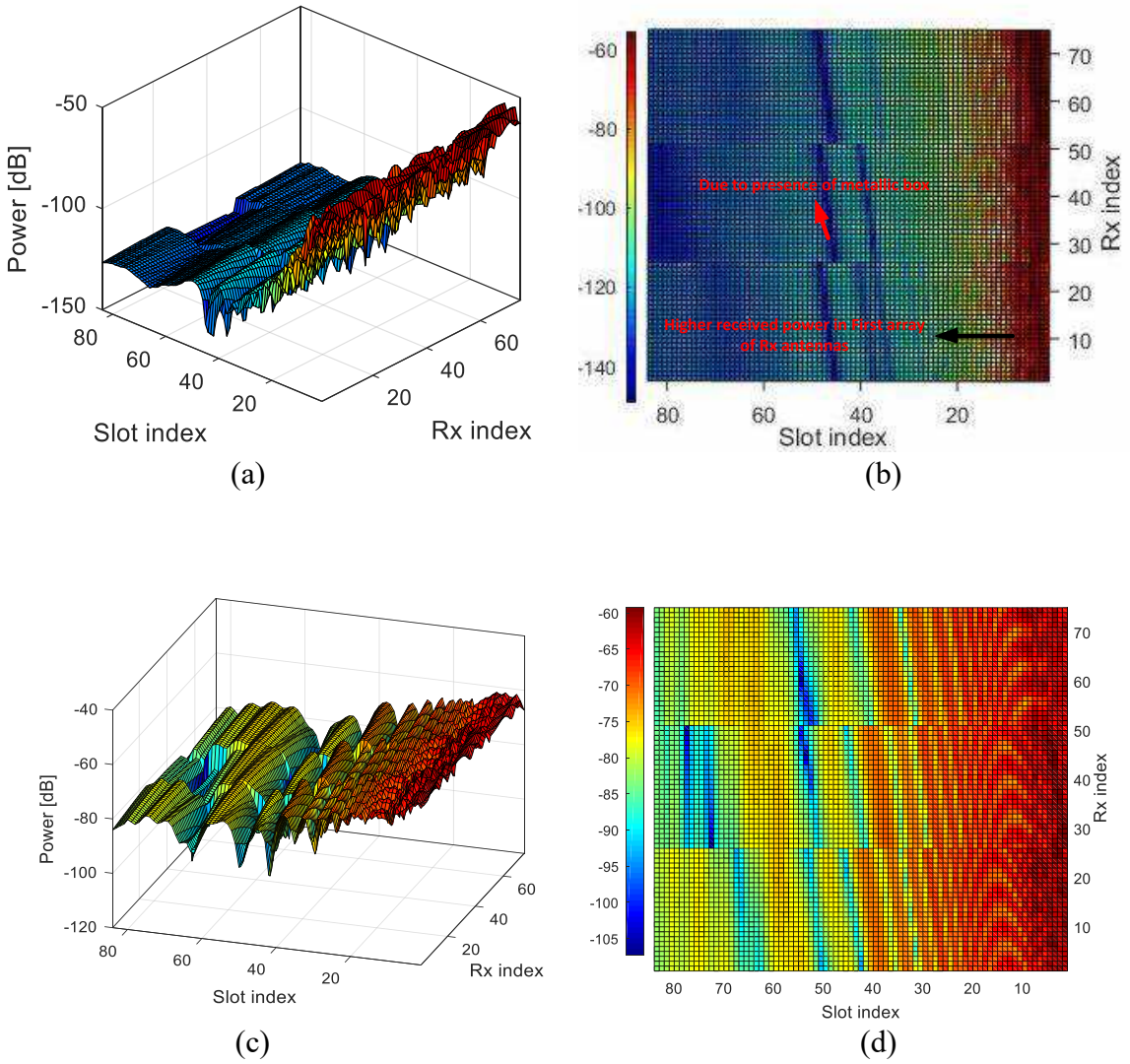


Figure 4: The PDP comparison for the SISO system of 75 Rx antennas in Region1 for Horizontally polarized LCX slots (a) 3D side view of PDP, (b) 2D upper view of PDP. The PDP comparison in Region1 for Vertically polarized LCX slots (c) 3D side view of PDP, (d) 2D upper view of PDP.

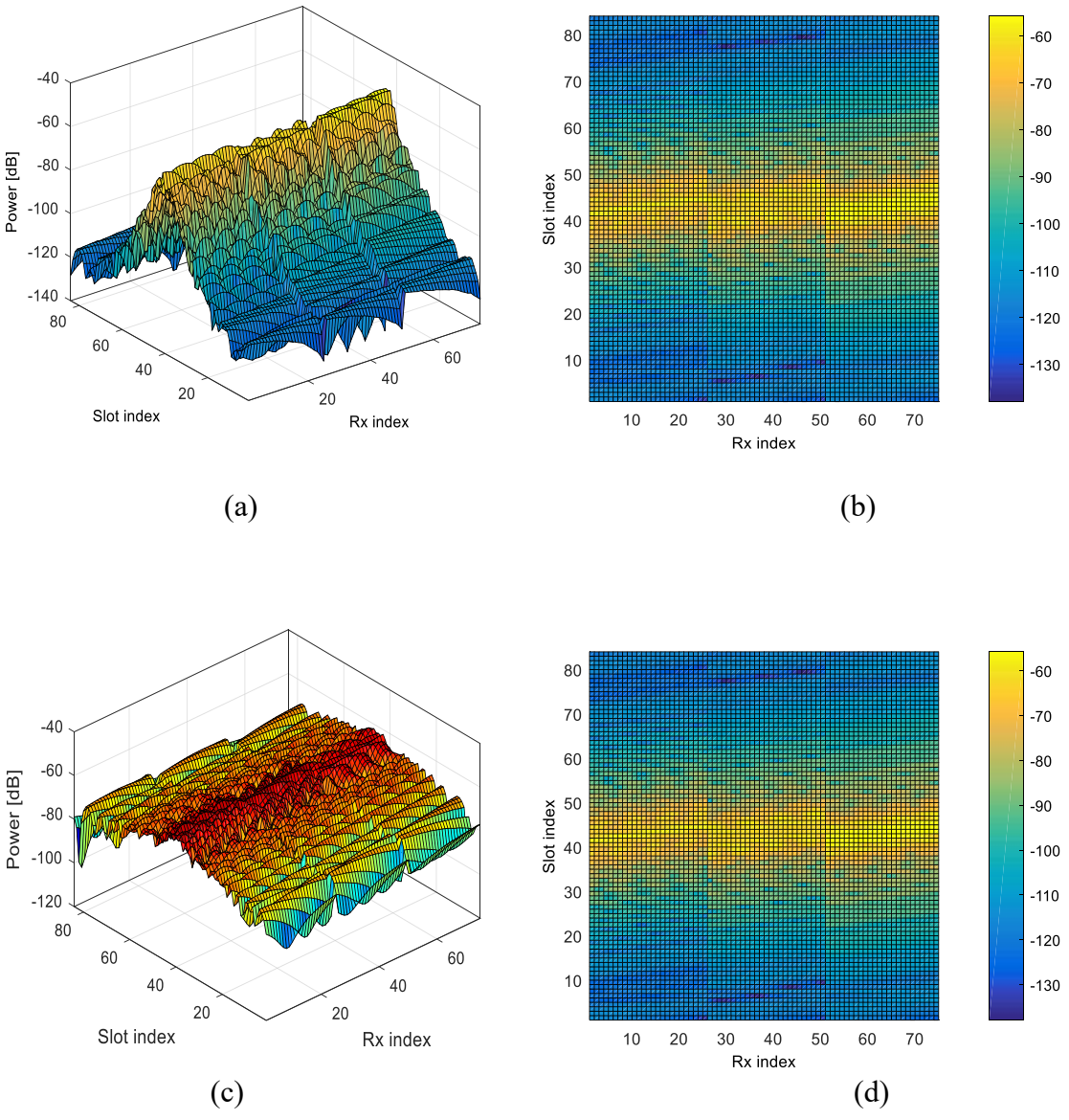


Figure 5: The PDP comparison for SISO system of 75 Rx antennas in Region2 for Horizontal polarized LCX slots (a) 3D side view of PDP, (b) 2D upper view of PDP. The PDP comparison in Region2 for Vertical polarized LCX slots (c) 3D side view of PDP, (d) 2D upper view of PDP.

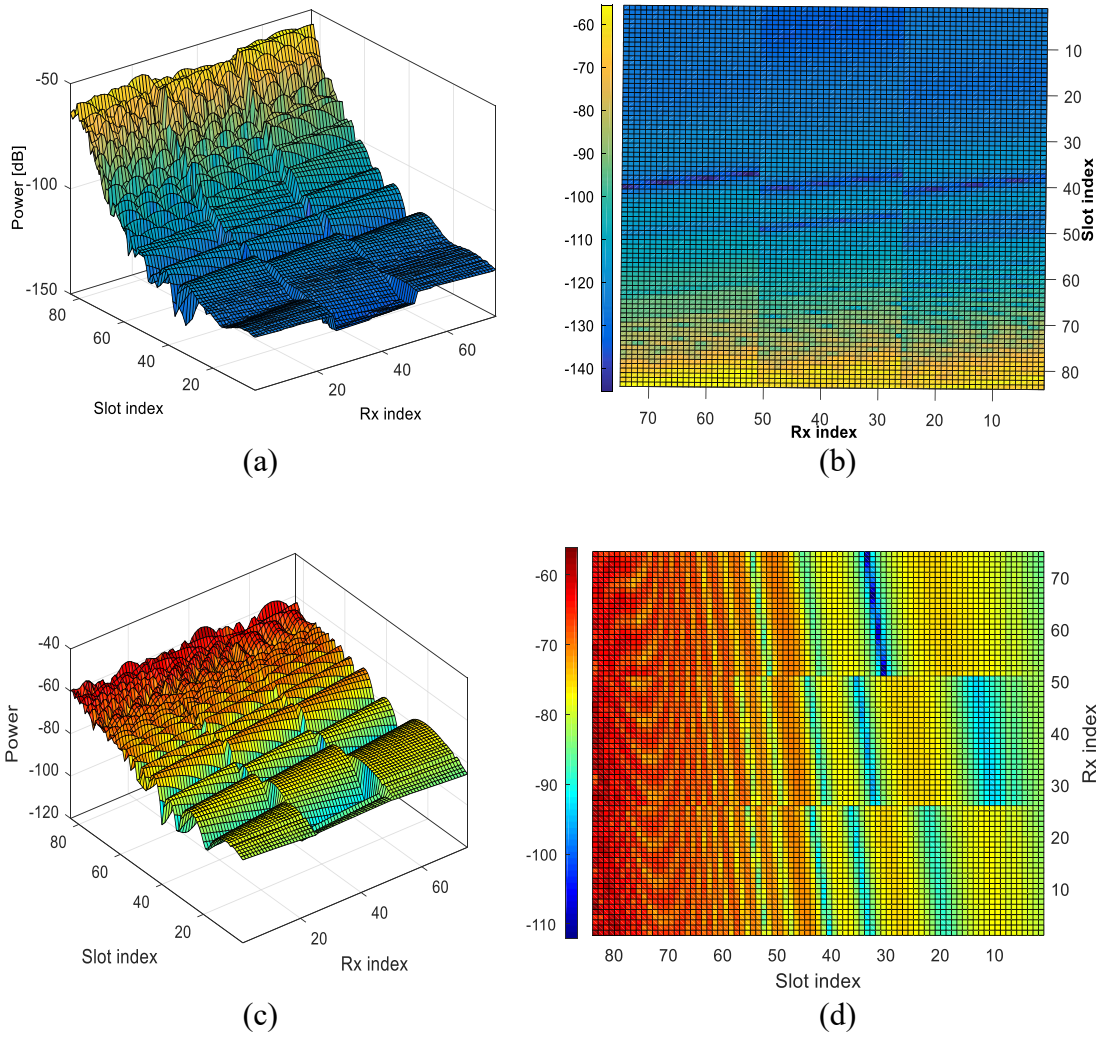


Figure 6: The PDP comparison for SISO system of 75 Rx antennas in Region3 for Horizontal polarized LCX slots (a) 3D side view of PDP, (b) 2D upper view of PDP. The PDP comparison in Region3 for Vertical polarized LCX slots (c) 3D side view of PDP, (d) 2D upper view of PDP.

Due to the presence of a single metal box in the mid rectangular shaped tunnel which originates many reflections, moreover, the junction of rectangular and arched tunnel has extra concrete wall material which also causes extra reflections. So, due to these reasons, Region1 has higher performance as compared to other two regions (Region 2 and Region 3).

For further investigation of PDP, we evaluated the PDP of the MIMO system for the different receivers as shown in Figure 3 (b). We considered the 2x3 MIMO system by using virtual receiving antenna arrays. The two different LCXs of 50m long at 2.7m and 1.9m high from the ground were examined. We took 3 receivers as Rx-1, Rx-2, and Rx-3, whereas each receiver has virtual array of 75 receiving antennas with 0.5 λ spacing. So, totally we will have 450 virtual Rx's for 2x3 MIMO systems. The PDP relation of MIMO system corresponding different numbers of Rx for horizontal and vertical polarized LCX's is given in Figure 7.

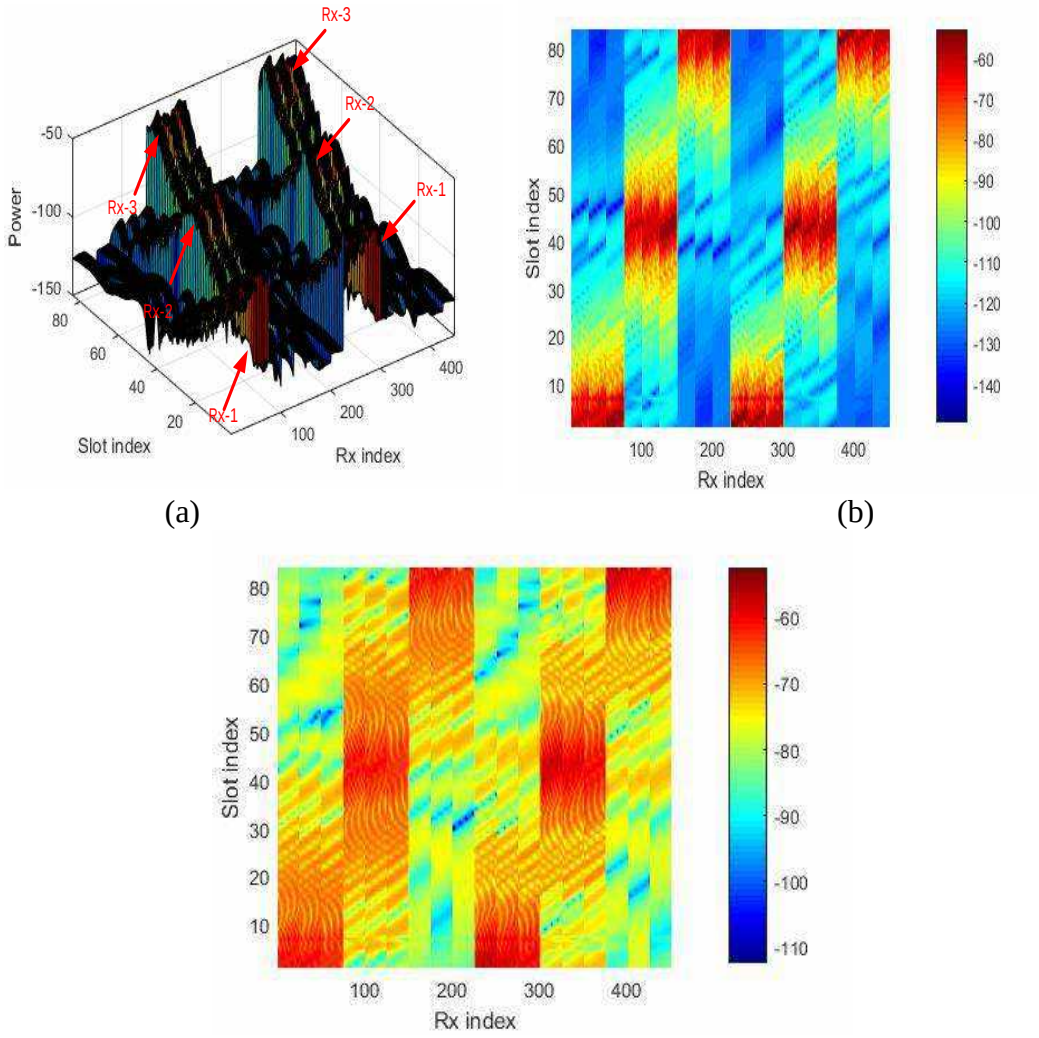


Figure 7: The PDP comparison for the MIMO system of virtual 450 Rx antennas for (a)Horizontal polarized LCX's slots in 3D side view (b) 2D upper view of PDP for horizontal polarized LCX's (c) 2D upper view of PDP for vertical polarized LCX's.

According to the formula of RMS-DS, the statistical parameters of average RMS-DS measured for the SISO channel with horizontally polarized configurations of LCX at 2.7m high from ground level according to Figure 3 (a) where receiving points scenario is calculated for all three regions in Figure 8. It can be seen that Region1 has a higher value of RMS-DS as compared to other two regions. Due to presence of metallic box in Region2 and extra concrete wall portion in Region3, there exists a more number of reflections, so Region1 have better performance in terms of PDP and RMS-DS than other regions.

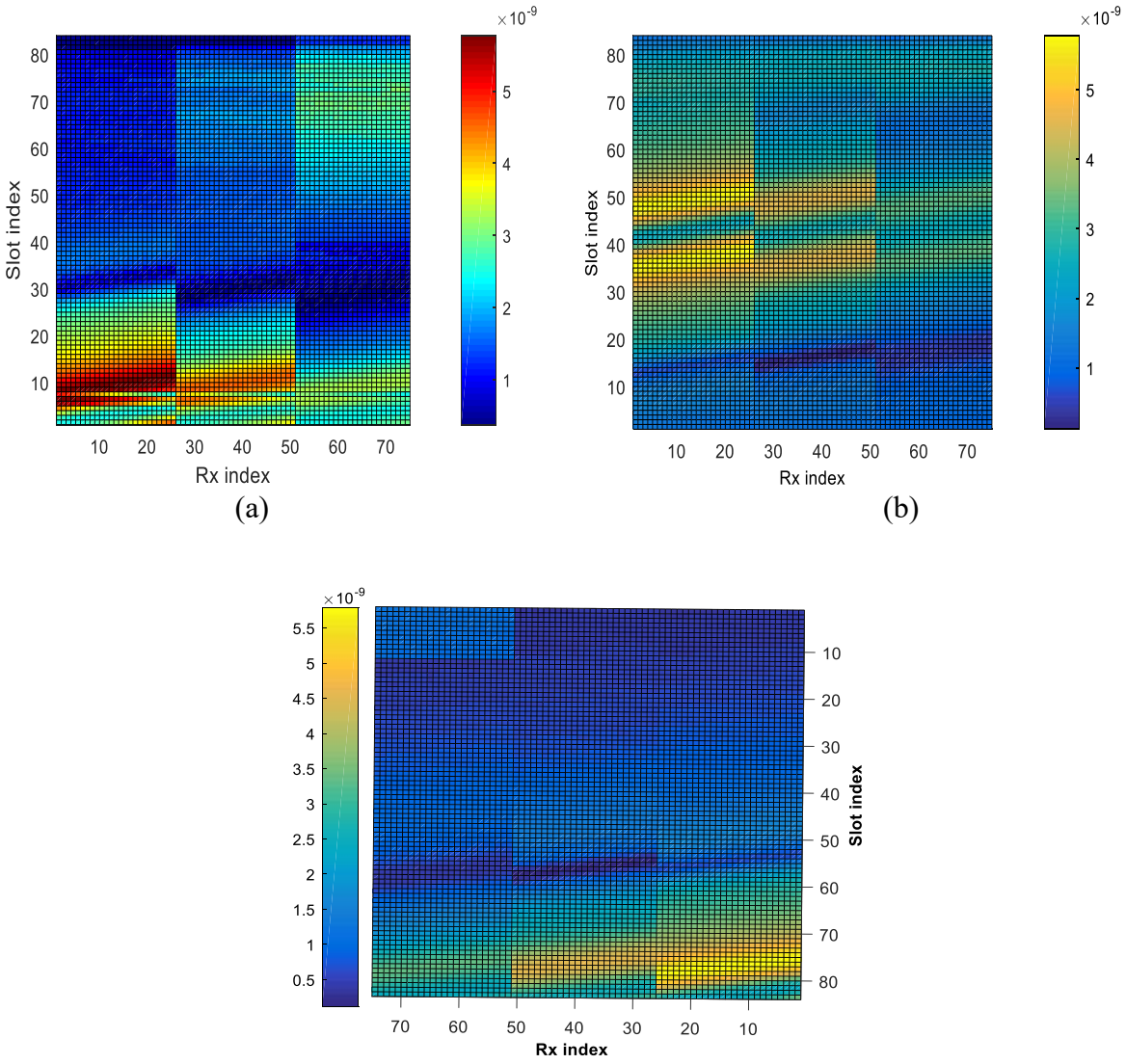


Figure 8: The RMS-DS comparison for SISO system for Horizontal polarized LCX (84 slots) at 2.7m high with receiving antenna in Region1 (a), In Region2 (b) In Region3 (c).

5. CONCLUSION

In this paper, we considered the simulated campaign for SISO and MIMO systems in the tunnel environment at 1.8GHz frequency band for both horizontal and vertical polarized LCXs. We have found the response of PDP and RMS-DS over different locations of LCXs and the receiving antennas. We have proved that horizontal polarized LCXs have superior performance than the vertical polarized LCXs when considered the SISO and MIMO systems individually. Furthermore, we have proved that Region1 has improved PDP and RMS-DS values than the other two regions (Region2 and Region3) in tunnel environment and the first array of receiving antennas which are a minimum distance from LCX, has better PDP and RMS-DS than the other two Rx antennas arrays. As a result, this study delivers a proficient knowledge for optimal model designing and moreover, it offers improved platform for the LTE-M system by deploying the LCX in the tunnel.

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6. AVAILABILITY OF DATA AND MATERIAL

The used or generated data in this study is available by request to the corresponding author.

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ROLES, RESPONSIBILITIES, AND HINDRANCES OF CHIEF RISK OFFICER IN THE RISK MANAGEMENT FRAMEWORK FOR THE BANKING INDUSTRY OF PAKISTAN: A QUALITATIVE APPROACH

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ABSTRACT

The purpose of this study is to conduct an in-depth analysis of the existing risk management framework to explore the roles, responsibilities, and hindrances of Chief Risk Officer (CRO) to better manage the risk governance issues of commercial banking industry of Pakistan. A qualitative research design was adopted for this study to carry out an in-depth evaluation of the existing risk management framework. A case study based research strategy was adopted in which in-depth interviews were conducted from the CROs/Heads of Risk of commercial banks of Pakistan. The thematic analysis reveals that there are certain deficiencies in the existing risk management framework which are incorrect positioning of CRO, lack of maturity of risk management capabilities; weak risk culture; de-risk software solutions; advanced risk techniques and tested risk models for effective risk assessment & analysis. Furthermore, it is suggested that the Board of Directors (BoDs) design policies to create a risk culture in the bank so that every person in the bank will understand the importance of risk management that could lead to correct the positioning of CROs in the banks so that the CROs can play their part in the most effective way.

1. INTRODUCTION

In recent times, the commercial banks are more exposed to various kinds of risks due to deregulations, financial innovations, and product complexity. SBP (2003) defined the risk as "*risk in banking organization is the possibility that the outcome of an action or event could bring up adverse*

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impacts. Such outcomes could either result in a direct loss of earnings/capital or may result in the imposition of constraints on bank's ability to meet its business objectives." Van Greuning and Iqbal (2008) defined the risk as "*a future possibility that a bank may suffer unexpected and unplanned loss which may affect the achievement of the bank's objectives and the successful fulfillment thereof, and may lead, in the event of failing to control such loss, to cause the bank to go bankrupt.*" There are various types of risk to which the commercial banks are exposed such as: credit risk, reputational risk, market risk (e.g. interest rate risk, foreign exchange risk, equity price risk), operational risk, compliance risk, country risk, model risk, liquidity risk, counterparty risk, strategy risk, technology risk, solvency risk and off-balance sheet risk.

According to SBP (2003), a risk management framework (hereafter RMF) covers the roles and responsibilities of the stakeholders indulge in risk management (hereafter RM), management of the type and extent of risks and process, tools, procedures, systems and techniques for management of risks. The BIS issued various standards for risk management in the form of Basel Accords (Basel I, Basel II, Basel III). In Pakistan, commercial banks are in a transition phase in the adoption of Basel III. Existing RMF was given in the brief form in the RM guidelines issued in 2003 by the SBP.

Banks are an integral part of the economy whether it is the economy of developing or developed countries. The banking sector suffered very badly during the crunch times i.e. the Asian crisis (1998), and Global Financial Crisis (2007-09). Bank of International Settlement (BIS) with the assistance of Banking Committee on Banking Supervision (BCBS) issues various guidelines and standards for the banks to cope various risks (IR risk, FX risk, liquidity risk, operational risk, etc.). Likewise, State Bank of Pakistan (SBP) being the regulator of the banking industry of Pakistan adapts those risk standards, guidelines and policies according to the local banking industry needs. SBP issued first RM guidelines in 2003. Afterward, various risk guidelines were issued from time to time during the period of 2003 to 2017.

During the preliminary interviews with the Chief Risk Officers (hereafter CROs) of Pakistani banks, it becomes clear that the roles of Chief Risk Officer and CRO's risk management department are grown globally but not evolved locally in Pakistan due to lack of focus on the CRO's role by the regulator and hindrances from executive management of the Pakistani commercial banks. There is a dearth of literature on the roles, responsibilities, and hindrances of CROs and there is not a single study on this issue in Pakistan. Therefore, the present study fills this gap by exploring the roles, responsibilities and hindrances o CRO in the banking industry of Pakistan.

1.1 RESEARCH QUESTION

What are the roles, responsibilities, and obstacles in the proper functioning of Chief Risk Officer (CRO)/Head of Risk in commercial banks of Pakistan?

1.2 RESEARCH OBJECTIVE

To evaluate the positioning of CRO/Head of Risk in implementing holistic risk management in the commercial bank of Pakistan.

2. LITERATURE REVIEW

The position of CRO and the dedicated risk management department were very rare to find in the industries in 1950-2000. The very first attempts were taken by the US financial firms in response to

heavy investment losses in the 1980s. For instance, Merrill Lynch appointed Mark Lawrence in the role of CRO and gave the responsibility of developing a dedicated RM function in response to the huge losses incurred in mortgage-backed securities in 1987. As there is no regulatory requirement for the position of CRO and dedicated RM unit so Merrill Lynch did not institutionalize this new structure. Consequently, the CRO position and the risk management department lost power and credibility (Power, 2005; Wood, 2002).

The first breakthrough in the evolvement of the CRO's role occurred when GE Capital appointed James Lam as its CRO in 1993. James Lam was the first to hold the title CRO (Lam, 2000). James Lam designed its RM department in such a way that it becomes the core unit of GE's finance department. Furthermore, GE's CRO and risk management unit showed a 'rigorous process approach', identified and monitored risk through data-driven analytics, assigning risk-based sanctioning authority across the organization, and tight enforcement of risk limits. In 2006, Deutsche Bank appointed Hugo Banziger as its CRO and gave the responsibility to bring transparency to the risk and profit consequences of business decisions. In the period of 2000s, the role of CRO had evolved from a defensive side to a risk advisor and business partner (Wood, 2002; Power, 2005). This evolution shifted the RM paradigm and transformed the CRO and RM model into the frontline strategic role. The introduction of Basel II and Basel III capital adequacy reforms ignite the need for up-gradation of RM practices under the umbrella of an independent RM department and under the risk lens of top management.

The evolvement of the role of CRO is not only limited to the financial sector. For instance, Power (2005) described that Sulzer Medica appointed a CRO in response to huge legal losses in 2001 and Delta Airlines appointed a CRO in response to huge risk after the 9/11 terrorist attacks. However, there was an increasing trend in the appointment of executive risk officers after the increase systemization of Enterprise Risk Management (hereafter ERM) in several risk standards. The importance of ERM was spread through the development of various risk standards such as COSO 2004, Ferma 2002, AS/NZS risk management standard version 1995, 1999, 2004 and 2009. Several institutions have a strong view that in order to become a best practice organization the adoption of ERM and appointment of CRO for the risk oversight is mandatory (Aabo, Fraser, & Simkins, 2005).

A survey conducted in 2008 by McKinsey showed that there is an increasing trend in the appointment of CROs in the non-financial firms as it rose to 10 percent in 2008 as compared to 4 percent in 2002. The internal auditing staff also showed interest in the RM domain as there was an increasing trend in the appointment of CROs and the establishment of independent RM unit in the organizations (Kloman, 2003). The Institute of Internal Auditors (IIA) includes RM as part of audit profession core competency and emphasized that the control risk self-assessment is the foundation of ERM. Therefore, the RM is becoming prominent and visible with the keen interest shown by the internal auditors, risk professionals and external auditors in this domain (Power, 2005).

CRO can come from financial management, internal audit, business management, external audit, and consulting. The CRO can perform a variety of roles but these can be divided into two main categories: (1) compliance role and (2) business partner role (Deloitte, 2007; IBM, 2005; PricewaterhouseCoopers, 2007). Prior to the sub-prime credit crisis, the main debate in the industry is

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concentrated on the issue that how the CRO balance between the compliance role and the business partner role. The sub-prime credit crisis draws the attention of the organizations towards risk management failures specifically loopholes in the internal risk assessment (Stulz, 2009). Mikes, Fraser, and Simkins (2011) indicate that the initiatives related to risk-modeling vary in quantitative sophistication and style and the selection and use of different quantitative and qualitative risk tools largely depend on the discretion of senior risk officers. Moreover, the CRO can play a big part in the strategic decision making in the role of business partner. Therefore, CRO role should not limit to compliance function only because the CRO can contribute as a model expert, strategic controller, and strategic adviser also in the business partner role (Mikes et al., 2011).

The CRO position gained importance in corporate governance as the organizations are under continuous regulatory compliance pressure after the financial crisis (Beasley, Clune, & Hermanson, 2005; Lam, 2000). A study of Donnelly (2011) reported the various key functions performed by CRO which are: (1) designing of ERM strategy (2) adviser to the unit heads (3) reviewing the effectiveness of RM programs (4) communication and coordination of risk strategies (5) liaison for risk information interchange. Power (2005) uses the appointment of CRO as a proxy for the implementation of ERM strategy in organizations and concluded that the appointment of CRO sends the signal in the market that the firm is successful in implementing an ERM strategy.

3. METHODOLOGY

3.1 POPULATION AND SAMPLE

The research question of this study required the responses of CROs/Heads of Risk from the commercial banks of Pakistan as they have the right knowledge and skills regarding risk management. There are 23 commercial banks (Public, Private and foreign) in Pakistan and each bank has only one position for CRO or Head of Risk. Therefore, this study took the whole population i.e. 23 CROs/Heads of Risk for the data collection purpose.

3.2 INTERVIEW SCRIPT SHEET

The interview script sheet was prepared during the preliminary interviews in which 6 CROs/Heads of Risk participated. After having detailed discussions, the interview script sheet was finalized which contained ten questions.

3.3 THEMATIC ANALYSIS

The study used a qualitative approach to answer the research question and the research objective. According to Braun and Clarke (2006), the most suitable method for qualitative studies is thematic analysis. Saunders, Lewis, and Thornhill (2016) explained the various phases of thematic analysis which are a coding phase, theme generation, and theme refinement phase. In coding phase, the interview transcripts were read with great care and relevant responses were placed in different nodes. The nodes were created to arrange and organize the coded extracts. In theme generation phase, word tree and word cloud analysis were applied to generate themes that were aligned with the research question. Lastly, theme refinement phase was completed by merging some themes which depicted similar ideas while some themes were omitted which were not aligned with the research question. Moreover, some themes broke into two to three themes illustrating sub-concepts.

4. RESULT AND FINDINGS

4.1 WORD CLOUD ANALYSIS

The word cloud in Figure 1 shows the themes related to the role of banks CRO risk management. This word cloud is helpful in extracting the potential themes in the data collected through interviews. The word cloud potential themes are 'CRO', 'compliance', 'constraints', 'empower', 'positioning', 'mindset', 'hurdles', 'clarity', 'support', 'functioning' etc. The refinement of these potential themes is done through context analysis using tree analysis which is to be discussed in a later section.

Figure 1: Word Cloud of themes related to Role of CRO

4.2 WORD TREE ANALYSIS

The theme generated from the codes is the *positioning of the CRO*. Now the next section and Figure 2 will explain how this study brought up to this theme from the initial codes.

The CRO is one of the key officials among the c-suite personnel of the bank. CRO oversights the activities of the credit, market & liquidity, operational risk department. During the interviews, it was revealed that the issue lies with CROs in Pakistani commercial banks is their correct positioning. The business units see the CRO as an obstacle to their projects. Some of the interviewees' views are:

[In risk management, the CRO role is very important in each and every step of risk management. But the problems faced by the CROs in the banks is their correct job positioning. There is no clear job positioning as he is not viewed as a peer with the other business line heads in virtually all aspects.]

[The CRO can play a pivotal role in the risk management process. But the problem in doing so is the lack of freedom and power given to him. The bank views the CRO function as a compliance management activity only.]

[The problem is the mindset of the board, senior management, and operating personnel is that they believe that risk management is a single person's/function's job and not the job of every single person in the bank. Therefore, the lack of coordination between these key stakeholders is the main hurdle in the effective functioning of CRO in the bank.]

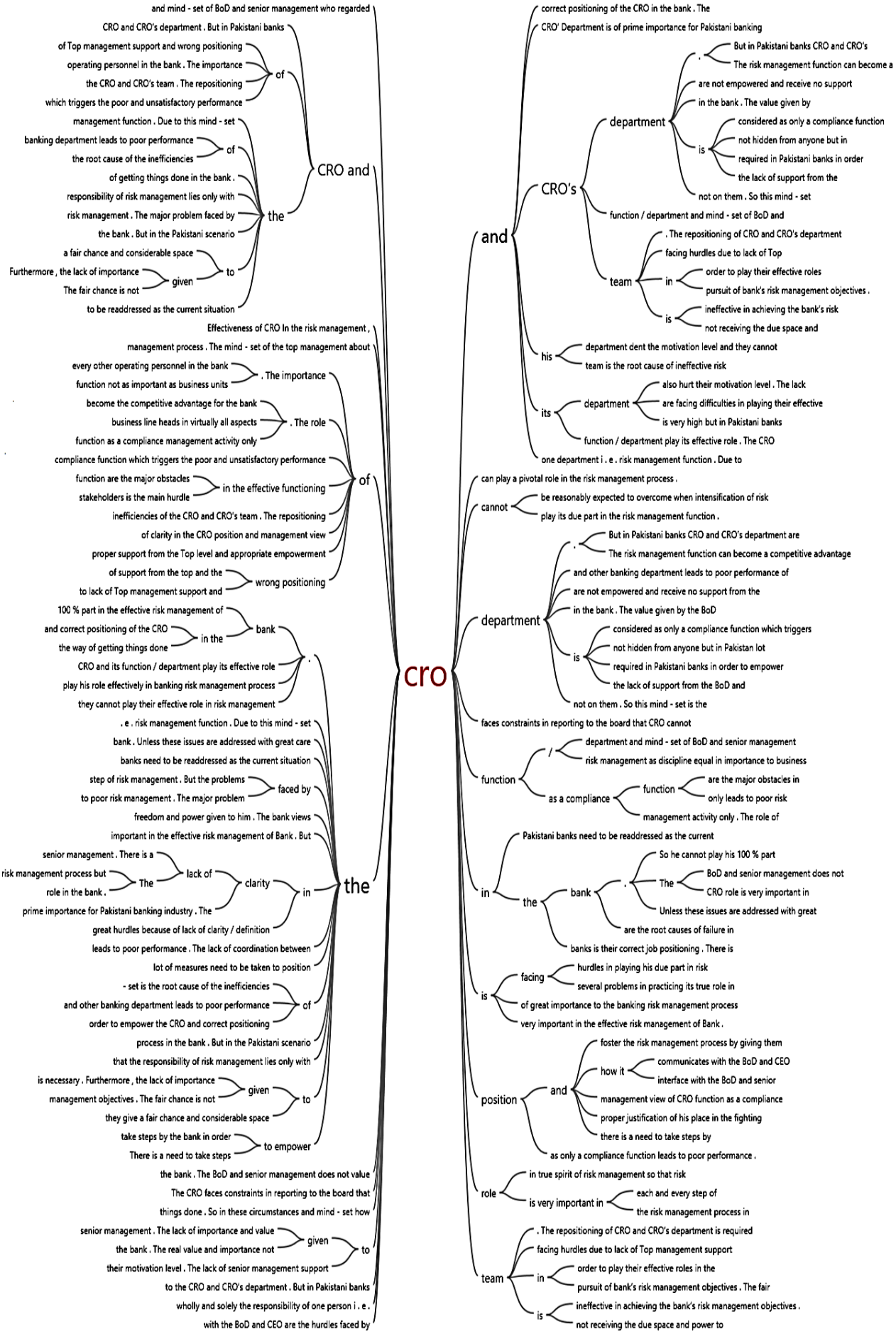

Figure 2: Word tree analysis on the role of CRO.

The CRO gets less support from the other departments as these departments see the CRO and its department as a compliance function only. In the interviews, several interviewees point out this issue of incorrect positioning of CRO in the banks. The CRO's point of view is not given importance as compared to the heads of the business units. Thus, some risky projects which are opposed by the CRO got the approval from the CEO and board of directors (BoDs). Arguments made by the interviewees in this regard are given below:

[The BoDs and senior management do not value CRO function/risk management as discipline equal in importance to business units or see it as a compliance function only. In the worst scenarios, the risk management function is regarded as a blocker to getting things done. Therefore, in these circumstances and mindset how CRO and its function/department play its effective role.]

[The CRO role is very important in the risk management process in the bank. But in the Pakistani scenario the CRO and CRO's team facing hurdles due to lack of top management support and wrong positioning of CRO and CRO's department in the bank. The value given by the BoDs and senior management is very less as compared to the business units.]

The CRO of the bank evaluates the project from every risk angle and gives healthy input about the project to the CEO and BoDs. During the interviews, several interviewees revealed that CRO is not given a free hand and power to do his job in full capacity. CRO lacks support from the top and other departments. Views in this regard are given below:

[The lack of senior management support to CRO and his team is the root cause of ineffective risk management in the bank. The real value and importance not given to CRO and his department dent the motivation level and they cannot play their effective role in risk management.]

[The fair chance is not given to the CRO and CRO's team in order to play their effective roles in the reduction of risks. They are considered as a blockage in the way of getting things done in the bank. The CRO and CRO's department is considered as only a compliance function that triggers the poor and unsatisfactory performance of CRO and CRO's department.]

[The major problem faced by the CRO and CRO's department is the lack of support from the BoDs and senior management. There is a lack of clarity in the CRO position and there is a need to take steps by the bank in order to empower the CRO and correct positioning of the CRO in the bank.]

There is a need to strengthen the role of CRO and correct positioning of CRO in the banks is the need of today for their progress in today's risky business environment. CRO needs support from the top as well as from other departments to do his job in true spirit and make a decision that is in favor of the bank. Many interviewees highlighted the need for correct positioning of the CRO in Pakistani commercial banks so that the risk management objectives and goals can be achieved. Some of the views of the interviewees are given below:

[The lack of coordination between the CRO's Department and other banking departments leads to the poor performance of the CRO and CRO's team in pursuit of the bank's risk management objectives.]

[The importance of CRO and CRO's department is not hidden from anyone but in Pakistan lot of

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measures need to be taken to position the CRO role in the true spirit of risk management so that risk management function can be used as a competitive advantage in the banking industry of Pakistan.]

[The need for proper support from the top level and appropriate empowerment of CRO and CRO's Department is of prime importance for the Pakistani banking industry. The clarity in the CRO position and proper justification of his place is required in the bank.]

From the word tree analysis, the problems highlighted in the correct positioning of the CROs in the banks are extracted as mentioned by several interviewees in their comments are given below:

[The positioning of CROs is not correct in the banking industry of Pakistan. One of the reasons for this incorrect CRO positioning is that the business heads and other department heads are not considering the CRO as their peers. The equal respect, stature and scope are missing in the majority of the banks in Pakistan.]

[*The reporting line of CRO is different in various banks. In some banks, the reporting line is BRMC while in other banks the reporting line is CEO. Furthermore, the reporting line of CRO is dual where the CRO is directly reporting to the CEO and dotted line reporting to the board through BRMC. The issue is preserving the independence of the risk management department and CRO in the bank. There may be a conflict of interest between the CEO and CRO that will hinder the career growth and functioning of CRO in the bank.*]

[Due to inadequate risk culture in the banking industry of Pakistan, the mindset of all the banking officials is that risk management is the sole responsibility of the CRO and its department. This sort of mindset and culture is damaging the risk management initiatives in the Pakistani commercial bank.]

[To maintain a balance between the market-making activities and control related activities makes the CRO job tough. As risk has a positive as well as negative impact so CRO needs the support of all the departments to maintain a balance between the market making and control activities. In the banking industry of Pakistan, CRO does not have a full corporation and support from the business line as they think that the CRO and its department is creating hurdles for them.]

[The CRO is only limited to the compliance role in the banking industry of Pakistan. CRO's role as a business partner in the form of model expert, strategic controller, and strategic adviser is not considerably visible due to incorrect positioning of the CRO in the banking industry of Pakistan. The problem exists due to weak risk culture is the banking industry of Pakistan.]

[In the banking industry of Pakistan, the CRO position is not clearly defined at the policy level. Few banks have this title 'CRO' for the head of the risk management department. There is no regulatory compulsion for the CRO position in banks of Pakistan. The roles, responsibilities, scope, stature, and compensation package are not properly defined.]

4.3 PROPOSED EXTENSIONS IN THE EXISTING RISK MANAGEMENT FRAMEWORK

The main issues prevailing regarding the positioning of the CRO is that the business unit heads do not give CRO the respect of a peer in the banks. Consequently, the CRO cannot take part in his full capacity in the designing of the risk strategies, active participation in setting risk appetite, development of risk reporting procedures, chairing/participating in ERMCs and cannot escalate risk issues to CEO, etc. Hence, the author has the view that peer status can be achieved if the CRO is given

equivalent compensation package as well as the scope of authority, responsibilities. The BODs set the tone for the risk policy so the BODs should convey the importance of CRO to the business heads and across the bank so that CRO can play its part in an effective way.

Some interviewees highlighted the hurdles in CROs interactions with the board as one of the reasons for incorrect positioning of CRO in the banks. In some banks, there is a dotted-line reporting to the BoDs and directly reporting to the CEO is in place for the CRO. Whereas some banks the CRO reports to BRMC only. But the CRO is facing problem in practical terms. In practice, the independent role of CRO is preserved in the bank only if there is a mutual understanding of CRO's role and function between CEO and BoDs. Hence, in authors' view, the BoDs must resolve those issues which are preventing the CRO from reporting the risks to the BoDs. The BoDs must be informed about the severity of the disputes between the first and second line of defense even if there is a resolution took place due to the efforts of the CEO. Moreover, BoDs should develop policies to protect the CRO's compensation and career if there is a difference of opinion arises between CRO and CEO.

According to some interviewees, another hurdle in the positioning of the CRO is that everyone believes that risk management is the only job of the CRO and they have nothing to do with it. The author has the view that this hurdle is due to the lack of risk culture in Pakistani commercial banks. Therefore, the author suggests that the BoDs and CEO should take close consideration to this matter and develop processes, systems, and policies that foster the collaborative approach of risk management and building up a risk culture across the bank. But the development of risk culture is a gradual process and it will take the time to evolve in Pakistani commercial banks.

Another hurdle faced by the bank in the effective positioning of the CRO is the balance between market-making and control activities. The CRO is the right person who is making an adequate balance between market-making and control activities. Hence, this process of creating a balance between the two activities starts with the development of a risk appetite statement for the bank. Moreover, risk management considerations are fused into compensation decisions and performance appraisal. Moreover, surveillance of the impact of fluctuations in the business environment on the risk profile of the bank also becomes part of RM considerations. Hence, the author suggests that the BODs and the CEO should develop such a healthy relationship among the business heads and CRO that they work together in analyzing the project's viability for the bank by considering the opportunities with spectacles of risk.

Another obstacle in the way of the effective positioning of the CRO in Pakistani commercial banks is that the majority of the banking personnel think that the role of CRO is just limited to the compliance function. There is no doubt that compliance with the regulations, laws, and policies of the regulator is the primary job of the CRO but that does not mean that the CRO puts its 100 percent attention on the compliance function. The author has the view that the BoDs and CEO must have positioned the CRO in such a way that the CRO not only focuses its attention on performing the compliance role but also on the other important roles also such as model expert, strategic controller and strategic advisor. Compliance is among the top three major risks for the banks, therefore greater attention should be given to compliance role but other roles should be given proper attention. This is possible only when the business heads give CRO the peer status in the bank. Therefore, the BoDs

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should develop such policies and guidelines and awareness workshop that ensures the respect of CRO across the bank.

Another hurdle in the way of the effective positioning of the CRO in Pakistan banks is the lack of clearly defined CRO positions in the banks. Therefore, the author has the view that there should be a clearly defined CRO position by the CEO and BoDs of the bank. They should develop the objectives of the roles that they expect to be performed by the CRO. Whether they want the CRO to play merely a compliance role or they want the CRO to perform beyond the compliance role by placing himself into the roles of a model expert, strategic advisory, and strategic controller. There should be a crystal-clear policy document of the functions and responsibilities of the CRO in the bank. Therefore, the CRO not only monitor the risks inherent in the projects and transaction but also improve the business plans, deals and transactions, therefore they become viable and lie within the risk profile of the bank. Hence, the value additions can be made by the CRO in the performance enhancement of the bank while protecting the financial health of the bank.

5. CONCLUSION

The positioning of CRO in the bank is very vital for the strengthening of the risk management framework. The CRO's positioning is not correct as there is a disparity in terms of scope, stature, authority and compensation packages between the CRO and business line heads across Pakistani commercial banks. The business line heads are given more weight than the CRO and due to the lack of risk culture, there is a mindset in the Pakistani commercial banks that the CRO's role is only confined to a Compliance role. This minds set is an obstacle in the way of correct positioning of CRO. The CRO role is not limited to compliance only because CRO can also play the role of a model expert, strategic advisory, and strategic controller. The independence of CRO from the risk-takers is very vital for his proper functioning at full capacity, therefore CRO's reporting line should be BRMC. The most important job of CRO is compliance but he should spare time for performing his role as a model expert, strategic controller, and strategic advisor.

The positioning of CRO is not right in the Pakistani commercial banks that is why CRO cannot perform in his full capacity. The other department thinks that the CRO and his risk management department is creating hindrance in their progress. Moreover, the opinions of the heads of business units are given more importance than the opinion of the CRO. Therefore, it is suggested that the BoDs should design policies to create a risk culture in the bank so that every person in the bank will understand the importance of risk management that could lead to correct the positioning of CROs in the banks so that the CROs can play their role in the most effective way.

6. AVAILABILITY OF DATA AND MATERIAL

The used or generated data in this study is available by request to the corresponding author.

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EFFECTS OF IRANIAN MUSIC ON THE IMPROVEMENT AND TREATMENT OF ALZHEIMER DISEASE AND ITS SPEECH-RELATED DISORDERS IN THE ELDERLY

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ABSTRACT

Alzheimer`s disease and dementia had been of the most serious humanitarian crises in industrial societies over the past decades, where many elderly people are affected. However, despite the young population pyramid in Iran over the past few decades, predictions are indicative of an increase in the elderly population in the decades to come. Thus, the increase in Alzheimer`s disease is a natural and inevitable event and the level of knowledge and ability of care and treatment centers for the elderly should be at an acceptable level regarding prevention and treatment. One of the recommended therapies for this disease and its disorders, especially speech disorders, is music therapy. Despite many studies concerning the effects of music therapy on patients with Alzheimer`s, no studies have been done on the effect of Iranian music on Alzheimer`s patients. The present paper examined the effect of this treatment on 22 elderly patients with moderate and severe Alzheimer`s disease admitted to one of the elderly care centers for 14 days. The effectiveness evaluation method was performed using the short-term test of mental status (MMSE Test) at two stages -before the start of the treatment and after the end of the second week of the treatment. The results of recording data showed the positive effect of Iranian music on the progression of the cognitive ability of the patients, and the speaking ability increased in all cases, except in one sample, well showing the effect of this type of music on the treatment and improvement of the patients with Alzheimer`s and its speech-related disorders.

1. INTRODUCTION

Alzheimer`s disease is one of the commonest types of dementia, accounting for two-thirds of all patients with dementia (Helmer et al., 2001; Aronson et al., 1991). In 2009, Alzheimer`s Disease

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International estimated that by 2010, 35 million people worldwide will have developed Alzheimer's disease and AD-Related Dementias (ADRD) (dementia). Moreover, this organization predicted that the prevalence of dementia would be roughly doubled every 20 years, for which, a total of 65.7 million people by 2030 and 11.45 million people by 2050 is expected to have this disease (Gerdner, 2012: 26). In industrialized countries, dementia is one of the major causes of death and disability in people over 65. Dementia greatly affects the life quality of the patients and their families (Aguero-Torres, 2002). As the young population pyramid tends to age in the coming decades in Iran (Noroozian, 2012), the increasing prevalence of Alzheimer's disease is becoming inevitable (Sheykhi, 2017). Thus, the importance of studying Alzheimer's therapies and low-cost therapies in the country can be understood. One of these therapies, whose effectiveness has been investigated and verified in many pieces of research, is music therapy.

Considering the increase in people with Alzheimer's as well as the benefits of non-aggressive treatments, paying attention to these treatments can have a role in alleviating disorders in patients with Alzheimer's disease. Given this, the study sought to evaluate the role of one of the most tangible types of music, Iranian music, for the population in reducing and improving these disorders with a combination of library resources and field method to introduce one of the most accessible Alzheimer's treatments that can be used in all circumstances.

1.1 ALZHEIMER'S DISEASE

Alzheimer's disease is a complex disease derived from a combination of age, genetics, and environmental factors (Duthey, 2013). Alzheimer's is a degenerative disease, i.e., it gets worse over time. It is assumed that the disease emerges up to 20 years or more, before the start of symptoms, and with small changes in the brain, which is not recognizable to the affected person. Only after years of brain changes, people experience significant symptoms, like memory impairment and language problems. The symptoms of the disease are caused by the damage or destruction of neurons in some parts of the brain involved in thinking, learning, and memory (cognitive process). People usually live with symptoms of Alzheimer's for many years. Over time, the symptoms tend to increase and disrupt the ability of individuals in doing daily activities. At this point, the person suffers from dementia due to Alzheimer's disease, or ADRD. As the disease progresses, the neurons in other parts of the brain are damaged or destroyed. Activities related to the person's identity, like family event planning or participating in sports, may no longer be possible. Finally, the neurons are affected in parts of the brain that enable the person to perform basic body functions like walking and swallowing. People at the final stages of Alzheimer's are in need of admission and care from those around. Alzheimer's disease ultimately leads to death (Alzheimer's Association, 2019).

1.2 SPEECH DISORDERS OF ALZHEIMER'S PATIENTS

Clinical evaluations of people with Alzheimer's show impairments in memory, judgment, decision-making, navigation, and speech (Khanahmadi et al., 2015). Although memory-related problems are the commonest symptoms of Alzheimer's disease and dementia, many people having Alzheimer`s, experience progressive problems in the power of verbal communication (Egan, et al., 2010). In these patients, speech problems appear as speech impairment, correct expression of the intended meaning, failure in the segments and phonetic suprasegmental, problems with grammatical and lexical simplification and speech impairment during dialogue (Pistono et al. , 2016; Szatloczki et al. 2015; Silag, et al. 2015; Mesulman et al. 2014; Ahmed et al., 2012). These symptoms sometimes

create serious problems in connecting with those around, which can be a great risk to their health and well-being due to the reduction of the physical capacity of the elderly and the need for others.

1.3 MUSIC THERAPY

Among the recommended therapies for psychological diseases is music therapy. Music therapy is the clinical and evidence-based use of musical interventions to reach individual goals in a therapeutic relationship with a prominent specialist who has taken an approved music therapy program (American Music Therapy Association (AMTA)). Music therapy is the potential for non-pharmaceutical therapy regarding the behavioral and psychological symptoms of dementia. Although some studies have considered it useful, in most cases, studies have been done on a small and sometimes uncontrolled scale (Svansdottir & Snaedal, 2006).

The role of music in therapy has undergone changes since 1990, which was affected by modern attitudes from the studies on the interaction of mind and music performance. The studies on the human brain in relation to music have shown that music has a distinct effect on the brain by stimulating the natural processes of cognitive senses. Moreover, biomedical scholars have found that not only music is highly effective in organizing listening language, including sophisticated understanding, cognition, and motor control of the brain, but also this sensory language can significantly affect the retraining of the damaged brain (Thaut & Hoemberg, 2014). The modern music therapy started in the mid-20th century which was traditionally rooted in the concepts of social sciences. The therapeutic value of music was paid attention given its emotional and social role in human life and community culture. Music has functioned throughout the whole life in expressing feelings, shaping societies, solidarity and organizing the public, and supporting educational goals by sharing ideas and beliefs (Thaut and Hoemberg, 2014). Thus, one can expect that the cognitive process may have an important role in the treatment process.

Musical speech stimulation (MUSTIM) is a neurological musical therapy (NMT) method for people who have a mental problem in speaking. This technique uses music-related items like songs, rhythms, hymns and musical phrases to simulate the body state of speech and automatic speech (Thaut, 2005). Among those who can benefit from this type of treatment are those suffering from Alzheimer's disease and dementia (Thaut and Hoemberg, 2014).

1.4 IRANIAN MUSIC

Farsi music is a very old kind of oriental music with significant effects on eastern music cultures such as Central Asia, North Africa, southern Europe and the Gulf States (Abdoli, 2011). The music of Iran has 24 quintals of tone in each octave (Vaziri, 1913) and 7 Dasgahs.

1.5 MUSIC AND ARCHITECTURE

In fact, our country is one of the richest territories in terms of enjoyment of heritage and cultural achievements and one of its manifestations is special and globally-known urban planning and architecture. Iran is one of the richest native architectural examples with form and structure achievements notable in the world, in the course of the Islamic era, it has changed into one of the successful examples of conceptual, meaning-oriented and mystical architecture while the impact of physical and architectural form as the spatial container which is the effect of social culture, is effective in the representation of these concepts and meaning (Mahdinejad et al, 2015, 2017, 2019).

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All the arts are cross-linked with each other because the origin of all of them is a beautiful expression (Khaki et al., 2015). Art is one of the most mysterious aspects of human culture and civilization that always pervades human life (Zomorshidi et al., 2018).

Iranian traditional architecture is one of the most dramatic and the most supreme examples of architecture in the world that unconsciously attracts any viewer and its subtleties and secrets make everyone admire (Mahdinejad et al, 2016). Undoubtedly, Iran is one of the trustees of the art and of course owes its beauty to ancient monuments that are the legacy of love and passion and glory of the Iranian people in the ups and downs of the history of this nation; buildings which are the description of "elegance" and "glory" of Iranian Muslim artists and evidence of the meaning manifestation in the form of matter. As any art, during its progress, affects the time and space conditions of the society and other factors, the arts are directly or indirectly affected in relation to each other and show its reflection from each side in its own territory and add their capacity and performance. The meaning of Architecture today is that at the same time, which it is measuring and limiting the space it also tries to reach through a large space that people shall move inside and around it, and meanwhile music is a feeling of a mechanical rhythm in the space. When such a feeling awakes a motional motive in human it will have an influence on human sole and on his sensitive hidden space inside him which will prevent him against the noise waves on Human body. The Sufis dance which derivers from spiritual believes stage making that its natural secret and essential character relates to the musical motions (Falamaki et al, 2008).

2. BACKGROUND

Many studies have been conducted on the relationship between music therapy and the improvement of Alzheimer's disorders. Most of these studies considered two types of neurological research as well as psychological research through cognitive tests to study the effects of listening to music based on a specific treatment plan for Alzheimer's patients in reducing the underlying disorder. However, no coherent studies have been done on the therapeutic effect of Iranian music on patients with Alzheimer's and related speech disorders. Table 1 gives a summary of the research records.

3. HYPOTHESIS

It seems that using music therapy - by Iranian music – can be effective in improving and treating elderly patients with Alzheimer's and its speech-related disorders.

4. METHODOLOGY

In the current study, the desirable method for studying according to the purpose and the conditions were the cognitive measurement method. This method was performed using MMSE.

MMSE is the most widely used cognitive measurement tool. In 1975, MMSE was developed throughout the world as a means of assessing cognitive conditions (Gluhm et al., 2013). This test was used to visualize cognitive impairment, track changes in cognitive function over time and assess the effects of therapeutic factors on cognitive function among the patients (O'Bryant, et al., 2008). Although this test cannot be considered as an official diagnosis, it is considered as the first step in identifying cognitive impairments, and many studies have confirmed its validity and reliability

(Pezzotti et al., 2008; Baek, et al. 2016).

Table 1. Research records and research methodology

Researcher(s)	Title	Methodology	Sample	Results
King and Others (2018)	Increased Functional Connectivity after Listening to Favored Music in Adults with Alzheimer Dementia	Field by MRI image	17	Listening to music in patients with Alzheimer's disease activates the attention network in the brain and has a significant role in coordinating the functions of the brain network.
Guess (2017)	Alzheimer's Disease and the Impact of Music Therapy: A Systematic Literature Review	Review by library resources	-	Music therapy has a clear effect on memory and the ability to recognize the elderly with Alzheimer's.
Gallego and Garcia (2015)	Music therapy and Alzheimer's disease: Cognitive, psychological, and behavioral effects	Field by NMT test, psychiatric nursing questionnaire, anxiety and depression scale, and Bartlett index	42	Music therapy improves some cognitive, psychological and behavioral disorders in Alzheimer's patients.
Dassa and Amir (2014)	The Role of Singing Familiar Songs in Encouraging Conversation Among People with Middle to Late-Stage Alzheimer's Disease	Field by content analysis s	6	Listening and reading music related to the past of the elderly with Alzheimer's helps them in conversation.
Fukui, Arai, and Toyoshima (2012)	Efficacy of Music Therapy in Treatment for Patients with Alzheimer's Disease	Field by measuring hormones	6	Suspicious behaviors such as Poornima (Fugue) are reduced by music therapy. Music therapy is a potential alternative therapeutic alternative to hormone replacement therapy.
Zare and Others (2009)	The Effect of Music Therapy on Reducing Agitation in Patients with Alzheimer's disease in Shahryar City Nursing Home	Field by DSM-5 and MMSE	26	Listening to music reduces the restlessness of patients with Alzheimer's.
Raglio and Others (2008)	Efficacy of Music Therapy in the Treatment of Behavioral and Psychiatric Symptoms of Dementia	Field by MMSE, Barthel's index and neurology questionnaire	59	Music therapy is effective in reducing moderate to severe disease severity in patients with moderate to severe mental and behavioral symptoms.
Svansdottir and Snaedal (2006)	Music Therapy in Moderate and Severe Dementia of Alzheimer's Type: A Case-Control Study	Field by BEHAVE-AD test	38	Music therapy is a very effective and safe way to treat anxiety in Alzheimer's. This is in line with the results of some uncontrolled studies on music therapy and dementia.
Gerdner (2000)	The Effects of Individualized Versus Classical "Relaxation" Music on the Frequency of Agitation in Elderly Persons With Alzheimer's Disease and Related Disorders	Field by Bonferroni post hoc	39	The impact of listening to personalized music is far more important than classical music to stimulate elderly people with Alzheimer's disorders.
Brotons & Koger (2000)	The Impact of Music Therapy on Language Functioning in Dementia	WAB Field by MMSE	20	Music therapy has a positive effect on the power and mental state of people with dementia.

In MMSE, the six points - orientation, registration, attention and calculation, recall, language, and copying -are examined using short questions. The total score is 30: 10 points in the orientation, 3 points in the registration, 5 points in attention and calculation, 3 points in the recall section, 8 points in the language section, and 1 point in the copy section. The total score determines the level of cognitive

impairment so that the acquisition of grades 24 to 30 shows a lack of cognitive impairment, 18 to 23 a moderate cognitive impairment, and scores 0 to 17 determine acute cognitive impairment.

In the present study, 22 elderly (65 years and over) patients with severe and moderate Alzheimer's disease received treatment based on a plan by a music specialist in a controlled area. The duration of music therapy was controlled every day for 15 minutes that was music playing in the controlled space in the morning as group therapy and music quality were adjusted according to the auditory conditions of all the subjects. The time to give MMSE was before the start of the treatment and after the end of the second week of the treatment. Samples were selected from patients admitted to a residential care center in Tehran and randomly selected from among the patients in this center.

5. DISCUSSION

Among the studied samples, 12 were male and 10 female. Of the 22 samples examined, 10 had moderate Alzheimer's disease and 12 acute. Moreover, 9 samples were over 75 years old, 5 were between 70 and 74 years old, and the rest were 65-69 years old.

Table 2 result showed that the mean score of the collected samples before the treatment period was 17.00 with an SD 3.364, which increased to 20.82 with an SD 3.850 after the end of the treatment period. The paired t-test was used to verify the validity of the results. Tables 3 and 4, according to the significance level <0.001 and the negative value of t, the positive effect of treatment with Iranian music on the improvement of patients with severe and moderate Alzheimer's could be confirmed.

Table 2. Paired Samples Statistics

		Mean	N	SD	Std. Error Mean
Pair 1	MMSE Scoring(Before)	17.00	22	3.364	0.930
	MMSE scoring(After)	20.82	22	3.850	0.821

Table 3. Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MMSE Scoring (Before) & MMS Scoring (After)	22	0.833	<0.001

Table 4. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	MMSE Scoring (Before)– MMSEscoring (After)	-3.818	2.423	0.517	-4.892	-2.744	-7.392	21	<0.001

Concerning language and speech ability, 17 patients had a score of 4 or less in the pre-treatment test, which reached 5 on completion of the treatment. Moreover, out of 22 samples, only one subject did not improve the language and speaking score. Table 5, the mean score in this section before the treatment was 3.36 with a standard deviation of 1.529, which reached 5.55 with an SD 1.535. Tables 6 and 7, the significance level of paired t-test was <0.001 and t value was negative, where like the overall score of the test, one can state the positive and direct effect of Iranian music therapy in improving the speech of Alzheimer's patients.

Table 5: Paired Samples Statistics

		Mean	N	SD	Std. Error Mean
Pair 1	Language (Before)	3.36	22	1.529	0.326
	Language (After)	5.55	22	1.535	0.327

Table 6: Paired Samples Correlation

		N	Correlation	Sig.
Pair 1	Language(Before) & Language(After)	22	0.764	<0.001

Table 7: Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Language(Before) - Language(After)	-2.182	1.053	0.224	-2.649	-1.715	-9.721	21	<0.001

6. CONCLUSION

The study examined the role of music therapy by Iranian music in improving and treating elderly people with Alzheimer's and related speech disorders. Although music therapy has been stated to be an effective treatment in many pieces of research, few field studies have been conducted in Iran to investigate its effectiveness among Alzheimer's patients in Iran. On the other hand, the gradual movement of the Iranian aging Pyramid into old age, Alzheimer's and dementia have become a serious threat to the health of the Iranian community. Thus, the focus of the study was to examine one of the most tangible and well-known types of music for Iranians, Iranian music, in improving these patients. The test was carried out on 22 patients with Alzheimer's disease in one of the elderly care centers of Tehran. The treatment period was 14 days and 15 minutes per day, done by a music therapist and in a controlled environment. The validated MMSE test was used before and after the treatment as a tool for measuring the variables. The results showed that using Iranian music in the musical therapy of Alzheimer's patients is helpful in improving cognitive impairment and increasing the linguistic and speaking power of patients with Alzheimer's, and this kind of music can be used as a suitable source in the therapeutic process.

7. MATERIAL AND DATA AVAILABILITY

Information regarding this study is available from the corresponding author.

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EFFECTS OF IRANIAN MUSIC ON THE IMPROVEMENT AND TREATMENT OF ALZHEIMER DISEASE AND ITS SPEECH-RELATED DISORDERS IN THE ELDERLY

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ABSTRACT

Alzheimer`s disease and dementia had been of the most serious humanitarian crises in industrial societies over the past decades, where many elderly people are affected. However, despite the young population pyramid in Iran over the past few decades, predictions are indicative of an increase in the elderly population in the decades to come. Thus, the increase in Alzheimer`s disease is a natural and inevitable event and the level of knowledge and ability of care and treatment centers for the elderly should be at an acceptable level regarding prevention and treatment. One of the recommended therapies for this disease and its disorders, especially speech disorders, is music therapy. Despite many studies concerning the effects of music therapy on patients with Alzheimer`s, no studies have been done on the effect of Iranian music on Alzheimer`s patients. The present paper examined the effect of this treatment on 22 elderly patients with moderate and severe Alzheimer`s disease admitted to one of the elderly care centers for 14 days. The effectiveness evaluation method was performed using the short-term test of mental status (MMSE Test) at two stages -before the start of the treatment and after the end of the second week of the treatment. The results of recording data showed the positive effect of Iranian music on the progression of the cognitive ability of the patients, and the speaking ability increased in all cases, except in one sample, well showing the effect of this type of music on the treatment and improvement of the patients with Alzheimer`s and its speech-related disorders.

1. INTRODUCTION

Alzheimer`s disease is one of the commonest types of dementia, accounting for two-thirds of all patients with dementia (Helmer et al., 2001; Aronson et al., 1991). In 2009, Alzheimer`s Disease

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International estimated that by 2010, 35 million people worldwide will have developed Alzheimer's disease and AD-Related Dementias (ADRD) (dementia). Moreover, this organization predicted that the prevalence of dementia would be roughly doubled every 20 years, for which, a total of 65.7 million people by 2030 and 11.45 million people by 2050 is expected to have this disease (Gerdner, 2012: 26). In industrialized countries, dementia is one of the major causes of death and disability in people over 65. Dementia greatly affects the life quality of the patients and their families (Aguero-Torres, 2002). As the young population pyramid tends to age in the coming decades in Iran (Noroozian, 2012), the increasing prevalence of Alzheimer's disease is becoming inevitable (Sheykhi, 2017). Thus, the importance of studying Alzheimer's therapies and low-cost therapies in the country can be understood. One of these therapies, whose effectiveness has been investigated and verified in many pieces of research, is music therapy.

Considering the increase in people with Alzheimer's as well as the benefits of non-aggressive treatments, paying attention to these treatments can have a role in alleviating disorders in patients with Alzheimer's disease. Given this, the study sought to evaluate the role of one of the most tangible types of music, Iranian music, for the population in reducing and improving these disorders with a combination of library resources and field method to introduce one of the most accessible Alzheimer's treatments that can be used in all circumstances.

1.1 ALZHEIMER'S DISEASE

Alzheimer's disease is a complex disease derived from a combination of age, genetics, and environmental factors (Duthey, 2013). Alzheimer's is a degenerative disease, i.e., it gets worse over time. It is assumed that the disease emerges up to 20 years or more, before the start of symptoms, and with small changes in the brain, which is not recognizable to the affected person. Only after years of brain changes, people experience significant symptoms, like memory impairment and language problems. The symptoms of the disease are caused by the damage or destruction of neurons in some parts of the brain involved in thinking, learning, and memory (cognitive process). People usually live with symptoms of Alzheimer's for many years. Over time, the symptoms tend to increase and disrupt the ability of individuals in doing daily activities. At this point, the person suffers from dementia due to Alzheimer's disease, or ADRD. As the disease progresses, the neurons in other parts of the brain are damaged or destroyed. Activities related to the person's identity, like family event planning or participating in sports, may no longer be possible. Finally, the neurons are affected in parts of the brain that enable the person to perform basic body functions like walking and swallowing. People at the final stages of Alzheimer's are in need of admission and care from those around. Alzheimer's disease ultimately leads to death (Alzheimer's Association, 2019).

1.2 SPEECH DISORDERS OF ALZHEIMER'S PATIENTS

Clinical evaluations of people with Alzheimer's show impairments in memory, judgment, decision-making, navigation, and speech (Khanahmadi et al., 2015). Although memory-related problems are the commonest symptoms of Alzheimer's disease and dementia, many people having Alzheimer`s, experience progressive problems in the power of verbal communication (Egan, et al., 2010). In these patients, speech problems appear as speech impairment, correct expression of the intended meaning, failure in the segments and phonetic suprasegmental, problems with grammatical and lexical simplification and speech impairment during dialogue (Pistono et al. , 2016; Szatloczki et al. 2015; Silag, et al. 2015; Mesulman et al. 2014; Ahmed et al., 2012). These symptoms sometimes

create serious problems in connecting with those around, which can be a great risk to their health and well-being due to the reduction of the physical capacity of the elderly and the need for others.

1.3 MUSIC THERAPY

Among the recommended therapies for psychological diseases is music therapy. Music therapy is the clinical and evidence-based use of musical interventions to reach individual goals in a therapeutic relationship with a prominent specialist who has taken an approved music therapy program (American Music Therapy Association (AMTA)). Music therapy is the potential for non-pharmaceutical therapy regarding the behavioral and psychological symptoms of dementia. Although some studies have considered it useful, in most cases, studies have been done on a small and sometimes uncontrolled scale (Svansdottir & Snaedal, 2006).

The role of music in therapy has undergone changes since 1990, which was affected by modern attitudes from the studies on the interaction of mind and music performance. The studies on the human brain in relation to music have shown that music has a distinct effect on the brain by stimulating the natural processes of cognitive senses. Moreover, biomedical scholars have found that not only music is highly effective in organizing listening language, including sophisticated understanding, cognition, and motor control of the brain, but also this sensory language can significantly affect the retraining of the damaged brain (Thaut & Hoemberg, 2014). The modern music therapy started in the mid-20th century which was traditionally rooted in the concepts of social sciences. The therapeutic value of music was paid attention given its emotional and social role in human life and community culture. Music has functioned throughout the whole life in expressing feelings, shaping societies, solidarity and organizing the public, and supporting educational goals by sharing ideas and beliefs (Thaut and Hoemberg, 2014). Thus, one can expect that the cognitive process may have an important role in the treatment process.

Musical speech stimulation (MUSTIM) is a neurological musical therapy (NMT) method for people who have a mental problem in speaking. This technique uses music-related items like songs, rhythms, hymns and musical phrases to simulate the body state of speech and automatic speech (Thaut, 2005). Among those who can benefit from this type of treatment are those suffering from Alzheimer's disease and dementia (Thaut and Hoemberg, 2014).

1.4 IRANIAN MUSIC

Farsi music is a very old kind of oriental music with significant effects on eastern music cultures such as Central Asia, North Africa, southern Europe and the Gulf States (Abdoli, 2011). The music of Iran has 24 quintals of tone in each octave (Vaziri, 1913) and 7 Dasgahs.

1.5 MUSIC AND ARCHITECTURE

In fact, our country is one of the richest territories in terms of enjoyment of heritage and cultural achievements and one of its manifestations is special and globally-known urban planning and architecture. Iran is one of the richest native architectural examples with form and structure achievements notable in the world, in the course of the Islamic era, it has changed into one of the successful examples of conceptual, meaning-oriented and mystical architecture while the impact of physical and architectural form as the spatial container which is the effect of social culture, is effective in the representation of these concepts and meaning (Mahdinejad et al, 2015, 2017, 2019).

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All the arts are cross-linked with each other because the origin of all of them is a beautiful expression (Khaki et al., 2015). Art is one of the most mysterious aspects of human culture and civilization that always pervades human life (Zomorshidi et al., 2018).

Iranian traditional architecture is one of the most dramatic and the most supreme examples of architecture in the world that unconsciously attracts any viewer and its subtleties and secrets make everyone admire (Mahdinejad et al, 2016). Undoubtedly, Iran is one of the trustees of the art and of course owes its beauty to ancient monuments that are the legacy of love and passion and glory of the Iranian people in the ups and downs of the history of this nation; buildings which are the description of "elegance" and "glory" of Iranian Muslim artists and evidence of the meaning manifestation in the form of matter. As any art, during its progress, affects the time and space conditions of the society and other factors, the arts are directly or indirectly affected in relation to each other and show its reflection from each side in its own territory and add their capacity and performance. The meaning of Architecture today is that at the same time, which it is measuring and limiting the space it also tries to reach through a large space that people shall move inside and around it, and meanwhile music is a feeling of a mechanical rhythm in the space. When such a feeling awakes a motional motive in human it will have an influence on human sole and on his sensitive hidden space inside him which will prevent him against the noise waves on Human body. The Sufis dance which derivers from spiritual believes stage making that its natural secret and essential character relates to the musical motions (Falamaki et al, 2008).

2. BACKGROUND

Many studies have been conducted on the relationship between music therapy and the improvement of Alzheimer's disorders. Most of these studies considered two types of neurological research as well as psychological research through cognitive tests to study the effects of listening to music based on a specific treatment plan for Alzheimer's patients in reducing the underlying disorder. However, no coherent studies have been done on the therapeutic effect of Iranian music on patients with Alzheimer's and related speech disorders. Table 1 gives a summary of the research records.

3. HYPOTHESIS

It seems that using music therapy - by Iranian music – can be effective in improving and treating elderly patients with Alzheimer's and its speech-related disorders.

4. METHODOLOGY

In the current study, the desirable method for studying according to the purpose and the conditions were the cognitive measurement method. This method was performed using MMSE.

MMSE is the most widely used cognitive measurement tool. In 1975, MMSE was developed throughout the world as a means of assessing cognitive conditions (Gluhm et al., 2013). This test was used to visualize cognitive impairment, track changes in cognitive function over time and assess the effects of therapeutic factors on cognitive function among the patients (O'Bryant, et al., 2008). Although this test cannot be considered as an official diagnosis, it is considered as the first step in identifying cognitive impairments, and many studies have confirmed its validity and reliability

(Pezzotti et al., 2008; Baek, et al. 2016).

Table 1. Research records and research methodology

Researcher(s)	Title	Methodology	Sample	Results
King and Others (2018)	Increased Functional Connectivity after Listening to Favored Music in Adults with Alzheimer Dementia	Field by MRI image	17	Listening to music in patients with Alzheimer's disease activates the attention network in the brain and has a significant role in coordinating the functions of the brain network.
Guess (2017)	Alzheimer's Disease and the Impact of Music Therapy: A Systematic Literature Review	Review by library resources	-	Music therapy has a clear effect on memory and the ability to recognize the elderly with Alzheimer's.
Gallego and Garcia (2015)	Music therapy and Alzheimer's disease: Cognitive, psychological, and behavioral effects	Field by NMT test, psychiatric nursing questionnaire, anxiety and depression scale, and Bartlett index	42	Music therapy improves some cognitive, psychological and behavioral disorders in Alzheimer's patients.
Dassa and Amir (2014)	The Role of Singing Familiar Songs in Encouraging Conversation Among People with Middle to Late-Stage Alzheimer's Disease	Field by content analysis s	6	Listening and reading music related to the past of the elderly with Alzheimer's helps them in conversation.
Fukui, Arai, and Toyoshima (2012)	Efficacy of Music Therapy in Treatment for Patients with Alzheimer's Disease	Field by measuring hormones	6	Suspicious behaviors such as Poornima (Fugue) are reduced by music therapy. Music therapy is a potential alternative therapeutic alternative to hormone replacement therapy.
Zare and Others (2009)	The Effect of Music Therapy on Reducing Agitation in Patients with Alzheimer's disease in Shahryar City Nursing Home	Field by DSM-5 and MMSE	26	Listening to music reduces the restlessness of patients with Alzheimer's.
Raglio and Others (2008)	Efficacy of Music Therapy in the Treatment of Behavioral and Psychiatric Symptoms of Dementia	Field by MMSE, Barthel's index and neurology questionnaire	59	Music therapy is effective in reducing moderate to severe disease severity in patients with moderate to severe mental and behavioral symptoms.
Svansdottir and Snaedal (2006)	Music Therapy in Moderate and Severe Dementia of Alzheimer's Type: A Case-Control Study	Field by BEHAVE-AD test	38	Music therapy is a very effective and safe way to treat anxiety in Alzheimer's. This is in line with the results of some uncontrolled studies on music therapy and dementia.
Gerdner (2000)	The Effects of Individualized Versus Classical "Relaxation" Music on the Frequency of Agitation in Elderly Persons With Alzheimer's Disease and Related Disorders	Field by Bonferroni post hoc	39	The impact of listening to personalized music is far more important than classical music to stimulate elderly people with Alzheimer's disorders.
Brotons & Koger (2000)	The Impact of Music Therapy on Language Functioning in Dementia	WAB Field by MMSE	20	Music therapy has a positive effect on the power and mental state of people with dementia.

In MMSE, the six points - orientation, registration, attention and calculation, recall, language, and copying -are examined using short questions. The total score is 30: 10 points in the orientation, 3 points in the registration, 5 points in attention and calculation, 3 points in the recall section, 8 points in the language section, and 1 point in the copy section. The total score determines the level of cognitive

impairment so that the acquisition of grades 24 to 30 shows a lack of cognitive impairment, 18 to 23 a moderate cognitive impairment, and scores 0 to 17 determine acute cognitive impairment.

In the present study, 22 elderly (65 years and over) patients with severe and moderate Alzheimer's disease received treatment based on a plan by a music specialist in a controlled area. The duration of music therapy was controlled every day for 15 minutes that was music playing in the controlled space in the morning as group therapy and music quality were adjusted according to the auditory conditions of all the subjects. The time to give MMSE was before the start of the treatment and after the end of the second week of the treatment. Samples were selected from patients admitted to a residential care center in Tehran and randomly selected from among the patients in this center.

5. DISCUSSION

Among the studied samples, 12 were male and 10 female. Of the 22 samples examined, 10 had moderate Alzheimer's disease and 12 acute. Moreover, 9 samples were over 75 years old, 5 were between 70 and 74 years old, and the rest were 65-69 years old.

Table 2 result showed that the mean score of the collected samples before the treatment period was 17.00 with an SD 3.364, which increased to 20.82 with an SD 3.850 after the end of the treatment period. The paired t-test was used to verify the validity of the results. Tables 3 and 4, according to the significance level <0.001 and the negative value of t, the positive effect of treatment with Iranian music on the improvement of patients with severe and moderate Alzheimer's could be confirmed.

Table 2. Paired Samples Statistics

		Mean	N	SD	Std. Error Mean
Pair 1	MMSE Scoring(Before)	17.00	22	3.364	0.930
	MMSE scoring(After)	20.82	22	3.850	0.821

Table 3. Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	MMSE Scoring (Before) & MMS Scoring (After)	22	0.833	<0.001

Table 4. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	MMSE Scoring (Before)– MMSEscoring (After)	-3.818	2.423	0.517	-4.892	-2.744	-7.392	21	<0.001

Concerning language and speech ability, 17 patients had a score of 4 or less in the pre-treatment test, which reached 5 on completion of the treatment. Moreover, out of 22 samples, only one subject did not improve the language and speaking score. Table 5, the mean score in this section before the treatment was 3.36 with a standard deviation of 1.529, which reached 5.55 with an SD 1.535. Tables 6 and 7, the significance level of paired t-test was <0.001 and t value was negative, where like the overall score of the test, one can state the positive and direct effect of Iranian music therapy in improving the speech of Alzheimer's patients.

Table 5: Paired Samples Statistics

		Mean	N	SD	Std. Error Mean
Pair 1	Language (Before)	3.36	22	1.529	0.326
	Language (After)	5.55	22	1.535	0.327

Table 6: Paired Samples Correlation

		N	Correlation	Sig.
Pair 1	Language(Before) & Language(After)	22	0.764	<0.001

Table 7: Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Language(Before) - Language(After)	-2.182	1.053	0.224	-2.649	-1.715	-9.721	21	<0.001

6. CONCLUSION

The study examined the role of music therapy by Iranian music in improving and treating elderly people with Alzheimer's and related speech disorders. Although music therapy has been stated to be an effective treatment in many pieces of research, few field studies have been conducted in Iran to investigate its effectiveness among Alzheimer's patients in Iran. On the other hand, the gradual movement of the Iranian aging Pyramid into old age, Alzheimer's and dementia have become a serious threat to the health of the Iranian community. Thus, the focus of the study was to examine one of the most tangible and well-known types of music for Iranians, Iranian music, in improving these patients. The test was carried out on 22 patients with Alzheimer's disease in one of the elderly care centers of Tehran. The treatment period was 14 days and 15 minutes per day, done by a music therapist and in a controlled environment. The validated MMSE test was used before and after the treatment as a tool for measuring the variables. The results showed that using Iranian music in the musical therapy of Alzheimer's patients is helpful in improving cognitive impairment and increasing the linguistic and speaking power of patients with Alzheimer's, and this kind of music can be used as a suitable source in the therapeutic process.

7. MATERIAL AND DATA AVAILABILITY

Information regarding this study is available from the corresponding author.

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EFFECTS OF HUMAN RESOURCES INDIVIDUAL DEVELOPMENT MODEL ON ORGANIZATIONAL PERFORMANCE, EMPLOYEE PERFORMANCE AND EFFICIENCY: CASE OF TEHRAN'S SOCIAL SECURITY ORGANIZATION

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ABSTRACT

This study investigated the effect of Human resources individual development (HRID) model on organizational performance, employee performance, and efficiency. This study was an applied research with a quantitative approach that uses correlation method as the research method. The statistical population of this study was Tehran's social security organization managers and employees. Using Cochran's formula, 351 participants were selected randomly as the participants of the study. Data collection was performed by Hersey and Goldsmith organizational performance questionnaire, researcher-made questionnaire on human resources individual development, employee performance questionnaire, and efficiency of employee's questionnaire. To analyze the data, structural equation method, t-test and the Pearson correlation method, was used. The software used in this study was LISREL and SPSS. The results showed that human resources individual development has a positive impact on organizational performance (t=9.64), employee performance (t=9.75), and employee efficiency (t=9.64). This study suggests the use of HRID model in organizations to improve the organizational development.

1. INTRODUCTION

Considering the developmental requirements of the new age is one of the essential features for the survival of the organization, and organizations need to increase their competitive advantage so that they can succeed (Azizi et al., 2018). The competitive advantage of an organization depends on the extent of its development, and human resource development is considered to be the most important developmental factor (Jafari & Ghalmani, 2018; Rana & Malik, 2015). Armstrong (2006) states that one of the most important strategies of today's organizations is the development of human resources. The goal of human resource development is organization development and employee

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development. The development of human resources is aimed at creating scientific awareness and raising the level of employee knowledge, enhancing employee skills and developing skills and updating information (Baghdadchi, 2018). Human resource development is an organized learning experience that is developed to improve individual performance and development (Marchington et al, 2016). Human resource development is a framework for helping employees develop their individual skills and competencies, through the provision of training opportunities, career development, substitution programs, management and performance development, organizational coaching and organizational development for achieving organizational goals (Cascio, 2018; Kurmanali et al, 2018). Human resource development can be analyzed at three levels: Human resource development at the individual level, human resource development at the organizational level, and human resource development at the social level (Garavan et al, 2004). The social level of human resource development emphasizes community development, national competitiveness and networking. At the organizatinoa level of analysis, human resource development should develop developmental activities or interventions that support the achievement of organizational goals. Individual level generally focuses on the human dimension of human resource development. This level focuses on the analysis of concepts such as self-efficacy, self-esteem, learning motivation and motivation through expectations (Tonkenejad, & Davari, 2009).

The purpose of human resources development in organizations is to improve organizational performance, employee performance, employee efficiency, productivity, and such goals. Because these factors play a key role in the success of organizations. For example, organizational performance is considered as one of the most important indicators in determining the success or failure of organizations (Wright, 2018; Abolfazli et al, 2017). Organizational performance refers to how the missions, tasks, and organizational activities and the results of their accomplishments are performed, and when organizational goals are achieved it means that an acceptable organizational performance is achieved (Shin, & Konrad, 2017; Barreto & Alturas, 2018). One of the most well-known definitions of organizational performance has been provided by Neely, Adams, and Kennerley (2002), which is "The process of explaining the quality of the effectiveness and efficiency of past actions" (p. 168). In the competitive era, managers are always struggling to create a sustainable competitive advantage by enhancing organizational performance to boost their organization (Abbasi et al, 2015; Iravani et al, 2015).

In addition to organizational performance, employee performance and efficiency are also important indicators in determining the success of organizations (Kiruja, & Mukuru, 2018; Ahmadi et al, 2018). Given that employees are intangible and strategic assets of the organization, this would directly affect the performance and efficiency of organizations. (Kaviani, 2014). The understanding of employee behavior in organization and its optimization in accordance with the goals of the organization is of great importance to managers of various organizations (Tarazuyi Zar & Amini, 2018). Paying attention to the individual development of the staff makes the performance and efficiency of the people dramatically increase (Hasanpour & Mahdavi, 2018). The meaning of function is what the person performs as a job in a job. Generally speaking, because organizational success depends on employee performance, it is important for organizations to set performance improvements as one of the goals of human resource development, especially at the individual level (Mohamadi & Sharifzade, 2017). In terms of efficiency, also, because efficiency addresses the relationship between the results achieved with the resources used; therefore, it is expected that

improving employee performance through individual human resource development will also increase employees' efficiency (Jahani & Mir Magda, 2017).

A study on the research background in relation to the mentioned components, namely, human resources development at the individual level, organizational performance, employee performance and employee efficiency, shows that there is not a research that investigates the effect of individual human resources development on organizational performance, employee performance and efficiency. Therefore, in this research, the researchers intend to focus on the organizational performance, employee performance and efficiency, and Human Recourses Individual Development (HRID) model developed by Tazakori et al. (2019a; 2019b) is used as the theoretical framework. This research responds to three main questions that are: 1) Does the HRID model affect organizational performance? 2) Does the HRID model affect employees' performance? 3) Does the HRID model affect the employees' efficiency? HRID model is shown in (Figure 1).

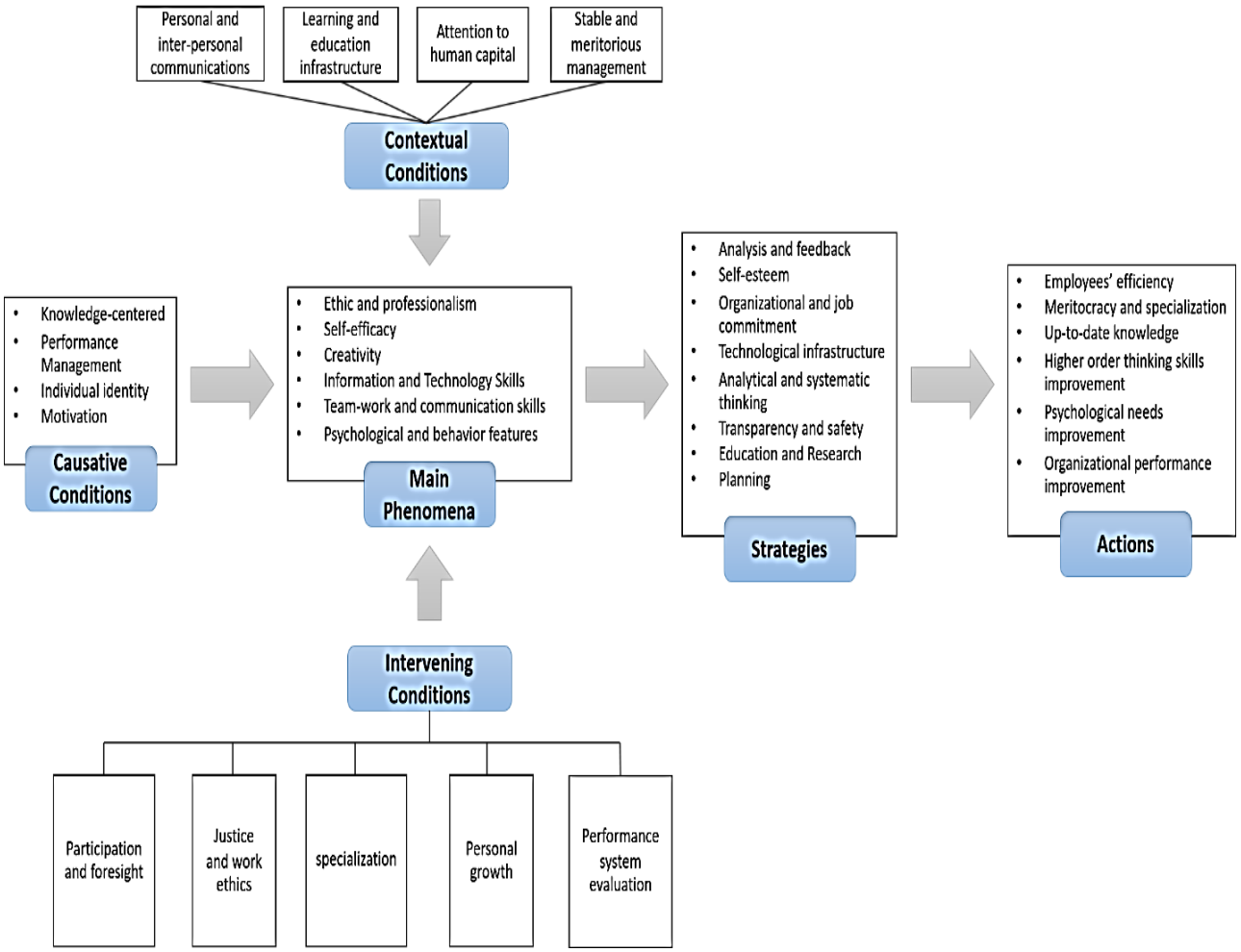

Figure 1: the HRID model

2. METHODOLOGY

This study was conducted to investigate the effect of HRID model on organizational performance, employee performance and efficiency. This study is an applied research with a quantitative approach that uses correlation method as the research method. Data collection was performed by Hersey and Goldsmith organizational performance questionnaire, researcher-made questionnaire on human resources individual development, employee performance questionnaire, and efficiency of employee's questionnaire. The organizational performance questionnaire of Hersey

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and Goldsmith (1980; cited by Yousef Saber, Tabataba'i, and Afrazeh, 2015) has 42 items that measure seven components of ability, clarity, help, incentive, evaluation, validity and environment. Scoring in this questionnaire is a five-point Likert scale, in such a way that 1 (very low), 2 (low), 3 (average), 4 (high) and 5 (very high). The score range is 42 (the lowest score), average score (126), and the maximum score (210). The interpretation of the score is as follows: if the score is between 42 and 84, which means the level of organizational performance is low. If the score is between 84 to 126, that is, the organizational performance is moderate, and if the score is between 126 and 210, that is, the level of organizational performance is good. The validity of this questionnaire has been reported 0.89 by which is acceptable and the reliability of this questionnaire has been reported as 0.89 which means the questionnaire is reliable. The researcher-made questionnaire has 46 items that measure six components of causative conditions, intervening conditions, contextual conditions, phenomena, strategies, and actions. Scoring in this questionnaire is a five-point Likert scale, in such a way that 1 (very low), 2 (low), 3 (average), 4 (high) and 5 (very high). The score range is as follows: 46 is the lowest score, the average score (115), and the maximum score is 230. The interpretation of the score is as follows: if the score is between 46 and 78, that is, the amount of personal development resources human is too low. If the score is between 79 and 108, that is, the level of human resources individual development is low and if the score is between 109 and 125, that is, the level of human resources individual development is moderate. If the score is between 126 and 170, that is, human resources individual development is high and if the score is between 171 and 230, that is, the human resources individual development is very high. Dimensions of this questionnaire were determined by exploratory factor analysis and then confirmed by confirmatory factor analysis. The reliability of this questionnaire was also reported 0.89 by the researcher. Employee performance questionnaire (Lozumi, 2014) consisted of 9 question as five-point Likert scale as follows: 1 (very low), 2 (low), 3 (average), 4 (high) and 5 (very high). If the score is between 9 to 18 which means employee performance is low in the organization. If the score is between 18 to 36 which means employee performance is average in the organization. If the score is higher than 36 it means that employee performance is high in the organization. Validity and reliability of the questionnaire has been confirmed by Lozumi (2014) and in this research reliability is reported 91.9 which is an acceptable reliability. Efficiency of employee's questionnaire has 17 questions and measure four dimensions as follows: questions 1 to 4 for equity dimension, questions 5 to 8 for alignment dimension, questions 9 to 12 for speed at work, and questions 13 to 17 for the use of equipment and facilities dimension. This questionnaire is designed as five-point Likert scale as follows: 1 (very low), 2 (low), 3 (average), 4 (high) and 5 (very high). If the score is between 17 to 34 which means employee efficiency is low. If the score is between 34 to 51 which means employee efficiency is an average level. If the score is higher than 51 which means employee efficiency is high. Validity and reliability of this questionnaire is confirmed by Hajizade (2005). In this research reliability is reported 0.87 which is acceptable. In this study, the reliability was reported 0.87. Structural equation, Pearson correlation coefficient and t-test were used to analyze the data. The software used in this study was LISREL and SPSS.

3. FINDINGS

The descriptive information of the participants in this research is given in Table 1. The results of the descriptive findings show that most of the participants in this study are men (65%). The largest age range is between the ages of 31 and 40 (35%), and the highest academic grade is for

undergraduates (44%).

Table 1. Descriptive information of research participants

Variable	Level	Frequency	Percentage
Gender	Female	121	35
	Man	230	65
	Total	351	100
Age	20 to 30	56	16
	31 to 40	125	35
	41 to 50	87	25
	More than 51	83	24
	Total	351	100
Degree	Undergraduate	54	16
	Bachelor	1157	44
	Master	123	35
	Ph.D.	17	5
	Total	351	100

To answer the research questions, firstly, a correlation matrix was drawn, then the impact factor of HRID model on organizational performance, meritocracy and professionalism was determined. Information on the correlation between HRID with organizational performance, employee performance and efficiency is presented in (Table 2).

Table 2: Correlation matrix between variables and HRID.

Variable	HRID
HRID	1
Employee performance	0.333**
Organizational Performance	0.297**
Ability	0.221**
Clarity	0.246**
Help	0.243**
Incentive	0.514**
Evaluation	0.314**
Validity	0.276**
Environment	0.278**
Employees efficiency	0.298**
Equity	0.287**
Alignment	0.321**
Speed at work	0.312**
Equipment and facilities usage	0.304**

** Significant at a level of 0.01

According to the results of the correlation matrix between variables in (Table 2), we conclude that HRID is significantly correlated with the variables of organizational performance and its dimensions, employee performance and employees' efficiency and its dimensions at the level of 0.01. Considering the significant relationship between variables, in the next section, we will determine the impact factor of the individual development of human resources on the variables of the research.

1) Does the HRID model affect organizational performance?

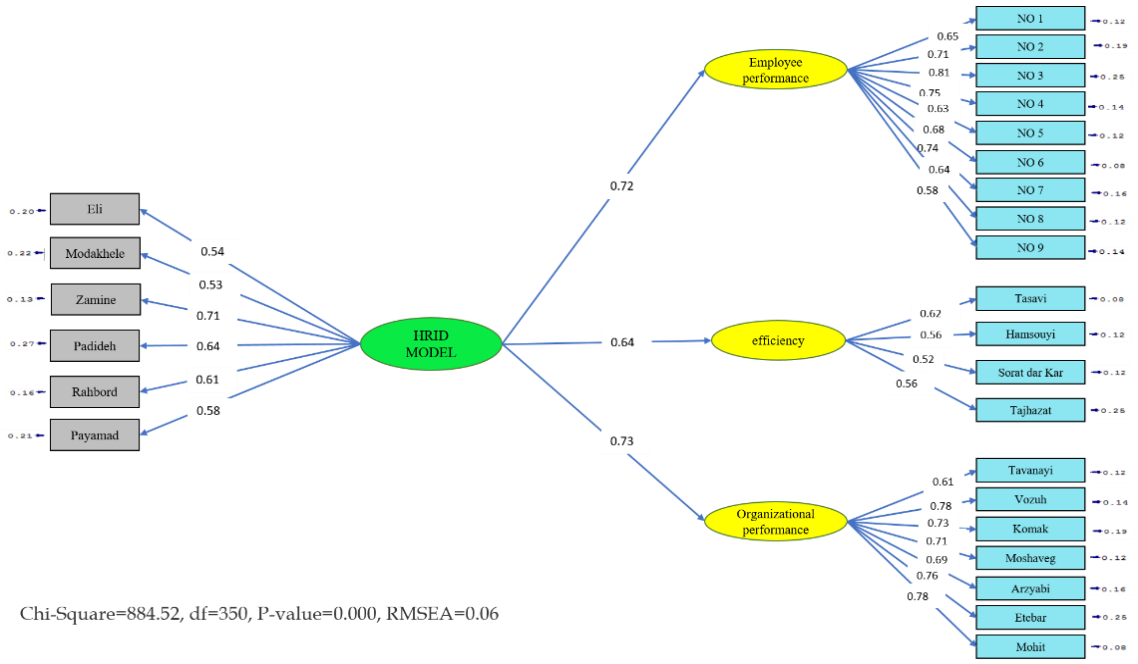

Figure 2: Factor load for variables organizational performance.

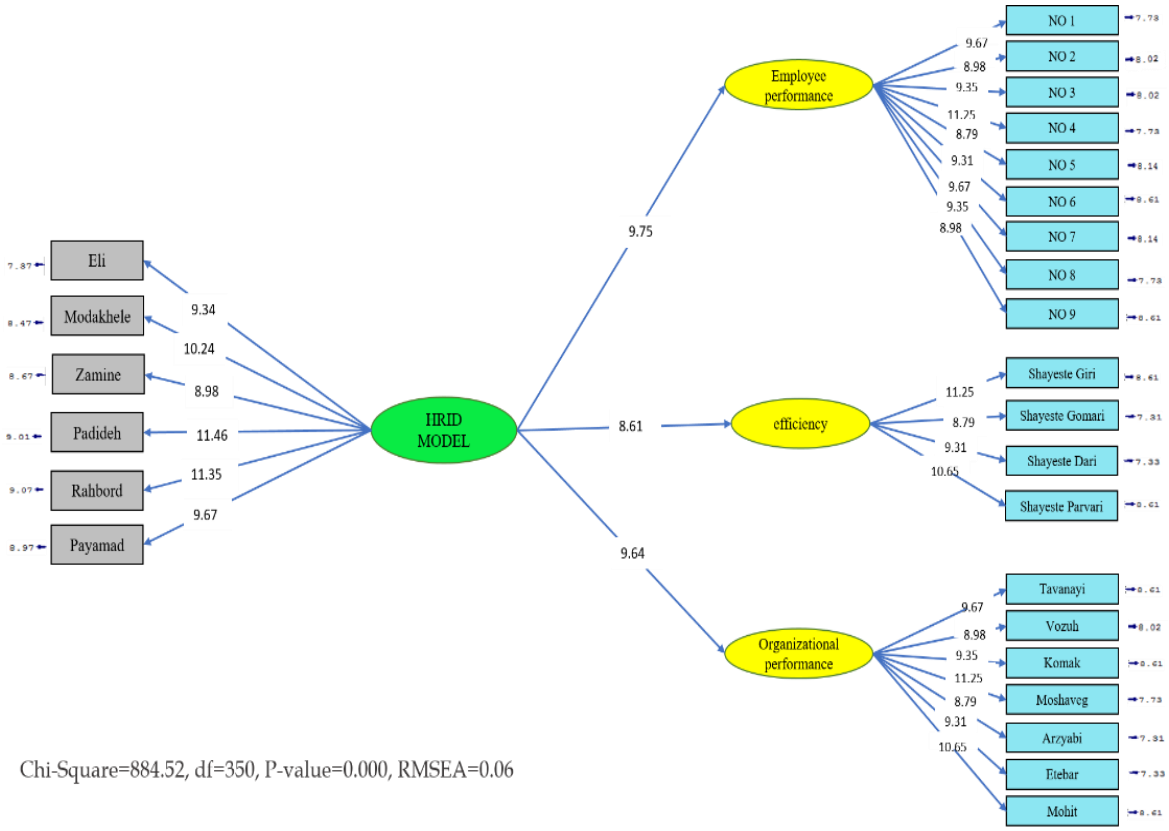

Figure 3. t-value for variables on organizational performance

The results of data analysis for the impact of the HRID model on organizational performance in (Figure 2) are equivalent to 73% of the factor load, and the obtained t value is 9.64 (Figure 3). With regard to the significance and positivity of these coefficients, it can be said that with the probability of 99% the HRID model has a positive effect on organizational performance. Table3 reports the model fitness on organizational performance including Chi-square test, Root Mean Square Error of Approximation (RMSEA), Goodness of Fit (GFI), Adjusted Goodness of Fit (AGFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), and Non-Normed Fit Index (NNFI). NNFI is also called Tucker Lewis Index (TLI).

Table 3: Model fit result on organizational performance

Fitness Indices	Values measured	Acceptable fit	Goodness of fit measure
Chi Square/df	χ^2/df<3	1.28	Good fit
RMSEA	RMSEA<0.09	0.05	Good fit
GFI	GFI>0.9	0.92	Good fit
AGFI	AGFI>0.9	0.93	Good fit
CFI	CFI>0.9	0.94	Good fit
NFI	NFI>0.9	0.96	Good fit
NNFI	NNFI>0.9	0.96	Good fit

Regarding the results of fitness indices in the models of verification of the confirmatory factor analysis of the research tools, it can be said that the value of each method in all measurement models is significant at 5% error level. Also, Fitness Indices in all measuring models is a good fit. Therefore, according to the results of the measurement models, it can be said that all the research instruments are suitable fit and acceptable.

2) Does the HRID model affect employees' performance?

The results of data analysis for the impact of the HRID model on employees' performance in (Figure 4) are equivalent to %72 of the factor load, and the obtained t value is 9.75 (Figure 5). With regard to the significance and positivity of these coefficients, it can be said that with the probability of %99 the HRID model has a positive effect on employees' performance. Model fitness is reported in (Table 4).

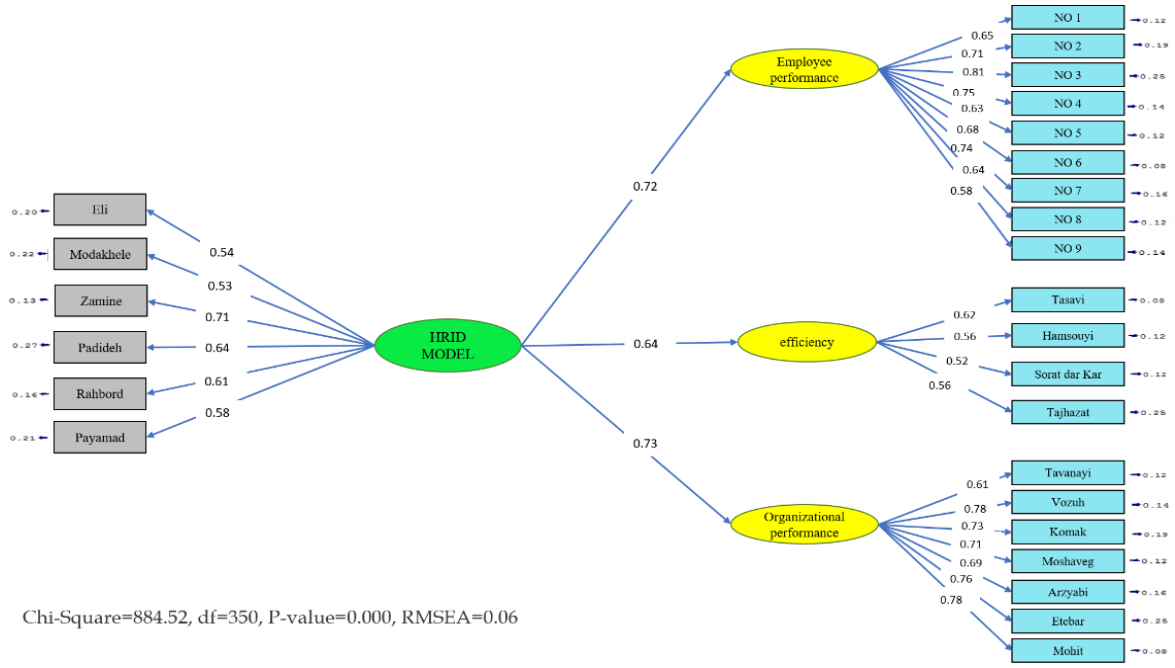

Figure 4: Factor load for variables on employees' performance.

Table 4: Model fit results on employees' performance

Fitness Indices	Values measured	Acceptable fit	Goodness of fit measure
Chi Square/df	k^2/df>3	1.28	Good fit
RMSEA	RMSEA<0.09	0.04	Good fit
GFI	GFI<0.9	0.96	Good fit
AGFI	AGFI<0.9	0.94	Good fit
CFI	CFI<0.9	0.97	Good fit
NFI	NFI<0.9	0.93	Good fit
NNFI	NNFI<0.9	0.92	Good fit

Regarding the results of fitness indices in the models of verification of the confirmatory factor analysis of the research tools, it can be said that the value of each method in all measurement models

is significant at 5% error level. Also, Fitness Indices in all measuring models is a good fit. Therefore, according to the results of the measurement models, it can be said that all the research instruments are suitable fit and acceptable.

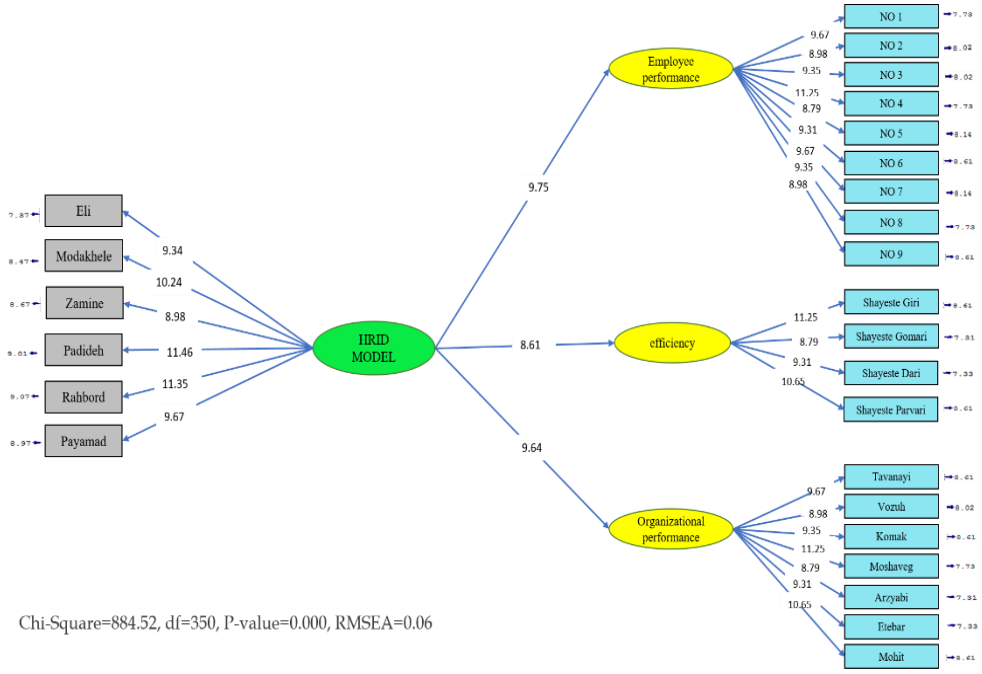

Figure 5: t-value for variables on employees' performance

3) Does the HRID model affect employees' efficiency?

The results of data analysis for the impact of the HRID model on employees' efficiency in (Figure 6) are equivalent to 64% of the factor load, and the obtained t-value is 8.61 (Figure 7). With regard to the significance and positivity of these coefficients, it can be said that with the probability of 99% the HRID model has a positive effect on employees' efficiency. Model fitness is reported in (Table 5).

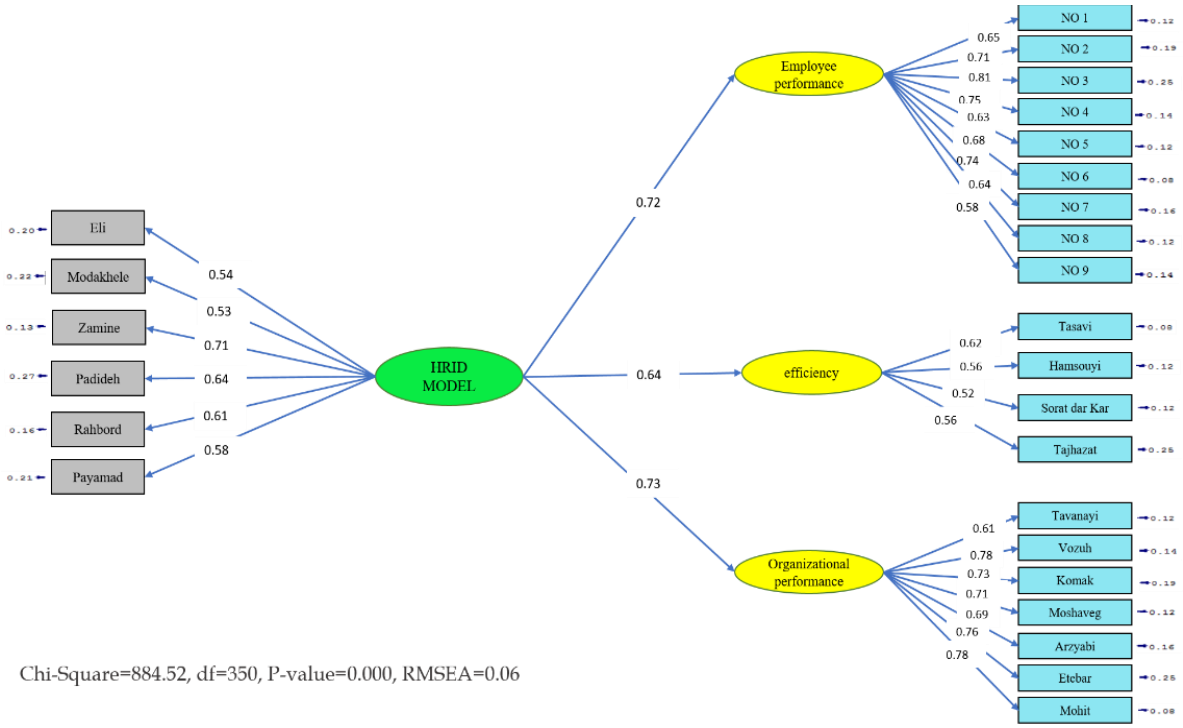

Figure 6: factor load for variables on employees' efficiency.

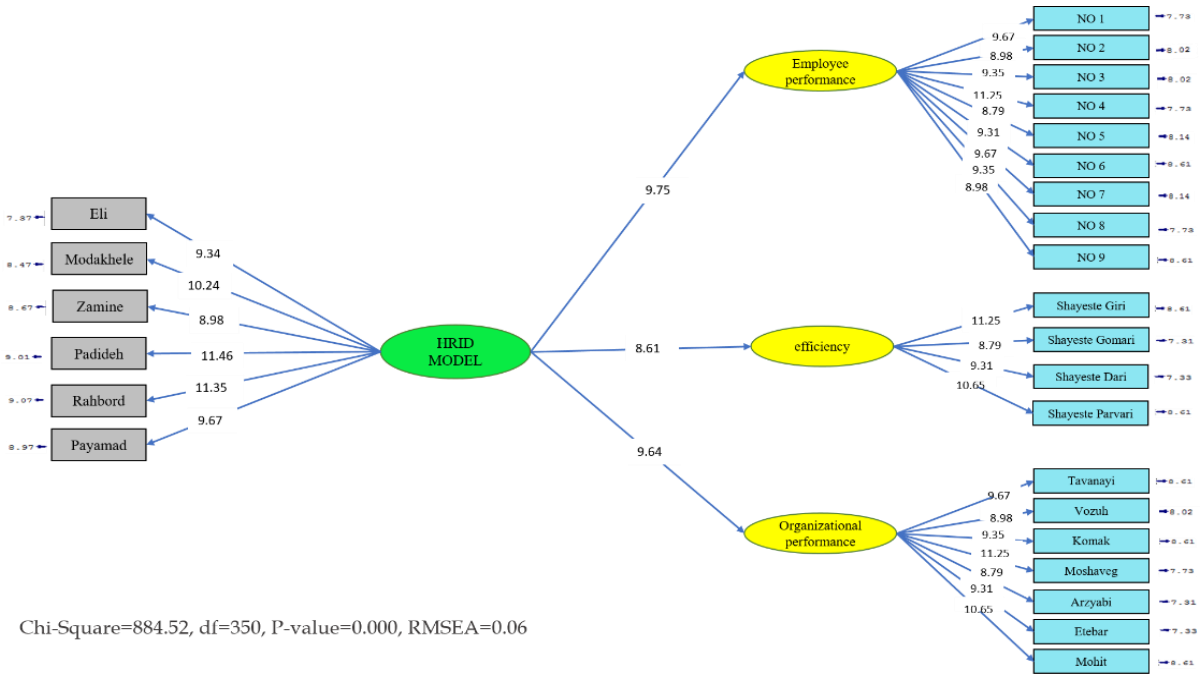

Figure 7. t-value for variables on employees' efficiency

Table 5. model fit results on employees' efficiency

Fitness Indices	Values measured	Acceptable fit	Goodness of fit measure
Chi Square/df	k^2/df>3	1.28	Good fit
RMSEA	RMSEA<0.09	0.06	Good fit
GFI	GFI<0.9	0.91	Good fit
AGFI	AGFI<0.9	0.95	Good fit
CFI	CFI<0.9	0.93	Good fit
NFI	NFI<0.9	0.97	Good fit
NNFI	NNFI<0.9	0.96	Good fit

Regarding the results of fitness indices in the models of verification of the confirmatory factor analysis of the research tools, it can be said that the value of each method in all measurement models is significant at 5% error level. Also, Fitness Indices in all measuring models is a good fit. Therefore, according to the results of the measurement models, it can be said that all the research instruments are suitable fit and acceptable.

4. DISCUSSION

This study was conducted to investigate the impact of HRID model on organizational performance, employees' performance, and employees' efficiency. Result for the first question showed that HRID model has a positive impact on organizational performance with %73 factor load. This finding is in line with previous studies such as Hosseini, Tabassomi & Dadfar (2017), Rasouli, Olfatpour & Ghorbani (2016), No-Pasand Asil & Malek-Akhlag (2014), Rana & Malik (2017), de Brito & de Oliveira (2016) and Seidu (2011). In explaining the convergence of the results of previous studies with this research, we can mention a number of reasons. First, the examination of theoretical foundations suggests that the theories and documents in this area support the close relationship between human resource development and organizational performance. For example, Neely, Adams, & Kennerley (2002) consider organizational performance as a process of explaining the quality of the effectiveness and efficiency of previous actions, and these actions are in fact reflected in the human

resources of that organization, including managers and employees. Because, human recourses play a key role in implementing organization actions and they are the key to achieve goals of organizations (Shin & Konrad, 2017). Wright (2018) also mentions the close relationship between organizational performance and human resource development, and states that enhancing organizational performance as a competitive advantage of the organization through human resource development is possible. Therefore, the study of theoretical foundations suggests that the experts in this field point to the existence of a correlation between human resource development and organizational performance. From the perspective of research, gender similarities can be a reason in explaining the alignment of findings of this research with previous studies. This means that, for example, both women and men participated as research participants in the current study and Hosseini, Tabassomi & Dadfar (2017), Rasouli, Olfatpour & Ghorbani (2016), and Rana & Malik (2017) research. Another factor can be the use of the same research tool. In this study, the organizational performance questionnaire of Hersey and Goldsmith (1980) was used to measure organizational performance, as well as in Hosseini, Tabassomi & Dadfar (2017), and de Britu & de Oliveira (2016). Therefore, the alignment of the findings of this research with previous studies can be explained both from the perspective of theoretical foundations and from the perspective of research bases. In relation to the second question, result showed that HRID model has a positive impact on employees' performance. This finding is in line with Ahmadi et al (2018), Tarazuyi Zar & Amini (2018), Hasanpour & Mahdavi (2018), Kiruja & Mukuru (2018), Mohamadi & Sharifzade (2017), Jahani & Mir Magdam (2016), Kaviani (2014) research findings. In explaining the convergence of research findings, it can be said that the development of human resources at the individual level increases the abilities of employees. According to Tazakori et al (2019) The human resources individual development (HRID) model promotes personal growth of employees, improves the psychological needs of employees, and provides staff with updated knowledge and communication. Such features generally enhance their capabilities and thus improve their performance and efficiency. Mohamadi and Sharifzade's research (2017) also show this meaningful relationship between human resource development and performance.

5. CONCLUSION

From this study, it can be said that human resources individual development (HRID) as one of the neglected areas can play a key role in the development of organizations and the prosperity of employees. As the findings of this research also support the positive impact of human resources individual development (HRID) on organizational performance, employees' performance and employees' efficiency. Therefore, it is suggested to organizations, especially to Tehran Social Security Organization, to take HRID seriously to provide the basis for improving organizational performance, employees' performance and employees' efficiency.

6. DATA AND MATERIAL AVAILABILITY

Data involved in this study can be requested to the corresponding author.

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DETERMINATION THE MOST EFFICIENT TRACKING TECHNIQUE FOR THE MAXIMUM POWER POINT OF SOLAR SYSTEMS IN RAPID ENVIRONMENTAL CHANGING CONDITIONS

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ABSTRACT

Nowadays, increasing fossil fuel usage in communities has led to an unpleasant consequence. Environmental pollution is caused by unnecessary consumption, on the other hand, the reduction of resources are the most important consequences. Hence, using renewable and clean fuels like solar energy is a good replacement. In many countries, solar cells play a significant role in generating electricity, but the cost of electricity produced by them is very high due to the high cost of construction and maintenance; that is why they are less popular. Many efforts have been made in recent years, to determine the working point of solar cells which are used in any environment and at maximum power. The peak power point The point at which the cell has the highest output power is called, called the maximum power point tracking (MPPT) technique, in terms of how to set the point of reference at the maximum power point. In this thesis, some techniques for tracking the maximum power point of solar cells have been introduced; among them the performance of two hill-climbing techniques and incremental conductance in variable environmental conditions and two scenarios have been investigated.

1. INTRODUCTION

Today, the growth of energy consumption in modern industrialized societies has led the world to face irreversible and threatened environmental degradation, in addition to the risk of the rapid extinction of fossil fuels. Therefore, in international programs and policies, a special role has been devoted to renewable energy sources for sustainable global development [1]. The World Energy Organization has suggested that fossil fuels such as oil, coal, and gas will end in less than ten decades.

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Fossil fuels contain more than 79% of primary energy consumption in the world, of which 57.7% is used in transportation. The growing demand and the community have forced politicians to seek a suitable alternative to fossil fuels [2].

Renewable energies have been much considered in recent years due to increased availability and lower costs, so that, for example, the European Union generated 12% of its electrical energy in 2010 through new energies. In our country, in this regard, the Organization of New Energy of Iran, following the policies of the Deputy Minister of Energy Affairs of the Ministry of Energy since 1995, has undertaken to address this issue in order to access the information and technologies of the world about the use of renewable energy sources, potential research and implementation of numerous projects. [3]. Renewable energies have different energy structures than conventional energy production technologies because the development process of renewable energy has high initial investment costs and the maintenance costs are low, but in the generating energy from conventional sources methods, the costs of primary investment are low. It can be expected to have different benefits to the development of renewable energy usage in the country, mainly depending on local conditions, the characteristics of alternative resources and social concerns. One of the benefits of renewable energy is increasing the security of energy supply, reducing global warming and environmental protection [1]. The exploitation of renewable energy also increases the availability of sustainable and secure energy sources for less developed regions. Tracking the maximum power point in a solar cell is very important due to the increased use of PVs in small and large networks and the maximum exploitation of solar cells. Hence, it is urgent and cost-effective to use an efficient maximum power point tracking (MPPT) technique that can track this point in any environmental conditions [4].

The purpose of this study is to determine the most efficient technique for tracking the maximum power point of solar systems' rapid environmental changing conditions.

2. BACKGROUND RESEARCH

It is really important to have a renewable energy system. Wind and sunlight energy are some of the most renewable energies. Solar energy, among other renewable energies, is a matter of great interest. Hence, the demand for solar cells to supply energy is increasing. More than 45% of future energy will be generated by solar cells [5].

The solar cell acts as a current source, which produces current as light radiates at the surface. A PV cell alone cannot produce enough power and is not used in many applications. In order to get the maximum energy from the cell, they are connected in parallel or in series. PV modules can produce output power [6].

MPPT techniques are used to find the voltage and current that maximizes the power of the PV array at a certain temperature and radiation conditions. The first MPPT techniques were introduced in the 1960s. Today, many techniques have been introduced to track the maximum power point in PV systems. These techniques include open-circuit voltage, short circuit current, hill climbing, and smart techniques. The use of hill climbing techniques, incremental conductance, and distraction and observation are more common among the many techniques available, which are used for simplicity

and convenience [7].

The drawback of the PV system is the high cost of solar cells and low economic interest. Although the price has slowed down in recent years, with the advancement in the structure and process of solar cell production, the price of electricity produced by solar arrays is still high in terms of electricity produced by fossil fuels. Therefore, the use of the PV array is extremely important at maximum power [8].

When the PV array is directly connected to the charge or used to charge the battery, the system's operating point is at the intersection of the I-V curve of the solar system and the load line. Normally, this point is not in the MPP of the PV array [9]. Installation costs in solar systems are high. In order to overcome this problem, a power converter is used with a key switch called the maximum power point tracker to maintain the point of the PV system in the MPP [10].

Numerous techniques have been developed for tracking maximum power so far. The general principles of methods can be divided into four categories: the first is the techniques that follow a basic algorithm. These types of techniques can be referred to as distraction and observation, hill climbing and increasing conduct.

The second group of techniques is based on solar cell modeling. In these techniques, solar cell modeling and the establishment of relationships in the proposed model will be predictable for solar cell properties and the system will be designed and implemented based on the model. The main problem with this type of technique is the lack of flexibility by replacing the solar cell with another cell. In a way, each implementation only has been designed for the same solar cell. In addition to the problem, finding a solar cell model and parameters before designing itself is another problem.

The third group of techniques is based on the relationship between working point and solar cell parameters. The fourth category is smart controlling techniques. In this type of technique, fuzzy logic control or fuzzy logic and artificial neural networks are used. The maximum power point control and tracker can include sensors, PWM wave generator, and MPPT implement. This section, with the MPPT control system, can be found depending on the technique available by measuring the required point-of-duty parameters, which is the maximum point of the solar cell's output power [11-13].

3. IMPLEMENTATION AND RESULT

3.1 INTRODUCING MAXIMUM SOLAR POWER POINT TRACKING TECHNIQUES

3.1.1 HILL-CLIMBING TECHNIQUE

This technique uses a change in the converter working cycle to determine the maximum power point. As shown in Figure 1, before MPP, the increase in voltage increases the power, but after MPP, we can increase the voltage by decreasing the voltage. This is the basis of the hill-climbing technique [14].

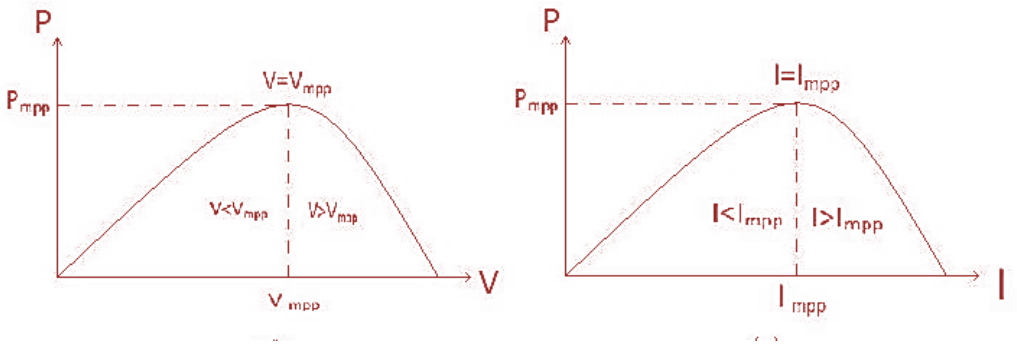

Figure 1: The hill-climbing technique chart [14].

The Flowchart of this technique is presented in Figure 2. In fact, when the condition $\frac{dP}{dD} = 0$ holds the maximum power point is tracked. The cycle of work in each sampling period is obtained by comparing the power in the present moment and power at the instant. When dP> 0, the working cycle must be increased to dD> 0. If dP <0, the work cycle should be reduced to dD <0 [15].

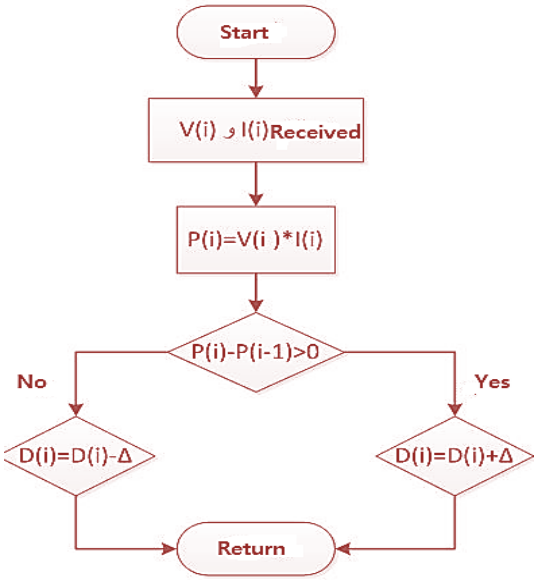

Figure 2: Flowchart of the hill-climbing technique [15]

The main problem in this technique is the relationship between the system stability in steady-state periods and the lack of rapid response to changing radiation conditions. Steady-state periods require a small change in the work cycle to prevent a high oscillation around the maximum power point, as this will reduce the energy received by the PV. On the other hand, rapid changes in radiation require a larger work cycle to track maximum power [16]. Another problem with this technique is its fluctuation around the maximum power point. Of course, this oscillation can be reduced by diminishing the range of dD variations, but it slows the process of finding MPP [17].

3.1.2 INCREMENTAL CONDUCTANCE TECHNIQUE

This technique has been used more than others among all the MPPTs techniques because it has more precision in tracing in stable conditions and has the ability to better adapt to variable weather conditions [17]. This technique uses the PV power curve to track MPP. The slope of the PV curve at the MPP moment is zero and for output voltage values it is less than the MPP voltage is positive and for output voltage values greater than the MPP voltage is negative. The derivative of the power of the

PV module is given in relation (1), and the resulting relation for the error value e is obtained from (3) [18]:

$$\frac{dP}{dV}=\frac{d\left(V\times I\right)}{dV}=I+V\frac{dI}{dV}=0 \quad (1).$$

Also,

$$\frac{dI}{dV}+\frac{I}{V}=\frac{I\left(i\right)-I\left(i-1\right)}{V\left(i\right)-V\left(i-1\right)}+\frac{I\left(i\right)}{V\left(i\right)}=0 \quad (2),$$

and

$$e=\frac{I\left(i\right)-I\left(i-1\right)}{V\left(i\right)-V\left(i-1\right)}+\frac{I\left(i\right)}{V\left(i\right)} \quad (3).$$

Therefore, the MPP tracking is required to follow the trend shown in Figure 3. This is done by inserting a simple separator with the e signal as the input and the coefficient of fit k. Correlation coefficient function k is adjusting the error signal e in the appropriate range before the integral compensator. The closer the point of reference to the MPP is, the smaller the error signal e, which makes tracking easy [19].

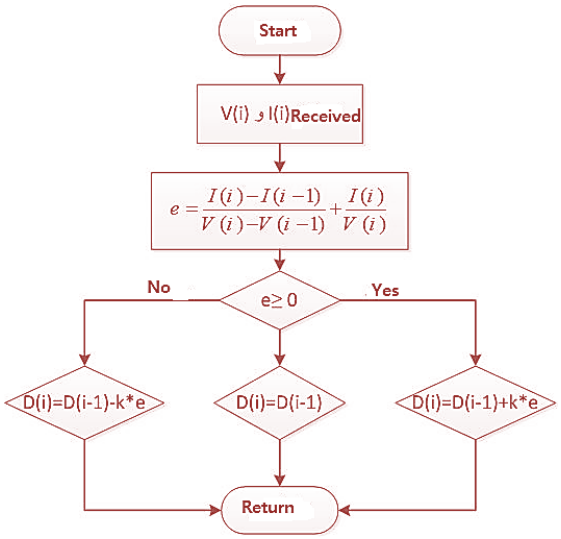

Figure 3: Flowchart of Incremental Conductance Technique [19]

3.2 MODELING OF MAXIMUM POWER POINT TRACKING TECHNIQUES IN THE SOLAR SYSTEM

In the presented models, one solar module with a maximum power of 60 watts is used as the solar system; and its voltage and current outputs will be used as inputs of the intended technique. On the other hand, the influencing factors of operation of the solar module are the temperature and solar radiation, and it is possible to examine the reactions of the techniques by applying changes to these conditions.

3.2.1 SIMULATED SOLAR SYSTEM

Figure 4 shows the solar system used in the simulations. This system includes a PV module, a

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boost converter, and a battery. Radiation *R* shines on the module and its temperature T is measured. Simulations are made for two hill-climbing and incremental conductance techniques. The PV system consists of the following components.

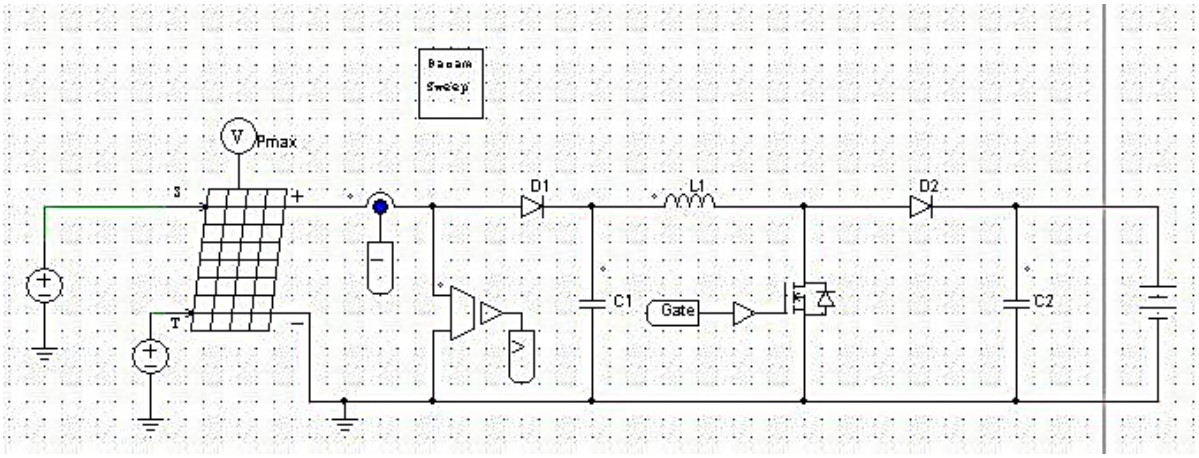

Figure 4: PV system.

The amount of solar radiation and operating temperature in the introduced system was initially considered as constant then it has been investigated by applying changes in the system response at different temperatures and radiation. The temperature has changed from 25 to 60 degrees Celsius and the radiation range from 800 to 1000 W/m^2. The following system components are introduced:

Module PV: The used module includes 36 silicon-based polycrystalline cells. The electrical characteristics of this module are shown in Table 1.

Table 1: Electrical Specifications of the PV Module.

Max power(Pmax)	50 W
Voltage in (Vmp) Pmax	17.1 V
Flow in (Imp) Pmax	3.5 A
Short circuit current (Isc)	3.8 A
Open circuit voltage(Voc)	21.1 V

DC/DC Boost Converter: Load impedance must be equal to the source impedance to have a maximum power transmission from source to load. Impedance equivalence can be achieved by adjusting the DC/DC converter's working cycle. The converter should work with the corresponding cycle of work to determine the maximum power point. The converter cycle should be adjusted with the variable operating conditions so that the maximum power is taken from the PV module. There are different architectures for the DC/DC converter, but due to the wide use and reliability of the architecture, this architecture has been used. The D_1 diode protects the PV module against the negative current. C_1 is located at the entrance of the converter to limit the components of the high-frequency harmonics.

3.3 TECHNIQUES AND SIMULATION SCENARIOS

The responsiveness has been investigated under two constant temperatures and steady-state scenarios in order to investigate the performance of the techniques. The values of temperature and radiation for all three models are considered to be of the same magnitude to facilitate the comparison; in the steady-state, the temperature is 25, 45 and 60 degrees Celsius, and in the steady-state radiation conditions they are 900, 950, and 1000 W/m^2.

3.3.1 HILL CLIMBING TECHNIQUE

Simplicity is the key advantage of this technique. The main problem with this technique is the stability of the system under constant radiation conditions and the lack of rapid response to rapid changes in radiation. Stationary radiation requires a small cycle of work to prevent high power fluctuations around the maximum power point, which reduces the amount of energy received by the PV. On the other hand, rapid changes in radiation need more work cycles to quickly track the maximum power point. An illustration of the simulated HC technique is shown in Figure 5.

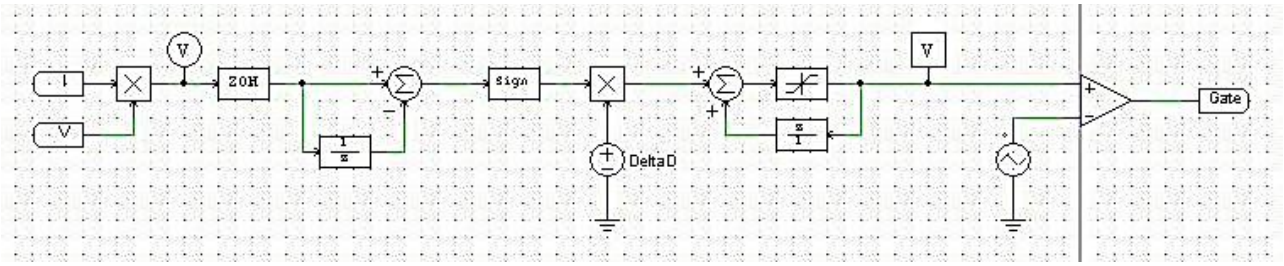

Figure 5: Slope Technique in Simulation.

3.3.2 INCREMENTAL CONDUCTANCE TECHNIQUE

The incremental conductance technique is very much used compared to all the MPPT techniques due to the high accuracy of tracing in stable conditions and good adaptation to atmospheric conditions. The disadvantages of this technique can be high operating costs. The following is an overview of the incremental conductance technique. In Figure 6, this technique is implemented according to the flowchart process.

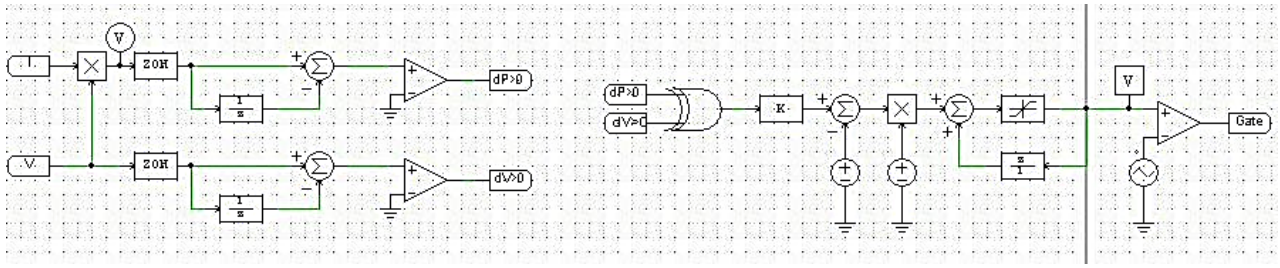

Figure 6: Incremental conductance technique 1 (in accordance with flowchart) in simulation.

3.4 SIMULATION RESULTS

In this section, the images of response techniques are presented in both scenarios. It should be noted that in addition to the sustained response, the dynamic response of these two techniques is also presented.

3.4.1 THE FIRST SCENARIO: A CONSTANT RADIATION WITH VARIED TEMPERATURES

In this scenario, radiation is considered to be 800W/m^2, and the temperatures are 25, 45 and 60 degrees Celsius respectively.

Table 2: Constant radiation with varied temperatures.

Color	Work cycle rate	Color	Work cycle rate
Red	2%	Purple	8%
Dark blue	4%	Orange	10%
Green	6%	Pale blue	P

From Table 2, the speed of tracing decreases for the hill-climbing technique with increasing

temperature, and this is independent of the amount of work cycle. For example, in a working cycle of 2%, the start time of the track at 25°C is 0.02 seconds, and this value reaches 0.05 and 0.08 seconds at 45°C and 60°C. This has also been the case for other values of the work cycle. On the other hand, the dynamic response is clear. This technique has a lot of fluctuations around the point of work, which has previously been cited as one of the disadvantages of this technique. The amount of fluctuations increases with the increasing working cycle, but the temperature increase increases the number of oscillations.

3.4.2 THE SECOND SCENARIO: VARIED RADIATION WITH A CONSTANT TEMPERATURE

In this scenario, the temperature is 25°C and the radiations are 900, 950, and 1000 W/m^2, respectively.

Table 3: Constant temperature with varied radiations.

Color	Work cycle rate	Color	Work cycle rate
Red	2%	Purple	8%
dark blue	4%	Orange	10%
Green	6%	Pale blue	P

According to Table 3, there is no change in the radiation pattern at the start of tracing for the hill-climbing technique, and this is independent of the amount of work cycle. For example, in a working cycle of 2%, the start time of the detection in the radiation is 900 times 0.02 seconds, and this value reaches 0.02 seconds for the radiation of 950 and 1000 W/m^2. This has also been the case for other values of the work cycle.

4. DISCUSSION

4.1 DISCUSSION THE RESULTS OF SIMULATION TECHNIQUES

Maximum power point tracking techniques are put in ambient conditions such as temperature and radiation variations, but their performance results have been examined only in the mode of the change of a factor due to the complexity of their complexity, that is why only one factor has been investigated at any one time. Also, sampling frequencies are considered low and the work cycle is updated at the same time in order to emphasize the accuracy of the output results. The mentioned techniques are compared in terms of response time (tracking speed) and dynamic response. The result is drawn with changes in the various work cycles, and for more clarity at the end, all the graphs obtained in each cycle are drawn together in order to make it easier to compare the time and accuracy of the responses between simulated different techniques. At first, the results of each technique in the first and second scenarios are examined separately, then the overall results are compared with each other.

4.2 THE FIRST SCENARIO OF CONSTANT RADIATION WITH VARIED TEMPERATURES

As can be readily seen, the speed of tracing decreases for the hill-climbing technique with increasing temperature, and this is independent of the amount of work cycle. For example, in a working cycle of 2%, the start time of the track at 25°C is 0.02 seconds, and this value reaches 0.05 and 0.08 seconds at 45°C and 60°C. This has also been the case for other values of the work cycle. On the other hand, the dynamic response is clear. This technique has a lot of fluctuations around the point

of work, which has previously been cited as one of the disadvantages of this technique. The amount of fluctuations increases with the increasing working cycle, but the temperature increase increases the number of oscillations.

The low performance in high temperatures is due to the poor performance of the solar cell assembly. Because at high temperatures the cell flow is significantly increased, but the voltage decreases linearly, which ultimately reduces the total gain of the set. This is the case for the other two techniques in the first scenario.

As we have seen, the incremental conductance technique decreases with tracking speed with increasing temperature, and this is independent of the amount of work cycle. In a working cycle of 2%, for example, the start time of the track at 25°C is 0.04 seconds, and this value reaches 0.77 and 0.1 seconds at 45°C and 60°C. This has also been the case for other values of the work cycle.

On the other hand, it is clear from the dynamic response that this technique also has many fluctuations around the point of work, which can be cited as one of the disadvantages of an incremental conductance technique, but the simplicity of the execution partly compensates this defect. The amount of fluctuations increases with the increasing working cycle, but the temperature increase increases the number of oscillations.

Comparing the two techniques shows that the response time in the hill-climbing technique is lower, but the incremental conductance technique is faster than the hill technique to the desired work point. The oscillation rate in the observation technique is lower, but as indicated, this technique does not function well at the variable temperature and makes the system unstable. Therefore, in steady-state and variable temperature conditions, if the response speed is considered, the hill-climbing technique is appropriate and if the responding time of the working point is considered, then the incremental conductance technique is appropriate.

4.3 THE SECOND SCENARIO OF VARIED RADIATIONS WITH A CONSTANT TEMPERATURE

As observed, there is no change in the radiation pattern at the start of tracing for the hill-climbing technique, and this is independent of the amount of work cycle. For example, in a working cycle of 2%, the start time of the detection in the radiation is 900 times 0.02 seconds, and this value reaches 0.02 seconds for the radiation of 950 and 1000 W/m^2. This has also been the case for other values of the work cycle.

On the other hand, the dynamic response is clear. This technique has many fluctuations around the point of operation. The amount of fluctuations increases with the increase of the working cycle, but the increase in temperature reduces the number of oscillations slightly.

The performance weakness in high radiation is due to the poor performance of the solar cell set. Because the high radiation influences the p-n bonds in the semiconductors, which ultimately reduces the overall gain of the set.

As seen, the incremental conductance technique does not show a change in radiation at the start of tracing, and this is independent of the amount of work cycle. For example, in a working cycle of

2%, the start time of the tracking in the radiation is 900 times 0.04 seconds, and this value reaches 0.04 seconds for radiation of 950 and 1000 W/m^2. This has also been the case for other values of the work cycle.

On the other hand, the dynamic response is clear. This technique has many fluctuations around the working point. The amount of oscillation increases with increasing work cycle, but the temperature increase significantly reduces the number of oscillations.

5. CONCLUSION

Comparing the two techniques shows that the responding time in the hill-climbing technique is less, but the incremental conductance technique is faster than the desired working point. The amount of oscillation in the observation technique is lower, but the time to reach the optimal point in this technique is very high. Therefore, in variable and steady-state modes, if the time for commencement of accountability is considered, the hill-climbing technique is faster, but if the speed of reaching the work point is considered, then the incremental conductance technique is appropriate.

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ASCENDANCY OF FINANCIAL EDUCATION TO ESCALATE FINANCIAL CAPABILITY OF YOUNG ADULTS: CASE OF PUNJAB, PAKISTAN

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ABSTRACT

This study assesses the impact of financial education on financial capability (literacy) of young adults in Punjab, Pakistan. Combination of objective financial knowledge, financial attitudes and financial behaviors constructed financial capability. Results indicate that business students are more financially capable than non-business students. The result of the study reveals that Master's degree level education in finance has significant positive impact on financial capability as compared with study of finance in other education levels. The financial education index has highly significant positive impact on financial knowledge, financial attitudes and financial capability index. However, financial education does not improve the financial behaviors of young adults. Moreover, the results also revealed that degree in finance has positive association with financial capability.

1. INTRODUCTION

Young adults pass through the phase of financial transformation. They enter from financial dependence to financial independence which requires them to be rational in making personal financial decisions. Youth must be capable enough to plan for ongoing and future expenses. They need to be aware of ongoing financial situations, current financial market trends, and; they need to be strong enough to behave in this demanding financial age. In early adulthood usually, the expenses are more than the financial resources of young adults. Financial education helps youth

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improve their financial knowledge as well as to have positive financial attitudes. In a national survey of United Kingdom, Atkinson et al. (2007) used the term 'financial capability' for the first time. Formal financial education helps in positive financial behaviors Wagner (2015). The goal of financial education is to help improve financial well-being (CFPB, 2015). However, effects of financial education are inconsistent (Alsemgeest, 2015, Potrich et al., 2017). Colleges and Universities are in need of educating their students about financial literacy Boyland and Warren (2013). Little research has addressed financial capability using dimensions of financial knowledge/literacy, financial attitudes, and financial behaviors. This study focuses on the assessment of objective financial knowledge, financial attitudes, and financial behaviors. The sum of these three variables is financial capability index. The association of financial capability with three aspects of financial education (ever studied finance, source of financial education and financial education category) is also addressed in the study. The impact of specific financial education category (Certificate, specialization, and degree in finance) on financial capability is addressed for the first time. Prior to this research study, Wagner (2015) assessed the effects of financial education on financial knowledge and financial behaviors. Later, Xiao and O'Neill (2016) assessed the effects of financial education on financial capability (subjective financial literacy, objective financial knowledge, behaviors) combinations. This study aims to assess the association of financial education with financial capability of the young adults in Pakistan. Moreover, the study investigates the effects of specific categories of financial education (degree, specialization, certificate in finance) and financial education in different degree levels on financial capability.

1.1 SIGNIFICANCE OF THE STUDY

This study is expected to contribute to the financial literacy knowledge in several ways. In terms of theoretical contributions, this study improves the existing literature by addressing two questions. First of all, this study extends beyond previous studies by investigating the major background that is clearly provided for in the understanding of financial literacy of the young adults in Punjab Pakistan. Secondly, the previous studies focus on developing and low-income countries, and fewer in the case of Pakistan. Understanding overall financial capability by young adults could serve as an important contribution to the financial theory of measuring financial capability existing in literature. Past studies (Xiao & O'Neill, 2016; Hilgert et al, 2003) have highlighted that previous literature which confirms that positive behaviors are related to income level more than education level and having financial knowledge. What's more, (Xiao & O'Neill, 2016; Hilgert et al, 2003) have proclaimed that the financial capability can be measured by assessing people's financial knowledge, skills, attitudes, and behaviors. Taking attention, they need to cross over any financial knowledge, financial attitudes, and financial behaviors. The sum of these three variables is financial capability index, this study helps the group of literature by reacting to the call for financial capability research on the young adults in Punjab, Pakistan. In addition, this study can help the noteworthy association of financial capability with three aspects of financial education (ever studied finance, source of financial education and financial education category) is also addressed in the study. The study can additionally give an understanding, comprehension which determinant financial capability using dimensions of financial knowledge/literacy, financial attitudes, and financial behaviors. Thirdly, since this study has been directed in Pakistan, the study broadens the current body of knowledge identified with the model of financial capability.

2. LITERATURE REVIEW

2.1 THE CONCEPT OF FINANCIAL CAPABILITY AND ITS MEASUREMENT

Institutions and researchers have defined financial capability in various ways. Financial literacy and financial capability are used alternatively where more than one dimensions are covered to measure financial literacy. According to World Bank (2013) "Financial capability is the internal capacity to act in one's best financial interest, given socioeconomic and environmental conditions. It encompasses the knowledge (literacy), attitudes, skills, and behavior of consumers with respect to understanding, selection, and use of financial services, and the ability to access financial services that fit their needs." Australian unity (2014) used objective measures to assess financial literacy. Various measures have been developed so far, such as Robb and Woodyard (2011) used subjective measures to assess financial literacy and expressed that subjective measure of financial knowledge has more impact on positive financial behaviors and attitudes. Aren and Aydemir (2014) stated: "it looks as more suitable to use objective measure of financial literacy". These and many other studies e.g. Shambare and Rugimbana (2012), Bashir et al. (2013) and Australian Unity (2014) have assessed financial literacy of students using both, the objective and subjective measures. Fernandes et al. (2014) stated that financial literacy is "the knowledge of basic concepts of personal finance with respect to borrowing/debt and saving/investments that lead to better lifetime financial decision-making". Financial knowledge solely is not sufficient to be considered as financial literacy (Huston, 2010). Many researchers used financial knowledge as synonym of financial literacy (Rooij et al. 2007; 2011; Fernandes et al., 2014; Wagner, 2015; Haque and Zulfiqar, 2016; Rehman et al, 2019).

Oseifuah and Gyekye (2014) assessed financial literacy of commerce students in a University of South Africa and found that the students paying their university dues through bank loans are more financially knowledgeable in comparison to family supported students. The level of education is an important determinant of financial literacy. Less-educated individuals perform poor in managing finances (Fan & Chatterjee, 2018, Fünfgeld and Wang, 2009).

2.2 FINANCIAL EDUCATION AND FINANCIAL CAPABILITY

The Organization for Economic Cooperation and Development (OECD, 2005) defined "Financial Education" as: "The process by which financial consumers/investors improve their understanding of financial products and concepts and, through information, instruction, and/or objective advice, develop the skills and confidence to become more aware of financial risks and opportunities to make informed choices, to know where to go for help, and to take other effective actions to improve their financial well-being." To become financially literate, people need the necessary skills and knowledge of financial products that come through education and behavioral biases and other external factors also. Financial education is the key to bring positive change in the financial behaviors of the youth Xiao et al. (2011). Sherraden et al. (2011) confirmed that financial education improves financial capability (knowledge) and students who receive financial education perform better on financial knowledge as compared to those who did not.

Recently, Xiao and O'Neill (2016) indicated that "Financial education not only increases consumers' knowledge level but also increases confidence in their financial knowledge". In a degree

thesis on financial education and financial literacy Wagner (2015) concluded that formal education is an effective and most appropriate source of learning long-term financial behaviors; highly qualified people do not rely only on financial advice, they have their own way of thinking and view about finances.

The objective of financial education is to help increase the financial well-being of consumers (CFPB, 2015). Loke et, al (2015) examined the impact of My Path Savings, a financial education program for the less privileged youth in the United States. The findings of the study indicated that such programs help the youth improve their financial knowledge as well as financial behaviors and these training programs should be arranged for financial well-being of the youth and nations on the whole. Moreover, Batty et al. (2015) study about the impact of financial education on the financial literacy of elementary students found that students who attain financial education in a classroom setting have more positive attitudes about personal finance and seem more likely to save. Also the findings suggested that "financial learning is associated with improved attitudes and behaviors which, if sustained, may result in increased financial capability later in life".

The course contents and duration of financial education also matters in improving financial capability/literacy of the individuals. Van Campenhout (2015) concluded that financial education programs focus mostly to improve financial knowledge only, new programs should be designed which focus on improving the financial attitudes of the youth. Improved financial attitudes help in taking effective financial decisions and improving financial well-being.

2.3 THE CONCEPTUAL MODEL OF FINANCIAL CAPABILITY AND DEVELOPMENT OF HYPOTHESES

As per the best of our knowledge, there is no standard pattern or theory of measuring financial capability existing in the literature. Xiao and O'Neill (2016) assessed financial capability of the consumers using the sum of their objective financial knowledge, subjective financial knowledge, perceived financial capability, and financial behaviors. World Bank (2013) report says that "Financial capability can be measured by assessing people's financial knowledge, skills, attitudes, and behaviors". Financial education improves financial knowledge and also improves the confidence in knowledge Xiao and O'Neill (2016). This confidence helps individuals to improve financial behaviors.

Based on literature review and above definitions, the study proposes following hypotheses;

H1: Receiving financial education has a positive impact on financial capability.

H2: Financial education from a specific source and combination of financial education sources (H2a) help perform better in financial capability.

H3: Those who have specific financial education category, score higher on financial capability.

3. METHODOLOGY

3.1 A SAMPLE OF THE STUDY

This empirical study investigated randomly selected university students studying in the undergraduate and postgraduate degree levels in Punjab, Pakistan. The data was collected from business and non-business students. The data was collected during April-May 2016. Sample of the study consisted of students enrolled in BS, Master, MS/M Phil and PhD students in Business

Administration and other disciplines. In total 600 printed questionnaires were distributed for data collection. After deleting the incomplete questionnaires, a valid response for analysis comprises 400 individuals' data. The effective response rate used in analysis makes 66% for the survey. The higher response rate for data is because of researchers' personal reference in the universities which helped in filling the questionnaires during lectures. Data collection in-class settings made possible the maximum response from the audience.

There are several justifications for selecting the young adults studying in universities of Punjab, Pakistan:

- Out of 179 Higher Education Commission of Pakistan registered universities in Pakistan, more than 50 are located in Punjab having multiple campuses functional. The literacy rate is highest in Punjab province as compared to other provinces.
- University students are in a phase of entering from financial dependence to financial independence. They have to make financial decisions which define their fortunate future or can bring consequences in the form of poor financial decisions and lower level of financial well-being.
- There is less likeliness in individuals with lower educational levels to answer the financial knowledge questions correctly and more they are likely to say that they "do not know the answer".
- Overall there is less financial literacy research in Pakistan and not existing in the academic sector. Therefore, it was needed to assess financial literacy in the young and particularly university students. Table 1 gives the detail of the sample of the study.

Table 1: Sample Size of the Study

Institution	Postgraduate	Master's	Bachelor degree	Total
BZ University (10%)	10	24	26	60
The University of Punjab Lahore (8.33%)	12	20	18	50
COMSATS University Vehari and Lahore (18.33%)	31	34	45	110
NCBA&E and UVAS Lahore (16.67%)	40	21	39	100
Other Private Universities in Lahore (33.33%)	45	75	80	200
UET Lahore (8.33%)	5	15	30	50
University of Gujrat (5%)	8	7	15	30
Total	151	196	253	600

3.2 VARIABLES OF THE STUDY

Financial capability, the dependent variable of the study was measured as the sum of financial knowledge, financial attitudes, and financial behavior variables. Index of these three variables called financial capability. This combination was used following the definition of the World Bank (2013) report which says that "Financial capability can be measured by assessing people's financial knowledge, skills, attitudes, and behaviors". For this purpose well researched financial knowledge questions of Rooij et al. (2011), were adapted by Potrich et al. (2016) to study the financial literacy of university students in brazil. A total eight financial knowledge questions were selected by researchers. The questions were objective in nature, multiple-choice type and test the knowledge of simple interest calculation, inflation, time value of money, stock market functions, asset risk diversification and evaluation of highest returning asset. The correct answer to each question was awarded 1 score and the 0 was marked to incorrect answer.

Four financial attitudes of the youth were also assessed which Potrich et al. (2016) used in the final analysis of the study. The scale was originally developed by Shockey (2002), which comprises nine

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questions organized as a five-point Likert scale, where1= absolutely disagree and 5= absolutely agree. Four questions are considered in this study.

The third and very important variable of financial capability was financial behaviors. Five financial behaviors were the part of the study, as adapted from Potrich et al. (2016). These questions are the application of financial attitudes. Higher the value of response, positive the financial behavior was considered. Demographic and socio-economic variables make difference in financial capability level of the people. Financial education, the explanatory variable was quantified in two questions. One question asked about the finance course studied during bachelor degree, master, MS/MPhil, PhD and employee provided. The respondents entered the level of their finance study. The next question was asked regarding the category of financial education. The categories of financial education were divided into a certificate in finance, specialization in finance, degree in finance.

3.3 MEASUREMENT OF FINANCIAL CAPABILITY

Sum of Financial knowledge (0-1), financial attitudes (1-5) and financial behaviors (1-5) mean was the financial capability. The financial capability values ranged from 1.01 to 3.54.

3.4 MEASUREMENT OF FINANCIAL EDUCATION AND FINANCIAL EDUCATION INDEX

Binary variables were generated for specific financial education types (1=Yes, 0=No). Similarly, the financial education category was also coded in binary variables (1=Yes, 0=No). One variable was generated for the youth who had ever received financial education or not. Those who had ever studied finance were coded as "1" and "0" for vice versa.

These variables were generated for financial education in bachelor, Master, MS/MPhil, and PhD. To create the financial education index the sum of financial education (0-4) at different educational levels was created. This index was created following the publication of Xiao and O'Neill (2016) and Wagner (2015). These two studies gathered information on financial education in school, college, and the workplace.

4. DATA ANALYSIS

Descriptive analysis was performed to write the frequency and percentage of respondents across groups. Independent sample t-test and one-way analysis of variance (ANOVA) were executed to distinguish the scores of financial knowledge, financial attitudes, financial behaviors and financial capability among groups on the base of personal and family differences. Linear Regression was performed to test the impact of financial education on financial capability of the youth. SPSS. 20 was used for analysis purposes.

To find out inter-item consistency, reliability was tested for the main variables of the study, financial attitude, and financial behavior. Meeting the criteria of Kline (2011) Alphas values, Financial behaviors comprise five items and the value is $\alpha = 0.715$ which is adequate. The financial attitude variable comprises of four items. The reliability of financial attitude and financial behaviors is also valid $\alpha = 0.856$.

5. RESULTS

5.1 DESCRIPTIVE STATISTICS

The analysis was performed on final data of 400 youth studying in Universities of Punjab, Pakistan. Table 1 describes the percentage and the mean financial capability value among groups of youth. The mean of eight questions of financial knowledge was 0.44 which represents that youth in Pakistan has financial knowledge but the level is low. The mean value of the financial attitudes was 4.00. The results revealed that youth in Pakistan has positive financial attitudes. The mean value of financial behaviors was 3.02. The value of financial capability was found by combined average scores of financial knowledge, financial attitudes, and financial behavior scores. After combining the mean values, the obtained value was divided by 3. The mean value of financial capability is 2.49 and it makes about 68% score. The lowest level is 1.01 which is 27% and the maximum value is 3.54, 96%. The range of combined financial capability score was 1.01 up to 3.67. The detail of each category is given in Table 2.

Table 2: Descriptive Statistics

Variable	Mean	Percentage
Financial knowledge (0-1)	0.44	
Financial attitudes (1-5)	4.007	
Financial behaviors (1-5)	3.025	
Financial Capability Index (1.01-3.54)	2.49	
Gender		
Male (1)	2.47	62.3
Female (0)	2.51	37.8
Age Group		
18-24	2.46	64.5
25-32	2.54	29
33-43	2.54	6.5
Marital Status		
Single	2.49	80.8
Married	2.53	18.5
Divorced	2.23	0.8
Annual Family Income		
Less than Rs. 500,000	2.55	42.8
500,000-1000,000	2.45	23.8
1000,000-1500,000	2.43	14.5
1500,000-2000,000	2.44	10.0
More than 2000,000	2.43	9.0
Degree Discipline		
Business Students	2.53	72.3
Others	2.31	27.8
Studied Finance Course During		
Bachelor	2.52	72.3
Master's	2.56	39
Postgraduate	2.61	12.3
Type of Financial Education		
Certificate in Finance (1=Yes, 0=No)	2.38	4.8
Degree in Finance (1=Yes, 0=No)	2.64	10.3
Specialization (1=Yes, 0=No)	2.53	15.0
None	2.46	70.0

5.2 RESULTS OF ONE-WAY ANOVA

The results presented that individuals who have ever received financial education performed better on financial capability measurement than those who never received financial education. They have higher financial knowledge, positive financial attitudes, and financial behaviors. The

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difference in financial capability index was significant for those who had ever received financial education as compared other counterparts. Table 3 explains the financial capability differences and the individual components of financial capability.

Table 3: One-way ANOVA Results for Financial Education Level and Categories

Category of Financial Education	Financial Attitude (1-5)	Financial Knowledge (0-1)	Financial Behavior (1-5)	Financial Capability Index (1.01-3.54)
Finance course in Bachelor Degree				
Yes	4.042	0.459	3.063	2.52
No	3.916	0.406	2.926	2.41
P		0.036*		0.031*
Finance course in Master's Degree				
Yes	4.11	0.492	3.089	2.56
No	3.938	0.411	2.984	2.44
P	0.027*	0.001*		0.008*
Finance course during MS/MPhil				
Yes	4.17	0.5	3.102	2.59
No	3.988	0.438	3.016	2.48
Finance course during PhD				
Yes	4.406	0.64	2.875	2.64
No	3.999	0.44	3.028	2.489
P		0.013*		
Certificate in Finance				
Yes	2.385	0.421	3.063	2.385
No	2.497	0.445	3.023	2.497
Specialization in Finance				
Yes	4.079	0.431	2.996	2.531
No	3.994	0.518	3.03	2.485
P	0.006*			
Degree in Finance				
Yes	4.166	0.503	3.238	2.635
No	3.988	0.437	3	2.475
P				0.025*
Ever received Financial Education				
Yes	4.042	0.459	3.063	2.521
No	3.916	0.406	2.926	2.416
P		0.036*		0.031*

*p-value <0.05

Table 4: Regression Results of Effect of Financial Education on Financial Capability Index and Individual Components

Variables	Financial Knowledge		Financial Attitude		Financial Behavior		Financial Capability Index	
Business students	B	P	B	P	B	P	B	P
Take finance course during Graduation	0.105	0.036*	0.072	0.148	0.069	0.171	0.108	0.031*
Master's Degree	0.168	0.001*	0.111	0.027*	0.057	0.254	0.133	0.008*
MS/MPhil	0.083	0.098	0.071	0.157	0.029	0.564	0.076	0.13
PhD	0.124	0.013*	0.073	0.144	-0.024	0.633	0.048	0.336
Financial Ed. Index	0.170	0.001*	0.117	0.019*	0.063	0.206	0.142	0.005*
Financial Education Category								
Certificate in Finance	-0.023	0.641	-0.097	0.053	0.009	0.852	-0.055	0.275
Specialization in finance	0.138	0.006*	0.039	0.44	-0.013	0.788	0.037	0.457
Degree in finance	0.089	0.077	0.07	0.162	0.081	0.106	0.112	0.025*

Result significant at *<0.05

Table 4 shows regression results indicate that financial education positively contributes to improving the financial knowledge and financial capability of young adults in Pakistan. Business students perform better on financial knowledge (p=0.036) as compared to non-business students.

6. DISCUSSION

Descriptive statistics revealed that females are more financially capable than males. One-way ANOVA results indicated than Business students had more financial capability than non-business students. The maximum financial capability level was in the youth who studied finance courses during a PhD degree. Young adults with degree in finance had maximum financial knowledge, most positive financial attitudes and positive financial behaviors as compared to youth with specialization in finance and certificate in finance.

Regression results for financial education in degree levels were different from ANOVA results. The results of linear regression revealed that studying finance during a Master's degree had a significant positive impact on financial capability index ($p=0.008$). The financial education index revealed significant positive impact on financial capability index ($p=0.005$). Further the regression analysis of financial education categories revealed that degree in finance has significant positive impact on financial capability index ($p=0.025$). This result confirmed the one-way ANOVA results.

Financial education has a positive association with financial capability variables. Financial knowledge and financial education revealed positive association. A higher level of financial education confirmed a higher financial knowledge score, confirming the findings of Nurul and Tabiani (2013), Wagner (2015) and Xiao & O'Neill (2016). Financial education at all educational levels improves the financial attitudes of the youth. This finding was consistent with the findings of Batty et al. (2015). Studying finance in a master's degree and financial education index confirms significant ($p=0.027$, $p=0.019$) positive association in the financial attitudes of the youth.

7. CONCLUSION

This study assessed the impact of financial education on the financial capability of the youth studying in Universities in Punjab, Pakistan. This study financial education was quantified in two questions. In total 400 individuals' data was analyzed and found that financial education improves the financial behaviors of the youth. Contrary to the improvement in financial attitudes and financial knowledge, no strong association was confirmed in this study. The justification for less or negative association can be in previous literature which confirms that positive behaviors are related to income level more than education level and having financial knowledge. This study result for financial education and financial behaviors variable are contrary to the findings of previous research studies (Xiao & O'Neill, 2016; Hilgert et al, 2003; and Robb & Woodyard, 2011). This finding is greatly in line with the hypotheses of the study that receiving financial education has positive impact on financial capability. The impact of financial education is significantly positive on financial capability of the youth and the financial education index also has significant positive impact on financial knowledge, financial attitudes and overall financial capability of the youth. However, the impact of financial education on financial behaviors is not significant in our study. The reason is that behaviors are more related to income level than the knowledge level. The sample of our study was youth in early adulthood, so they scored lesser on financial behaviors because they are in the cycle of life where expenses are higher and income is very limited or they unemployed. All the hypotheses of the study are accepted in regression analysis.

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8. MATERIAL AND DATA AVAILABILITY

Information regarding this study can be requested to the corresponding author.

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ON REALIZATION OF LIMIT POLYGONS IN SEQUENTIAL PROJECTION METHOD

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ABSTRACT

In this article, we study the properties of the algorithm for solving systems of linear equations based on the sequential projections of an initial approximation point on the hyperplanes, defined by the equations of the system (Kaczmarz algorithm). We consider the case of overdetermined systems when the sequence of approximations converges to a limit cycle, the points of which we regard as the vertices of a limit polygon. Although the proof of convergence to the limit polygon is known, we are discussing a simplified version, relating to the case of general position and clarifying the main idea of the proof. The properties of the limit polygon are little studied, but at the same time, they are important for applications. We explain that, with a proper choice of a system of equations, the limit polygon can be any predefined polygon. In other words, there are no restrictions on the type of limit polygon.

1. INTRODUCTION

The sequential projection algorithm for solving systems of linear equations was first described in Kaczmarz's work [6] (paper [6] is a translation of the original Kaczmarz's paper published in 1937). This algorithm has a simple and visual geometric meaning and later it was repeatedly rediscovered. For some mysterious reasons, the algorithm was very rarely mentioned in textbooks and manuals on computational linear algebra, at least until recently, when the algorithm was intensively used in computed tomography problems. At the same time, the algorithm is very popular in the scientific literature and there are a large number of sources devoted to the description of the algorithm, its generalizations and the range of related tasks and applications. In particular, the algorithm and its applications are described in the excellent book [2] and there is also an extensive bibliography. The issues of convergence of the algorithm in the case of arbitrary rectangular systems of linear equations were studied, for example, in [11] for the original version, in [1], [5], [7] for the block version, in [3],

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[11] for versions with relaxation, in [4], [8], [9], [10] for the version with the randomized choice of the hyperplanes sequence. This listing of articles, of course, does not pretend to be complete, and for a more detailed bibliography, we can recommend, as already mentioned, the book [2]. In connection with the universality of the algorithm, the case of overdetermined systems is especially interesting, when the modified algorithm allows finding pseudo-solutions and can be considered as an alternative for pseudo-inversion.

2. METHOD DESCRIPTION

From the geometric point of view, the Kaczmarz algorithm for solving a system of k linear equations with n unknowns can be described as a sequential cyclic projection of an arbitrary initial point on the hyperplanes in $\mathbf{R}^n$, determined by the equations of the system. Here it is necessary to distinguish two cycles: the "internal" cycle of the length k according to all equations of the system and the "external" cycle corresponding to the multiple uses of the internal cycle to achieve required accuracy. The algorithm converges to a solution for consistent systems. In the case of inconsistent systems, the algorithm (without the relaxation multiplier) converges cyclically to some sequence of points on the hyperplanes. Such a sequence can be interpreted as a sequence of polygon vertices in space. We call this polygon the limit polygon (or limit cycle) of the algorithm. Here are two immediate questions related to the concept of a limit polygon: a description of the class of limit polygons (which polygons in space may be limit for the Kaczmarz algorithm); a description of the connection of limit polygons with pseudo-solutions of systems, for example, does a pseudo-solution (or a geometric pseudo-solution, see the definition in [2]) belong to the convex hull of a limit polygon. In this article, we give a simple proof of the known fact that the algorithm converges to a limit polygon and show that there are no restrictions on a limit polygon, that is, any preselected polygon is a limit polygon for some overdetermined system of linear equations. Note that there is a version of the so-called double Kaczmarz algorithm (DART - see [2]), which allows to exclude work with inconsistent systems and find the pseudo-solutions as the only solution to the some modified overdetermined (but already consistent) system of equations. However, the study of the properties of a conventional algorithm in the case of inconsistent systems remains relevant.

3. PROOF OF CONVERGENCE

Let $AX = B$ be a system of k linear equations with n unknowns. Denote by $L_1, L_2, \cdots, L_k$ the hyperplanes in $\mathbf{R}^n$, defined by the equations of the homogeneous system $AX = 0$. Affine hyperplanes $\widetilde{L_1}, \widetilde{L_2}, \cdots \widetilde{L_k}$, determined by the equations of the original system $AX = B$, are derived from hyperplanes $L_1, L_2, \cdots, L_k$ by shifts on normal vectors $n_{\perp i} \perp L_{\perp i}$,

$$\widetilde{L_\iota} = \bar{n}_i + L_i \qquad (1).$$

Let P_i denote the linear projection operator $\mathbf{R}^n \to L_i$, then the affine projection operator $\tilde{P}_i : \mathbf{R}^n \to \widetilde{L_\iota}$ can be written as

$$X \to \tilde{P}_i\,(X) = P_i(X) + \bar{n}_i \in \widetilde{L_\iota} \qquad (2).$$

In these notations, the result of one internal cycle of the algorithm of sequential projections

(without the random choice of the sequence of hyperplanes) can be written as

$$X_s \to X_{s+1} = \tilde{P}_k \circ \tilde{P}_{k-1} \dots \circ \tilde{P}_2 \circ \tilde{P}_1 (X_s) \in \widetilde{L_k} \quad (3),$$

or, taking (2) into account as

$$X_s \to X_{s+1} = [\![P_k(\dots (P]\!]_2 (P_1(X_s) + \bar{n}_1) + \bar{n}_2) \dots) + \bar{n}_k \in \widetilde{L_k} \quad (4).$$

Thus, the final formula for the result of one internal cycle is

$$X_s \to X_{s+1} = P_k \circ P_{k-1} \dots \circ P_2 \circ P_1 (X_s) + N \in \widetilde{L_k} \quad (5).$$

where N is a "universal" vector dependent only on the sequence $P_1 \dots P_k$ and $\bar{n}_1 \dots \bar{n}_k$ i.e. does not depend on X_s). Denote the composition $P_k \circ P_{k-1} \dots \circ P_2 \circ P_1$ by P, then formula (5) can be written as

$$X_s \to X_{s+1} = P(X_s) + N \quad (6).$$

The iterations of the internal cycle, i.e. "external" cycle, are described by the formulas

$$X_0 \to P(X_0) + \bar{N} = X_1 \to P(P\big((X_0) + N\big) + N = X_2 \to \square \quad (7),$$

where

$$X_0 - \forall,$$

$$X_1 = P(X_0) + N \in \widetilde{L_k}$$

$$X_2 = P^2(X_0) + P(N) + N \in \widetilde{L_k}$$

$$X_{s+1} = P^{s+1}(X_0) + P^s(N) + \cdots P(N) + N \in \widetilde{L_k}$$

$$\dots$$

Note that the norm $\|P\| < 1$ if the subspaces $L_1, L_2, \cdots, L_k$ have no common vectors, except for $\square$ (and this is the general position case). Indeed, the projection operator P_i is fixed on L_i and reduces the lengths of all other vectors. Therefore, the condition $|P(X)| = |X|$ means that $X \in L_i$ for all i but it is forbidden by condition. Thus, $\|P(X)\| \le q|X|$ for some $q \in (0;1)$ and hence the first term in $X_{s+1} = P^{s+1}(X_0) + P^s(N) + \cdots P(N) + N \in \widetilde{L_k}$ goes to zero when $s \to \infty$. The rest is estimated as $\|P^s(N) + \cdots P(N) + N\| \le \|P^s(N)\| + \cdots + \|P(N)\| + \|N\| \le |N|(q^s + \cdots + q + 1)$, and therefore converges. We proved that the Kaczmarz algorithm converges for any starting point X_0, while the limit point depends on the numbering of the equations and belongs to the affine hyperplane $\widetilde{L_k}$, which is determined by the last equation of the system. The result also implies that every sequence $X_{i+s} \in \widetilde{L_i}$ for every fixed $i = 1,2, \dots, k$ converges to a point on the affine hyperplane $\widetilde{L_i}$. Therefore, for overdetermined systems the sequence of approximations in the algorithm converges to a limit cycle, the points of which we regard as the vertices of a limit polygon.

Let us also explain the convergence of the Kaczmarz algorithm in the case when the system is consistent and has a unique solution. First of all, note that the affine shift does not affect the geometry of the Kaczmarz algorithm. This observation makes the proof of convergence almost obvious. Let X_{sol} be the unique solution. We consider a new system, obtained from the initial one by a shift on the vector X_{sol}. Then the initial system $AX = B$ with the unique solution X_{sol} turns

into the system $AX = 0$ with the unique solution at point 0. In this case, $L_i = \tilde{L}_i$ and $\bar{n}_i = 0\ \forall i$, therefore, $N = 0$. The formula for iterations is reduced to $X \to P(X)$, where $\|P\| < 1$, which implies the convergence.

4. PREDEFINED LIMIT POLYGONS

The following construction shows that in the space of any dimension there are no restrictions on the type of a limit polygon: any given polygon is realized as a limit for some overdetermined system of linear equations. Let $M_1, M_2, \dots, M_k$ be an ordered set of points in the space $\mathbf{R}^n$, $k > n$ the first equation of the system is the equation of the hyperplane passing through the point M_1 perpendicular to the vector $\overline{M_k M_1} = N_1$. The second equation of the system is the equation of the hyperplane passing through the point M_2 perpendicular to the vector $\overline{M_1 M_2} = N_2$ and so on; the last equation of the system is the equation of the hyperplane passing through the point M_k perpendicular to the vector $\overline{M_{k-1} M_k} = N_k$. It is clear that the polygon $M_1, M_2, \dots, M_k$ will be the cycle of the algorithm for the initial point $X_0 = M_k$, and since it was proved above that the limit cycle is unique, this polygon will be the limit cycle of the algorithm for the constructed system.

5. CONCLUSION

The sequential projection algorithm is an efficient iterative algorithm for solving systems of linear equations. This algorithm is distinguished by its universality in terms of the type of system and, if properly interpreted, it can be used for many systems, including overdetermined and inconsistent. In the last case an important task is the study the properties of the limit polygons. In this article, we showed that any predefined polygon is a limit polygon for some overdetermined system of equations.

6. MATERIAL AND DATA AVAILABILITY

Information regarding this study is available from the corresponding author.

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THE MEDIATING ROLE OF ACCOUNTING INFORMATION QUALITY ON THE RELATIONSHIP BETWEEN COMPARABILITY OF FINANCIAL STATEMENTS AND CASH HOLDINGS: EVIDENCE FROM SELECTED IRANIAN COMPANIES

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ABSTRACT

This study investigates the mediating effect of accounting information quality on the Relationship between Financial statement comparability and cash holdings. Hence, in this paper, data from 90 non-financial firms listed on Tehran Stock Exchange (TSE) between 2013 and 2017 (450 firm-year) were evaluated by using linear regression models with panel data analysis. To test the significance of the mediating effect, the Sobel test is used. The results of the research show that financial statement comparability decreases poor accounting information, Also the results indicate that poor accounting information increases cash holdings. Moreover, by adding accounting information quality (mediating variable) to the model, there is also a significant relationship between Financial statement comparability and cash holdings which implies comparability enhances accounting information quality that indirectly and significantly decreases cash holdings. Thus the author finds a partial mediation effect of accounting information quality on mentioned relationship.

1. INTRODUCTION

One of the main duties of corporate financial managers is to manage the firm's cash. Firms determine their cash management strategies on the basis of two goals: to provide cash for the company's payments and to minimize the funds remaining in the company stagnant. The second goal reflects this thinking that if no asset items are used properly, there will be no returns for the company. Unfortunately, these two goals may contradict each other. One theory of corporate cash management

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is pecking order theory, which, in contrast to the trade-off theory, contends that the most worry of managers is not to determine the optimal level of cash; Instead, they focus more on how to fund investment projects and for investment, use available cash in the company, retained earnings, debt, and equity, respectively. According to this theory, managers will save the company's cash assets to use for investments. Another theory relates to agency theory that managers with high cash assets have a greater incentive to use these assets for their own interests and do not pay attention to optimal levels of cash and appropriate investments (Khajavi et al., 2012).

Mehrvarz and Marfou (2016) state that the information of a reporter entity will be more useful when compared with similar information from other entities and with similar information of the same entity for other periods. Comparability is one of the main quality features associated with providing information that adds to the usefulness of the information.

According to FASB Statement No. 8 (FASB., 1980) and the IASB Financial Reporting Framework, the ability to compare, validate, timely and comprehensible are qualitative features that highlight the handiness of the information that is pertinent and truly allocated. the ability to compare, which enables the investors to recognize and get similitudes and contrasts, decreases the expense of getting information and processing them, And by that way enhances the general amount of quantity and quality of companies' information (De Franco et al., 2011) and leads to the allocation of capital efficiency (Chen et al., 2013). Other advantages of comparability include: increasing the quality of available information and, consequently, increasing the coverage of analysts and their predictive accuracy and reducing their predictive dispersion (Horton et al., 2013; Lang et al., 2010). Increasing liquidity and volume of stock trades and reflecting more specific company's information on the returns of the current period (Barth et al., 2013) and reducing the benefits of using confidential information (Brochet et al., 2012). In the concept statement No. 8 of the Financial Accounting Standards Board, the importance of financial statement comparability has been highlighted that among the most basic reasons for the need for financial reporting standards is increasing the ability to compare the reported financial information, and in the theoretical concepts of financial reporting of Iran (Accounting Standards Committee., 2010), It has been argued that if information is relevant and reliable, its usefulness will be restricted if it is not comparable and incomprehensible.

On the other hand, the quality of accruals is considered as a substitute for the quality of accounting information, as it provides information about the expected cash flow to investors' knowledge and can be a criterion for optimal cash management (García-Teruel et al., 2009). Due to the effect of accounting information quality on the companies' interest in holding cash, firms with low (high) quality of accounting information tend to hold more (less) cash. Since opaque reporting accentuates information asymmetry, thereby making external financing costly (Sun et al., 2011). In terms of comparability of financial statements, Peterson et al. (2015) show that by increasing the comparability of financial statements, the incentives for earning management are reduced. In general, the better quality of accrual accounting information is, the better prediction of future corporate cash flow is easier, and this prediction is more easily done, and in this situation, it seems that companies are more easily financed and are not obliged to hold additional cash in the company. On the other hand, managers of Iranian companies may hold more cash due to more caution, regardless of the quality or weakness of the quality of accounting information.

Since the Similarity level of financial statements decreases the expense of acquiring information and, expanding the information quality, and consequently reduces unreliability information through the access of investors to low-cost information, it is expected that this diminishing in unreliability information, subsequently decrease cash holdings by lessening restrictions of financing and information asymmetry issues.

What is less obvious from the existing studies is the mediating role of accounting information quality in the relationship between financial statement comparability and cash holdings. To handle this problem, the current study was designed to answer this problem.

This study develops the existing literature in various significant ways. To start with, as far as we could possibly know, it is the first study that examines the accounting information quality as a potential mediating variable between the similarity level of financial statements and cash holdings. Second, it features the problem of accounting information quality and the comparability of financial statements in Tehran Stock Exchange (TSE) firms. In this manner, this paper can give more experience in solving agency problems and information asymmetry in TSE firms.

2. LITERATURE REVIEW AND BACKGROUND OF THE STUDY

Mita et al. (2018) utilized 18 nations data of Europe, Asia, Africa, and Australia in a period from 2003-2012, found that "the level of IFRS adoption positively affects the comparability of financial statements. The degree of compliance with IFRS obliquely expands the ownership of cross-border investors via the comparability of financial statements". Their findings were in accordance with defenders for compliance with IFRS which contended that "compliance with IFRS enhances the financial statements comparability, thus improves the attraction of foreign investors' ownership". Parsa and Sarraf (2018) used 81 firms data in 2010-2017 in TSE listed companies and demonstrated that comparability of financial statements significantly reduced expected crash in stock prices. Habib et al. (2017) examined a sample of 58828 firm-year in the US during 1981-2013. They stated that "there is a significant and negative relationship between financial statement comparability and cash holdings". Also, they examined whether corporate governance, financial reporting quality, and financing constraints play a mediating role in this relationship or not. Their findings confirmed the correctness of this issue. Kia and Garayeli (2017) used a sample of 85 companies listed in TSE during 2012-2016 and Multivariate Regression Model based on panel data, showed that "the comparability of accounting information reduces accrual-based earnings management, while increases real earnings management". That's mean, with the expansion in the comparability of financial statement, managers replace real earnings management with accruals earnings management. Hajiha and Chenari (2017), with 400 firm-year data in TSE listed companies during 2012-2016, uncovered that "financial statements comparability significantly increases the real earnings management". That means, with expanding the comparability, managers' propensity to real earnings management would be expanded to manipulating real activities. Hosseini (2016), using 111 active firms in TSE during 2010-2014 indicated that the score of disclosure quality, timeliness and reliability affected the stock price delay. also, the mentioned effects were confirmed in the firms with a high risk of lack of funds. Fakhari and Taghavi (2010), by using 150 non-financial firms listed in TSE in period 2001-2007 (1050 observation) showed that "cash holdings are negatively affected by financial reporting quality. These

*Corresponding author (Saeed Shahriyari). E-mail: shahriyari@kar.ac.ir Volume 10 No.15 ISSN 2228-9860 eISSN 1906-9642 CODEN: ITJEA8 Paper ID:10A15H http://TUENGR.COM/V10A/10A15H.pdf DOI: 10.14456/ITJEMAST.2019.202

findings suggested firms with good accrual quality hold lower cash levels than firms with poor accrual quality". García et al. (2009), using panel data for firms listed in the Spanish Stock Exchange over the period 1995-2001, showed that firms with good accruals quality hold lower cash levels than firms with low quality of accruals. They suggested that the quality of accounting information may reduce the negative effects of information asymmetries and adverse selection costs, allowing firms to reduce their level of cash holdings.

3. METHODOLOGY

3.1 RESEARCH METHODOLOGY

Considering that the results of this research can be used by investors, shareholders, corporate executives and other users of financial statements, this research can be considered as applied research. Also, in terms of the data-analysis method is cross-sectional descriptive-correlational study.

Accordingly, after data collection, to investigate the relationship between variables and test the hypothesis of research, first in each stage, multivariate regression models based on panel data, the necessary tests have been done and in the final stage to test the research hypothesis, using the estimated coefficients of the previous models, through the Sobel test, the significance of the role of the mediating variable has been investigated. As indicated by Baron and Kenny (1986), testing for mediating impact should be possible after three stages:

1) **Stage 1:** Check out that the explanatory variable is associated with the explained variable.
2) **Stage 2:** Check out that the explanatory variable is associated with the mediator. This stage basically includes the mediator as though it were an explained variable.
3) **Stage 3:** Check out that the mediator influences the explained variable. It isn't adequate just to associate the mediator with the explained variable, in light of the fact that the mediator and explained variable might be connected because they are both occurred by the explanatory variable. Therefore, the explanatory variable should be controlled in setting up the impact of the mediator on the explained variable.

Baron and Kenny (1986) called attention to three options. To start with, if the impact of the explanatory variable on the explained variable winds up insignificant within the sight of the mediator, the impacts of the explanatory variables are totally interceded by the mediator. Second, if the impact of the explanatory variables stays significant within the sight of the mediator, the impacts of the explanatory variable are partially mediated. At long last, if none of the above conditions are met, the mediation effect will not be approved.

Sobel test cannot be directly calculated and to obtain it, the regression coefficients are calculated from online sites. In this research, the site http://quantpsy.org/sobel/sobel.htm is used.

3.2 RESEARCH POPULATION AND STATISTICAL SAMPLE

The statistical population of this research includes all companies accepted in Tehran Stock Exchange from 2013 to 2017 excluding financial firms. Also, in order to calculate the Financial statement comparability, it was required to have data for the last six semesters (3 years ago) of it, Therefore, the required data for sample companies should be available for the 8 year period (years 2010-2017). The sampling method was performed using a systematic elimination method (screening). Common features of the firms to determine the population are as follow:

- The company is listed on TSE from the beginning of 2010 till the end of 2017. in order to enhance the comparability and homogeneity of companies, The fiscal periods of companies should be finished at the end of the solar year
- The company should be continuously active during the research period and its shares have been traded, and there is no trading halt.
- The type of company activity should be productive not be subsidiaries of banks, financial institutions such as investment firms, financial mediating, holding corporations, and leasing agencies. Because of their nature of management, activity, and financial reporting are different.

Accordingly, the sample selection includes 90 firms and 450 firm-years.

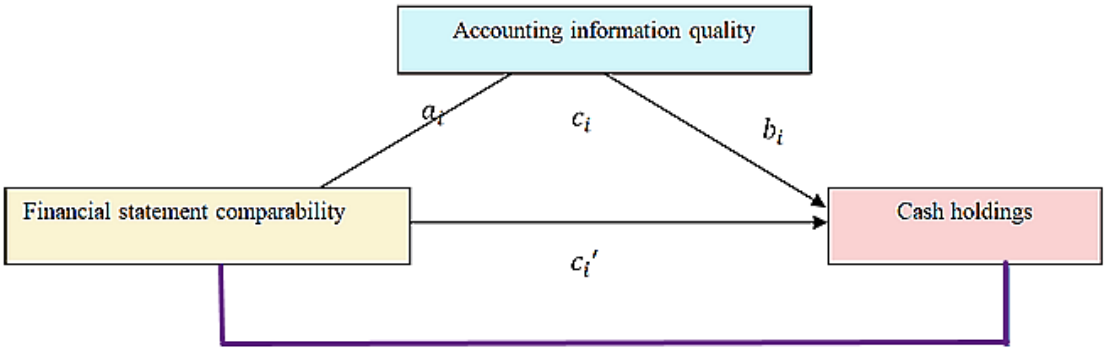

Figure 1: A research framework.

3.3 RESEARCH MODELS

In testing the mediation effect of accounting information quality on the relationship between financial statement comparability and cash holdings we use the Sobel test. Therefore the following steps must be met:

1) Test the direct impact of the explanatory variable (Financial statement comparability) on the explained variable (cash holdings). as appeared in Figure 1, examine track (c_i), Regarding Model 1.
2) The explanatory variable (Financial statement comparability) affects the mediator variable (accounting information quality). As appeared in Figure 1, examine track (a_i), Regarding Model 2.
3) The mediator (accounting information quality) affects the explained variable (cash holdings) controlling the impacts of the explanatory variable. As appeared in Figure 1, examine track (b_i), Regarding Model
4) Investigate the impact of the explanatory variable (Financial statement comparability) on the explained variable (cash holdings) by controlling for the impacts of the mediator. As appeared in Figure 1, examine track (c_i'), Regarding Model 3.

The regression models are given as

$$CASH_{i,t} = \beta_0 + \beta_1 COM_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 MB_{i,t} + \beta_4 LEV_{i,t} + \beta_5 R\&D_{i,t} + \beta_6 DIV_{i,t} + \beta_7 NWC_{i,t} + \beta_8 CFO_{i,t} + \varepsilon_{i,t} \quad (1),$$

$$DAC_{i,t} = \beta_0 + \beta_1 COM_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 MB_{i,t} + \beta_4 LEV_{i,t} + \beta_5 R\&D_{i,t} + \beta_6 DIV_{i,t} + \beta_7 NWC_{i,t} + \beta_8 CFO_{i,t} + \varepsilon_{i,t} \quad (2),$$

$$CASH_{i,t} = \beta_0 + \beta_1 DAC_{i,t} + \beta_2 COM_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 MB_{i,t} + \beta_5 LEV_{i,t} + \beta_6 R\&D_{i,t} + \beta_7 DIV_{i,t} + \beta_8 NWC_{i,t} + \beta_9 CFO_{i,t} + \varepsilon_{i,t} \quad (3),$$

where $CASH_{i,t}$ denotes cash holdings, $COM_{i,t}$ represents financial statement comparability, $DAC_{i,t}$ is the accounting information quality proxied by discretionary accruals model, $SIZE_{i,t}$ denotes the size of firms, $MB_{i,t}$ denotes growth firms, $LEV_{i,t}$ denotes the leverage of firms, $R\&D_{i,t}$ denotes Research and development expenditures of firms, $DIV_{i,t}$ denotes cash dividends, $NWC_{i,t}$ denotes

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Net working capital, $CFO_{i,t}$ is defined as operating cash flows and $\varepsilon_{i,t}$ is the error term of firm *i* in year *t*.

4. RESULT

4.1 DESCRIPTIVE STATISTICS

To evaluate the data, the descriptive statistics including minimum, maximum, mean, median, standard deviation, Skewness, and Kurtosis are calculated and presented in Table 1 below:

Table 1: Descriptive Statistics for Major Variables.

	CASH	COM	DAC	SIZE	R&D	NWC	MB	LEV	CFO	DIV
Average	0.038	-0.814	0.005	14.057	1.176	0.122	2.596	0.616	0.134	0.788
Median	0.025	-0.709	0.035	13.9	0.000	0.142	2.274	0.633	0.122	1.000
Maximum	0.46	-0.003	2.732	18.427	10.630	1.057	33.21	0.996	0.823	1.000
Minimum	0.000	-2.629	-2.930	10.616	0.000	-1.228	-32.953	0.012	-0.283	0.000
SD.	0.043	0.603	0.991	1.415	2.653	0.288	4.261	0.196	0.142	0.408
Skewness	3.307	-0.826	0.059	0.471	1.929	-0.427	-0.221	-0.351	0.624	-1.415
Kurtosis	23.632	3.020	3.070	3.34	5.058	4.382	40.352	2.882	4.821	3.004
Observations	450	450	450	450	450	450	450	450	450	450

Table 2: Correlation matrix (Pearson values)

Variables	COM	DAC	SIZE	RD	NWC	MB	LEV	DIV	CFO	VIF
COM	1.000 -----									1.138
DAC	-0.0102 (0.828)	1.000 -----								3.245
SIZE	0.098 (0.036)	0.036 (0.445)	1.000 -----							1.188
RD	-0.120 (0.010)	0.015 (0.742)	0.057 (0.220)	1.000 -----						1.022
NWC	0.338 (0.000)	0.0677 (0.151)	-0.016 (0.734)	-0.059 (0.206)	1.000 -----					1.716
MB	0.121 (0.010)	-0.045 (0.332)	0.133 (0.004)	0.045 (0.339)	0.037 (0.425)	1.000 -----				1.041
LEV	-0.450 (0.000)	-0.013 (0.771)	-0.186 (0.000)	0.146 (0.001)	-0.602 (0.000)	-0.086 (0.066)	1.000 -----			1.944
DIV	0.357 (0.000)	0.012 (0.787)	0.198 (0.000)	-0.059 (0.206)	0.309 (0.000)	0.061 (0.195)	-0.441 (0.000)	1.000 -----		1.137
CFO	0.189 (0.000)	-0.608 (0.000)	0.285 (0.000)	-0.088 (0.061)	0.114 (0.015)	0.085 (0.069)	-0.315 (0.000)	0.270 (0.000)	1.000 -----	3.473

Note: the significant at the level of 5 percent. The values in brackets represent p-value significance level.

4.2 MULTICOLLINEARITY OF VARIABLES

We utilize two tests to check the multicollinearity between the independent variables. In the principal test, a Pearson correlation matrix is evaluated. Multicollinearity alludes to a condition in which at least two explanatory variables are very associated with each other. Based on Kervin (1992), when the Pearson correlation coefficient surpasses 0.7, there is multicollinearity. Based on Table 2, the correlation coefficients are poor, proposing that there is no significant issue of multicollinearity among explanatory variables.

To additionally test whether the independent variables are associated with each other, we determined the variance inflation factor (VIF). Studenmund (2006) shows that the basic point is 10 and more of this amount represents a high degree of multicollinearity. As featured in Table 2, the VIF for independent variables is poor. This demonstrates the independent variables are not significantly related to one another.

4.3 ASSUMPTIONS OF THE CLASSICAL LINEAR REGRESSION TEST

One of the hypotheses of the Classical linear Regression (CLR) is that residuals of the estimated model have the same variance. This is known as homoscedasticity. When this assumption is not confirmed, we have heteroscedasticity. In this study Bartlett's test is used to detect heteroscedasticity. According to Table 3, Results in all three models indicate that the Null hypothesis based on homoscedasticity is accepted. Additionally for checking autocorrelation and independence of the residuals, the Durbin-Watson test is used. As indicated by Table 3, in all models the Durbin-Watson statistic is between 1.5 and 2.5 and therefore the data is not autocorrelated. Multicollinearity of Variables checked out in Table 2.

Table 3. Assumptions of the classical regression test

Classical assumptions / Regression Models	Homoscedasticity test	Autocorrelation test
Regression Model 1	2.702 (0.439)	2.07
Regression Model 2	6.317 (0.097)	1.97
Regression Model 3	2.827 (0.419)	2.07

Note: The Table denotes the significant at the level of 5 percent. The values in brackets represent the p-value significance level.

4.3.1 Determination the type of model's estimation

In this research, all models are assessed utilizing panel data regression.

According to the results of Table 4, it can be concluded that since the probability value of the F-Limer test is less than 0.05 for all models, the preference of the pooled method is rejected, while the panel data method is accepted. Table 5 gives the Hausman test result.

Table 4: F-Limer Test.

Model	Null hypothesis	F-limer test
Model 1	Preferred pooled	3.802 (<0.001)
Model 2	Preferred pooled	12.968 (<0.001)
Model 3	Preferred pooled	3.729 (<0.001)

Table 5: Hausman Test.

Model	Null hypothesis	Hausman test
Model 1	Preferred Random Effects Model	17.12 (0.028)
Model 2	Preferred Random Effects Model	1145.7 (<0.001)
Model 3	Preferred Random Effects Model	18.937 (0.025)

4.4 THE REGRESSIONS RESULTS OF THE RESEARCH

After performing various statistical tests and identifying its results, the findings of the hypotheses of this research are shown in Table 6. It is necessary to test the significance of the model before

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variables examination, approval or rejection of the hypothesis. This can be done by calculating the F statistic and p-value of this statistic. Since p-value calculated for this statistic is less than 0.05, the significance of all models can be confirmed at a five-percent error level. According to the result, the high value of R-squared shows all our models will fit better data.

Table 6: The Regression results of the research.

Variables	Model 1 (Cash)	Model 2 (DAC)	Model 3 (Cash)
COM	-0.002*** (0.006)	-0.113*** (<0.001)	-0.002*** (<0.001)
DAC			0.001*** (0.004)
SIZE	-0.004 (0.849)	0.006 (0.8688)	-0.004 (<0.001)
R&D	<0.0011 (<0.001)	-0.002 (0.456)	<0.0018 (0.897)
NWC	0.043 (0.552)	1.333 (<0.001)	0.039 (<0.001)
MB	-<0.0011 (<0.001)	0.007 (0.017)	-<0.0011 (0.495)
LEV	0.033 (0.012)	-0.782 (<0.001)	0.032 (<0.001)
DIV	-0.003 (<0.001)	-0.481 (<0.001)	-0.002 (0.026)
CFO	0.052 (<0.001)	-9.700 (<0.001)	0.069 (<0.001)
R-squared	0.74	0.98	0.73
Adjusted R-squared	0.67	0.97	0.65
Prob(F-statistic)	<0.001	<0.001	<0.001
Sobel test			-2.721
P-value of Sobel t			0.006

Note: the significant at the level of 5 percent. The values in brackets represent the p-value significance level. The models are estimated with firm-year fixed effects.

5. DISCUSSION

The present study tried to give a few responses to the questions concerning the mediating role of accounting information quality on the Relationship between Financial statement comparability and cash holdings. Thus this research used panel data from 90 TSE listed companies during 2013-2017 (450 observations), and the result is consistent with previous studies (Habib et al., 2017; Kia and Safari garayeli., 2017; Peterson et al., 2015; Bhattacharya et al., 2013; Ebrahimi et al., 2015; Fakhari and Taghavi., 2010; García-Teruel et al., 2009). Our empirical results reveal that low-level of accounting information increases cash holdings. The higher accounting information quality, the lower the cash holding. The results also show that accounting information quality mediates the effects of financial statement comparability on cash holdings.

In this research, the accruals quality criterion has been used as an accounting information proxy. Other studies can extend the current research to other features of earning quality such as sustainability, predictability, timeliness, and relevancy. Also, Since De Franco et al. (2011) model is based on the returns and earnings; there are some limitations to this model. Zalaghi et al. (2017) claim that the suggested model of De Franco et al. (2011) cannot properly reflect the ability to compare, and when companies have a different capital cost, the model shows fewer comparisons. Therefore, it is

suggested that financial statement comparability be calculated based on newer models, such as Cascino and Gassen (2015) and Zalaghi et al. (2017), and its relationship with cash holdings be tested again. On the other hand, since larger companies are more capable of comparing their performance due to the better performance of the accounting system in reflecting economic events (in the form of financial statements) than on smaller companies, Therefore, it is suggested that the subject of this research be considered separately in small, medium and large companies.

Model (1) in the research tests the effect of financial statement comparability on cash holdings. The results are reported in Table 6 (Column 2). According to the results obtained from the estimated first regression model, the level of possibility of financial statement comparability is less than 5 percent and has a negative effect on cash holding. Thus the H0, namely the insignificance of the obtained coefficient is rejected and H1 is accepted and the obtained coefficient is significant, statistically. The results of this hypothesis showed a negative and significant connection between financial statement comparability and cash holdings. Regarding the control variables of this model, it can be mentioned that the variables of R&D, LEV and CFO are positively connected with cash holding; while DIV and MB are negatively connected with cash holding.

Model (2) in the research tests the effect of financial statement comparability on accounting information quality. The results are reported in Table 6 (Column 3). According to the results obtained from the estimated second regression model, the coefficient for COM is negative and statistically significant. Implying that financial statement comparability decreases low-level of financial reporting. Thus the H0, namely the insignificance of the obtained coefficient is rejected and H1 is accepted and the obtained coefficient is significant, statistically. The results of this hypothesis showed a negative and significant connection between financial statement comparability and low quality of accounting information. Regarding the control variables of this model, it can be mentioned that the variables of NWC and MB are positively connected with low quality of accounting information; while CFO, DIV and LEV, are negatively connected with low quality of accounting information.

Model (3) in the research tests the mediating effect of accounting information quality on the relationship between financial statement comparability and cash holdings. The results are reported in Table 6 (Column 4). According to the results obtained from the estimated third regression model, the level of possibility of DAC on cash holdings (by controlling the effects of the financial statement comparability) is less than 5 percent and is positive and statistically significant, implying that low-level of accounting information increases cash holdings. Also, the level of possibility of financial statement comparability on cash holdings by controlling for the effects of accounting information quality is again less than 5 percent and has a negative effect on cash holding, which means comparability improves accounting information quality that indirectly reduces cash holdings. Thus the H0, namely the insignificance of the obtained coefficient is rejected and H1 is accepted and the obtained coefficient is significant, statistically. Regarding the control variables of this model, it can be mentioned that the variables of R&D, LEV, and CFO are positively connected with cash holding; while DIV, NWC and Size are negatively connected with cash holding.

The Sobel test for the indirect effects as shown in Table 6 demonstrates that the impacts of financial statement comparability and cash holdings through their indirect effects via accounting

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information quality are significant. Accordingly, our findings demonstrate a partial mediation effect of accounting information quality on the mentioned relationship. These results are in accordance with Baron and Kenny's (1986) findings.

6. CONCLUSION

The results of this study have important implications. First, the factors that improve the quality of accounting information and the ability to compare financial instruments are essential, including providing solutions for the rapid, effective and efficient transmission of information reporting and comparability, such as providing information through the company's website that can be identified for the general public (charts, tables, etc.). Second, regarding the role of financial statement comparability and accounting information quality, in reducing issues such as information asymmetry and agency conflicts, and hence reducing cash holdings, it is recommended that the standard-makers determine strategies for applying these two criteria and thereby help the accounting information providers to provide the best information. Third, The results of this study will increase investors' and other users' awareness of cash holdings, so they are advised to focus more on the financial statement comparability and accounting information quality. Because comparability is an important qualitative feature of financial information that enables users to identify similarities and differences in the financial performance of companies. In addition it is recommended that directors and officials of the Tehran Stock Exchange be required to reduce the conflict of interests by requiring institutions to accurately audit and validate financial reports and check the criteria for financial statement comparability.

7. DATA AND MATERIAL AVAILABILITY

Information regarding this study can be requested to the corresponding author.

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ROLE OF OCCUPATIONAL STRESSORS AMONG IRANIAN DOCTORS AT HOSPITALS IN TEHRAN PROVINCE, IRAN

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ABSTRACT

The present investigation was planned to examine the imperative role of occupational stressors on doctors who are working at hospitals in Tehran, Iran. Stress assumed as body respond which has been changed based on situation and various opportunities. In truth, this inner feeling is influenced by different factors such as family factors and social factors. Furthermore, recognizing the operative factors that have considerable contribution to the level of stress among doctors is super significant, and lack of deliberation to this inner feeling leads to quite a lot of abnormal organizational behaviours at workplace. Thus, this research focused on the important role occupational stressors that lead to stress of doctors at hospitals. A cross-sectional examination design was used with purposive selected sample that taken from doctors (N=780) in Tehran hospitals, Iran. In the current study, the participants completed the ASEAN job stressors questionnaire which explained some specific factors that related on feeling of individuals and motivate the amount of their stress. It is concluded amongst occupational stressors: physical environment, work volume, poor pay, lack of appreciation, lack of support, opportunities, promotion, patient expectation, and deadline have meaningful association with the stress of doctors that analysed by Multivariate logistic regression.

1. INTRODUCTION

Nowadays there are many factors that lead to stress and change the level of performance and presentation of staff at a workplace; in fact, the stress defined as body reaction based on situation that individuals illustrate it in their private or social life, differently (Bryce, 2001). In some cases, the staff cannot cope with various types of stressors in work environment; furthermore, they show some

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uncommon or abnormal organizational behaviour or reaction that as not convenient at workplace, not at all. On the whole, they try to disappear at work and social communication; gradually, has been decreased the amount of their output and activities. Incidentally, the present investigation focused on stressors predictors among Iranian doctors in different hospitals in Tehran province. In fact, this research examines the effective factors that influence on stress of doctors that related to their job. In other words, try to find imperative factors on stress at workplace. Overall, should be careful that the occupational stressors are not only the consequence of work condition; as well, they could be appearing based on properties of staff. In effect, considering stress at workplace determined as a real difficulty, also for staff which should be recognized well by managers, leaders (if they have), and organization or workplace. There are various factors such as physiological, emotional, cognitive, and behavioral reactions that related to stress specifically job stress, which assumed as work content, work organization, and works environment. Furthermore, should be organized some effective strategies that conduct these types of stress at workplace via managers or leaders. Recently, industrialized countries endeavor to cope with these kinds of stresses and manage them, correctly (WHO, 2007).

Not only nurses in Iran get job burnout (Noroozi and Gandomfeshan, 2019), the important role of stress amongst doctors, precisely Iranian doctors in Tehran hospitals is still not adequate. In this regard, the researchers of this investigation try to emphasis more on imperative factors that influence on doctors feeling and performance during of working hours, in addition, motivate the amount of their stress. Moreover, the existing stduy examined the important and critical role of occupational stressors that associate with stress amongst Iranian doctors who are working in hospitals in Tehran province, Iran.

1.1 RECOGNIZING STRESS AND ITS VITAL ROLE AMONG INDIVIDUALS

The word of stress has been derived from the ancient Latin language. In other words, stress means force, pressure, or stain. In point of fact, this internal factor defined as a natural and anticipated feature of experience at work and likewise at life (Kendall, Murphy, Neill, & Bursnall, 2001). In addition, numerous investigators explained that stress assumed as an absence inner peace and, in some cases, determined as loss of control (Lazarus & Folkman, 1984). In the same way, according to Rcgp (2005) reported stress likewise defined as an emotional, cognitive, behavioural, and psychological reaction to various aspects of work, workplace, and organization. According to the principle role of stress among individuals, definitely staff at workplace that lead to some difficulties in work environment; in continue, focused more on vital occupational factors that appeared as abnormal organizational behaviour and reaction at work among staff. In trust, occupational stress determined as incapability between individuals and their workplace (Caulfild, Chang, Dollard, & Elshaug, 2004).

Factually, stress reactions may the consequence of when individuals are exposed to risk factors in the work environment. These reactions appear based on expressive, behaviour, intellectual, and physiological factors in nature. With continuing stress in long period, an individual's life can be observed some uncommon health problems such as chronic fatigue, musculoskeletal problems, and some comparable items, which should be monitored by staff, manager, and social situation that play considerable role in appearing individuals stress. There are different types of factors at workplace

which lead to occupational stress; by the way, La Dau (2004) explained five main groups that included 1) career development, 2) role of the individual, 3) job test or assignment, 4) working environment, and 5) shift work. Besides these factors, individual and organizational characteristics have great contribution to stress specifically job stress. For the part of individual (social demographic factors) has been considered that have main influence on internal feeling of individuals; while for the part of organization, or in another word, workplace, working condition assumed as principle factor in appearing stress. Recognizing these factors and try to be decreasing their negative effect is partially important for staff, managers, and structure of workplace.

In the study of Niosh (2008), occupational stress has an unconventional influence on staff's performance and organizational behaviour and lead to burnout, absenteeism, employee intent to leave, reduced patient satisfaction, and diagnosis and treatment errors. Regarding previous research that has been focused on Iranian samples, some factors such as type of employment, distance of workplace to city, number, and combination of health workers at the health centre (Nasirpour, 2008). In parallel to previous research, in Germany, Sehlen et al. (2007) reported occupational stress is super considerable and the source of it determined among physicians, nurses, and radiographers. Overall, three types of factors influence job stress that included individuals (sociodemographic), family factors, and social factors (occupational stressors) that in the current study focused on occupational stressors in the work environment.

1.2 OCCUPATIONAL STRESSORS (SOCIAL STRESSORS)

Occupational stressors assumed as one of the serious effective factors that can be related to stress (Ozer & Daniel, 2003). These vital factors have been studied many years in various places and countries. The occupational stressors or social stressors can be assumed as an important factor in development of stress, if doesn't care about it, adequately (La Dou, 2004). This factor defined as a helpful and beneficial factor that has considerable influence on individual's wellbeing (Regehr, 2001). Similarly, Rovik et al. (2007), has focused on social stressors and their important role on stress that included spouse support, family support, and colleague support that have negative relation with stress, if they play their role as supporters.

Regarding previous studies that considered the role of occupational stressors, there is not enough research that explores more about these effective factors among staff particularly doctors in Iran. Furthermore, this evidence motivates researchers of the current study to endeavour to focus more on this sample at hospital.

2. METHODOLOGY

2.1 SAMPLE

A quantitative and cross-sectional design was applied to collect the investigation's data. In this research, the participants were all doctors who are working in hospitals of Thran, Iran (selecting the hospitals based on specific zone, randomly). A total number of the contributors were 780 doctors that were selected by cluster sampling via Lwanga and Lemeshow (1991) method. The data has been collected 2008-2012.

2.2 MEASURING INSTRUMENTS

Job stressors inventory (ASEAN) Persian version has been used for this study. The inventory included 55 items that measure five main groups: 1) workload, 2) patient-related problems, 3) professional self-doubt, 4) organizational structure and policy. The Cronbach's coefficient alpha of ASEAN based on data analysing was 0.91.

3. DATA ANALYSIS

The collected data were analysed via SPSS version 16. The Multivariate Logistic Regression likewise has been used for investigating the objective of study and providing information on the impacts of occupational stressors on doctors' feelings. Likewise, the Kolmogorov-Smirnov test has been used for determining normality.

4. RESULT

4.1 NORMALITY

As specified in the methodology segment, sources of occupational stress were determined by using the ASEAN job stressors questionnaire. The questionnaire involved 55 items which each of them scored based on four-point Likert- Scale. Table 1 shows the top ten occupational stressors as specified by doctors.

Table 1 illustrates the ten most important sources of stress at work environment (in order) were physical environment problem, too much noise, low paid, lack of appreciation. These were closely followed by insufficient supporting staff, no training opportunities, low promotion opportunities, scanty management input, expectations from patients/relatives, deadlines putting pressure, and keeping clinical practices up-to-date.

Table 1: Top ten occupational stressors as stated by doctors (N=780)

Source of stress	N	%
Physical environment problem	588	75.0
Too much volume of work	576	74.0
Poorly paid	564	72.0
Lack of appreciation	528	68.0
Inadequate supporting / nursing staff	504	65.0
Lack of opportunities in training	504	65.0
The poor prospect of promotions	468	60.0
Insufficient input into the management	456	58.0
Patients or relatives having expectations	444	57.0
Under pressure to meet deadlines	432	55.0
Keeping up to date with current clinical practices	396	51.0

4.2 ONE-SAMPLE KOLMOGOROV-SMIRNOV TEST

In addition, Table 2 displays assessing normality of occupational stressors, One-Sample Kolmogorov-Smirnov Test was applied. The Outcome presented there is no normal distribution.

Table 2: One-Sample Kolmogorov-Smirnov Test (Stressors) (N=780)

Variable	Kolmogorov-Smirnov Z	p-value
Job Stressors	9.47	<0.001

4.3 MULTIVARIABLE ANALYSIS

The current research has been applied the Multivariate logistic regression to determine those associated factors that were significantly contributed to stress amongst doctors. To discover which of the independent variables were significant as predictor of stress regression analysis were occupied with stress as dependent variables and sources of stress (occupational stressors) as independent variables. Table 3 illustrates this relationship with the adjusted odds ratio (OR), 95% confidence intervals (CI) and p-values.

Table 3: Association between Occupational Stressors and Stress status among Iranian doctors (N=780).

Variable	Adjusted OR	Exp (β)	95%CI	p-value
Physical environment	0.122	0.124	0.077-0.221	<0.001*
Work volume	0.333	0.336	0.224-0.469	<0.001*
Poor pay	2.230	2.232	1.559-3.095	<0.001*
Lack of appreciate	5.196	5.198	3.603-7.467	<0.001*
Supporting	0.207	0.210	0.114-0.291	<0.001*
Opportunities	4.518	4.520	3.130-6.412	<0.001*
Promotion	3.948	3.950	2.776-5.452	<0.001*
Insufficient input	1.161	1.164	0.841-1.612	0.359
Patient expectation	4.518	4.520	2.991-6.746	<0.001*
Deadline	2.770	2.773	1.914-3.702	<0.001*

Correspondingly, the outcomes showed that occupational stressors that were significantly associated with stress were physical environment, work volume, poor pay, lack of appreciation, lack of support, opportunities, promotion, patient expectation, and deadline.

Overall, all the doctors believe that stress assumed as an important issue at work, which can influence their health, behavior, and performance. They definite doctors cannot deliver care if they require care themselves. In addition, the stress can because of losing the level of creativity, loss of concentration, loss of interest at work environment, and growth medical mistakes, malpractice, and not enough time to devote with each patient that finally leads to patient dissatisfaction, and raise their complaints.

5. DISCUSSION

According to the main purpose of the present study, occupational stressors associated with stress amongst Iranian doctors who are working in hospitals in Tehran province, Iran. In multivariable analysis, the significant predictors of psychological morbidity were physical environment, work volume, poor pay, lack of appreciation, lack of support, opportunities, promotion, patient expectation, and deadline. Moreover, these results are dissimilar from Dobaie (2008) study in which age, disturbance of home/family life by work, inability to purchase a house were the significant predictors of stress.

6. CONCLUSION

The study findings gained from data analyzing Based on the multivariable analysis method to find the relationship between occupational stressors and feelings of doctors (stress). The study

findings clarify the crucial role of occupational stressors among 780 doctors which most of them were between 30 to 39 years old. In addition, according to the results of the study poor workplace environment, work volume, poor pay, lack of appreciation, lack of support, opportunities, promotion, patient expectation, deadlines play critical and considerable role in the level of stress. In this regard, considering effective factors that can improve and appear or disappear abnormal feeling such as stress amongst staff is super vital, specifically those factors are supported via managers, workplaces (organizations), also work ministry. The managers and work ministry should determine some practical strategies and also organized effective workshops for their staff until they can get convenient knowledge about their job, job motivators, job stressors, etc. , in this regard, the staff can cope with and control their feeling toward any internal and external effective factors at workplace.

7. DATA AND MATERIAL AVAILABILITY

For information related to this study, please contact the corresponding author.

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ANTIGENIC ACTIVITY OF AN EXPERIMENTAL INACTIVATED VACCINE AGAINST CHICKEN INFECTIOUS BRONCHITIS

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ABSTRACT

The article presents materials on the study of the antigenic activity of an experimental inactivated emulsion vaccine based on the field isolate of the chicken infectious bronchitis virus isolate that is identical to the variant strain QX of the IBI virus. The research results allow us to consider the obtained virus isolate as a candidate for the manufacture of inactivated vaccines against infectious bronchitis of hens.

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1. INTRODUCTION

Infectious bronchitis of chickens (IBS) still poses a real threat to industrial poultry farming, despite intensive programs for the specific prevention of the disease (Kuklenkova, et al., 2018). This is due to the identification in different regions of the world, including in the Russian Federation, field IBA virus strains that differ in virulence, antigenic and immunogenic activity: D274, D1466, 793B, CR88, 4/91, IT02, D388, QX, etc. (Abdulloev, 2015). The emergence of new variant strains of the virus is due to the genetic structure of coronavirus IBC, amenable to relatively rapid mutation and genetic recombination. Circulation in poultry farms of virulent field, incl. variant strains of the IBC virus make it extremely difficult for veterinarians to diagnose, prevent and control the disease (Shcherbakova, et al., 2018).). The circulation of variant strains in poultry farms of the Russian Federation, in addition to the case of poultry, leads to a significant decrease in egg productivity and the quality of the resulting eggs see Figure 1.

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Figure 1: Eggs obtained from laying hens with chicken infectious bronchitis

Widely used in previous years, live and inactivated vaccines based on the classic Massachusetts serotype virus from strains H-120, H-52, Ma5, M41, Chapaevsky currently in many cases do not provide the formation of reliable immunity in vaccinated birds (Kuklenkova, et al.,2018).). This requires new approaches to the study of the epizootic situation in each individual region and the poultry industry. A significant role in this work is played by comprehensive laboratory studies of the material, aimed at isolating the circulating virus, determining its species and strain affiliation. The results of the analyzes contribute to the development of effective programs for the specific prevention of IBS, based on the use of autogenous vaccines prepared on the basis of field virus isolates (Balykina, et al., 2018). The objective of the present studies was to study in an experiment on chickens the antigenic activity of an experimental inactivated emulsion vaccine prepared on the basis of a field isolate of the causative agent of the IBI virus, identical to the variant strain QX of the IBC virus (Javadov, et al., 2008). The data obtained can be used to obtain the inactivated IBA virus antigen and its possible use in the manufacture of mono- and multivalent inactivated vaccines against this disease.

2. MATERIALS AND METHOD

2.1 VIRUS REPRODUCTION

For the manufacture of the vaccine, a field isolate of the IBC virus was used. Reproduction of the virus in order to obtain a brood of viral material was performed on developing SPF embryos of 9-day incubation chickens (Lohmann Tierzucht, Germany). The infectious activity of the obtained virus was checked on SPF chicken embryos (Teryukhanov, 1976). Titration was performed using the virus in successive 10-fold dilutions. The virus was pre-checked for the absence of bacterial contamination by plating on culture media. The calculation of the titer of the infectious activity of the virus was carried out according to the method of Reed and Mench.

2.2 VIRUS INACTIVATION

The virus was inactivated using the domestic chemical preparation Ecodezrico, containing

1,8,3,6-diendomethylene-1,3,6,8-tetraazacyclodecane sodium hydrogen phosphate as the active substance, in a final concentration of 0.12%. When conducting inactivation, we used separate methodological materials described in the article by D. Glazer et al. Upon completion of inactivation, the quality of the virus inactivation was monitored by the method of successive passages of inactivated viral material on 9-day-old incubation hens SPF embryos. For this purpose, inactivated viral material in the volume of 0.2 cm^3 was injected into the allantoic cavity in each embryo, followed by incubation in the prescribed mode. The safety of embryos and the presence of pathological signs characteristic of IBI were taken into account. Then, allantoic fluid was taken from each embryo, which was used for the second passage. Then spent the final third passage.

2.3 GETTING VACCINE EMULSION

For the preparation of the vaccine in the form of an inverse emulsion "water in oil" used ready-made oil adjuvant Montanide ISA 70vc (Seppic, France). Emulsification was performed using an Ultra-Turrax T-25 apparatus.

2.4 EXPERIMENTAL BIRD

To study the antigenic activity of the experimental inactivated vaccine, 35 heads of 10-day-old broiler chickens of the Ross-308 cross were used, obtained from a farm that is safe for respiratory diseases of birds. At the beginning of the experiment, there were no antibodies to the IBI virus in the blood serum of chickens. The chickens were kept in a cage. Conditions of feeding and feeding (the composition of the diet, temperature regime, and illumination in the boxes of the vivarium, basically, corresponded to the hygiene standards for birds of this cross-country and age). Chickens ringed. 2 groups of chickens were formed: 1 group (10 goals) - intact chickens ("clean" control); Group 2 (25 goals), chickens, each of which was administered an inactivated vaccine subcutaneously, in the lower third of the back of the neck in a volume of 0.5 cm3. The bird was monitored for 35 days after immunization (observation period). The safety and clinical condition of the birds was recorded daily. Blood was taken from control and immunized birds before vaccination and 21-, 28-, and 35 days after vaccination. The resulting serum was examined for the presence of antibodies to the IBI virus.

2.5 LINKED IMMUNOSORBENT ASSAY

Antibodies to IBA virus in the blood serum of the experimental bird were detected by enzyme-linked immunosorbent assay (ELISA, ELISA) in an indirect solid-state version of the reaction. We used IDEXX test systems and the x-Chek computer program. ELISA results were recorded on a Sunrise TECAN spectrophotometer.

3. RESULTS AND DISCUSSION

When the virus was titrated on chicken SPF embryos, the titer of the infectious activity of the obtained virus was established, which amounted to 7.5lg EID50/cm^3.

The control of the inactivated virus for completeness of inactivation revealed a complete and irreversible loss of the infectious properties of the virus.

The results of the study in ELISA of blood serum samples of vaccinated chickens for the presence of antibodies to the IBI virus are presented in Figure 2.

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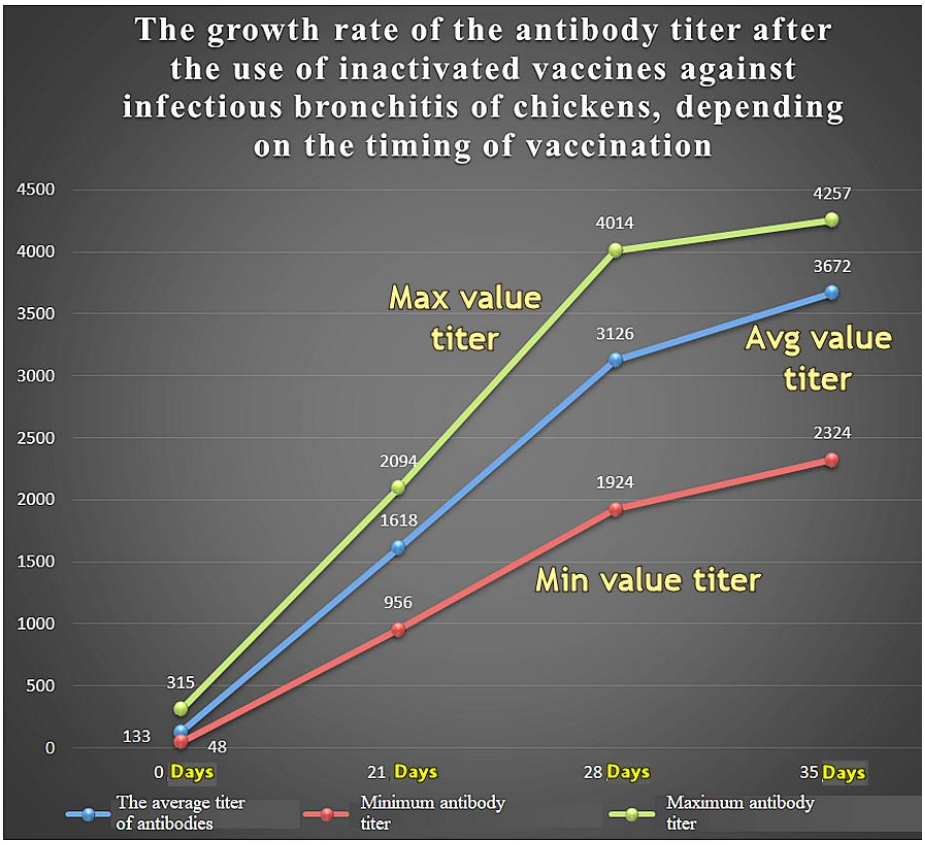

Figure 2: Antigenic activity of inactivated vaccine against IBS at different times after immunization (23 pieces of the sample).

It was found that the inactivated emulsion vaccine has a pronounced antigenic activity and causes vaccinated chickens to produce antibodies to the IBI virus in high protective titers. In chickens in the "pure" control group, no antibodies to IBI virus were detected in positive diagnostic titers in any case. The death of the bird during the experiment and the increased post-vaccination reaction of local and / or general nature was not noted.

4. CONCLUSION

An experimental inactivated emulsion vaccine based on the isolate of the chicken infectious bronchitis virus isolate, identical to the variant strain QX of the IBC virus, provides the formation of humoral immunity in vaccinated chickens in protective titers after a single immunization.

5. AVAILABILITY OF DATA AND MATERIAL

Data can be made available by contacting the corresponding author.

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LIVING IN GREEN CITY

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ABSTRACT

Nowadays, the bioenvironmental problems are one of the fundamental issues related to the city and are resulted from their conflict with the natural environment; because the urban development involves the predominance of buildings, industries, transformations, and economic activities on the natural spaces. With the development of cities, the landscapes and values of natural environment have been exposed to further destruction and erosion and the urban residents have been deprived of the natural attractions and the mental and social problems have appeared. Nowadays, the notion of cities without effective green spaces with its different forms is not comparable. To be able to adjust their sustainability, the cities as the focal centers of activities and human beings' living should accept the structure and function affected by the natural systems. Meanwhile, the urban green spaces as the necessary and inseparable component of the unique framework of the cities play a significant role in their metabolism that their scarcity can cause severe disorders in the life of cities. The results have revealed that the urban green spaces have social and ecologic output and the most important effect of green space on the cities is their bioenvironmental functions or ecologic output which make the cities ready for living and challenge the destroying effects of development of the transportation and improve the quality of the citizens' life. The urban green space is so important that nowadays, it is considered as one of the indexes of the development of the communities. The most important effects of the green spaces on the cities are the reduction of noise and air pollution, temperature modification, increase of relative moisture, air moderation and dust absorption. The other effects of the green space on the cities are relative, but all its effects make their presence in the cities inevitable. In this paper, it has been tried to present the definitions and explanations related to the green space and urban environment and their different functions in the city.

1. INTRODUCTION

Nowadays, the concept of cities without effective green space with its different forms is not

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imaginable. The consequences of urban development and the complexities of their bioenvironmental predicaments have made the existence of green space and their development inevitable forever. The consideration given to green spaces as the respiratory lungs of the cities is not an exaggerated definition of its function, but it is indicative of its minimum function in the ecologic notion of the cities. These areas are of special importance in terms of the provision of bioenvironmental needs of the citizens and also a provision of leisure areas and the communication bed and social interaction. The pollutions resulted from the industries and technology have changed the cities to an inferno for the inhabitants. Furthermore, the impolitic development of cities in horizontal and vertical forms has destroyed nature. Nature and green space, which played the vital role of beating the heart of the human habitats for years and were the best place for the creation of early cities, are destroyed by the carelessness of the city inhabitant. With regard to these crises such as noise pollution, air pollution, and mental pressure resulted from living among the numerous stony buildings and severe traffic of different kinds of vehicles that threat the cities every day, the attention should be paid to the needs of this large urban community. The increase of population and its congregations at regional levels has direct effects on environmental quality, in such a way that the growth of population, poverty, and erosion of environment in the developing country have created a futile circle. This futile circle has affected the quality of people's life seriously and has ruined the efforts of third- world countries for access to sustainable development. Having the welfare and convenience in community life is one of the ways to have access to sustainable development; nowadays, all the authorities of the community make their effort to provide the people's welfare and convenience. This welfare is subdivided into two material and mental sections and the mental one is more important than the other factors. The urban green spaces are one of the external factors effective in providing welfare in the crowded urban areas and many pieces of research have confirmed its effect on the citizens' welfare. Therefore, nowadays, the emphasis has been put on the sensitive and determining role of the urban design and planning for keeping the connection between the urban environments and the green space and nature.

In regard of the necessity of green space, the bioenvironmental functions of the green spaces are the most important effect of them on the cities and the creation of balance in the metabolism of city on one hand, and the increase of level of beauty, on the other hand, causes the increase of quality of civilization of the cities. And, in fact, the green spaces are considered to be the respiratory lungs of the cities (Khansefid, 2007: 25).

2. HISTORY OF THE CREATION OF GREEN SPACE

The history of architecture and urban building indicates that, from the past periods, the human being had felt the need to create the garden and green space in even the elementary cities of that period so that not to be separated from nature and his origin. For example, it can be referred to as the hanging gardens of Babylon that were built 500 years BC in an area about fourteen hectares of a big palace at the center of Babel city. This big garden included the surfaces which hanged the gardens with rare plants on the pillars firmed on seven floors. In the fifth century BC, the Greeks built the top of pillars in Corinthian order in the shape of flower basket and the pillars in the ivy form. Furthermore, the young neighborhoods were afforested in Athens. The Egyptian architects also built the pillars in a lupine, papyrus, and date palm form concordant to the environment and nature. Alexandria had great national gardens and Athens had Femoze's arboretum and zoo. The Iranians also

built the fruit gardens on the outskirts of their cities from Achaemenian period and the greengage and peach have been the most popular planted fruits. Of course, the existence of amusement park in the period of Shah Abbas Safavid has been reported and some gardens have remained from that period. The old gardens of Iran generally had a total fence, a central channel of water flowed in a canal and a pavilion placed generally at the center of garden and was a place for resting. Chahar Bagh- e Isfahan, Fin- e Kashan and Eram- e Shiraz are instances of these gardens. Today, regarding the increasing pollution of environment and mental requirements of the human being, beyond the inherent and historical interests, designing the cities is not separated from the green space. Brasilia in Brazil country is an instance pf these kinds of cities which have been designed and built concordant to and natural complementary of its environment (ibid, 26).

2.1 WHAT IS URBAN GREEN SPACE?

Gary Moul, the father of park planning in Iran, talks about green spaces of cities. The urban green space is a region covered by the plants in and outskirts of the cities that has two important functions for the city: temperature modification, moderating weather and beautification (Salehifard, 2008: 3).

The green space is a part of urban open space which includes the trees, flowers, grasses and other plants in the natural and artificial domains that is built and protected based on the supervision and management of human being, regarding the disciplines, laws and expert knowledge related to that for improving the biological condition and welfare of the citizens and the non-rural population centers (Khansefid, 2007:26).

2.2 THE FUNCTIONS OF GREEN SPACE ARE SUBDIVIDED TO FOUR CLASSES

1) Public green space: These include the urban green spaces and parks which have social functions. These areas are used by the people for spending their free time, recreation and social and cultural gatherings.
2) Half-green space: These areas are more limited than the public areas, such as the open campus of hospitals, government offices and so on.
3) Green spaces of passages and streets: These are the urban green spaces which usually include afforesting the narrow border of the sidewalk and carriageway.
4) Private Greenspace: This consists of all the areas including gardens and flower beds existing in the city whose use is limited to their owners (Henrik, 1995: 20).

2.3 MANAGEMENT OF URBAN GREEN SPACE

Generally, the management of urban green space includes all the stages of evaluation, design and planting concordant to the place, supervision on its protection and maintenance by the people's cooperation (Kokabi, 2007: 9).

2.4 IMPORTANCE AND SIGNIFICANT FUNCTIONS OF URBAN GREEN SPACE

Nowadays, the concept of cities without effective green space with its different forms is not imaginable. The consequences of urban development and the complexities of their bioenvironmental predicaments have made the existence of green space and their development inevitable forever. To be able to guarantee their sustainability, the cities as the centers of concentration of activities and human beings' living should accept the structure and function affected by the natural systems. The urban

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green spaces as the necessary and inseparable component of the unique framework of the cities play a significant role in their metabolism and their shortage can cause serious disorders in the life of cities. The attention to the green space as the respiratory lungs of the cities is generally not the exaggerating definition of its function, but it is indicative of its minimum function in the ecologic concept of the cities (Pakzad, 1951: 19).

These areas are of special importance in terms of the provision of bioenvironmental needs of the citizens and also a provision of leisure areas and the communication bed and social interaction. Here, it is referred to the most important functions of green spaces in the cities:

1) Recreational function: Parks are the best places for resting and refreshment. Nowadays, a part of the recreational functions of the family, neighborhood relationships, market and so forth have been replaced by the recreational functions of the parks and green spaces.
2) Sanitary function: Parks/gardens and green spaces can provide the physical and mental health of the individuals. The wide role of green space on the neural concentration of individuals is an obvious matter.
3) Communicative function: Parks are providers of the unwritten organized relations which are formed and continued according to the needs of different social groups.
4) Educational function: Playing and entertainment play an effective role in the physical and mental training of the children. Although the parks have a few playing materials, they provide the situation for the children to gain skill and creativity.
5) Trading function: Despite the fact that parks are places for resting and recreation, they are also a suitable place for the presentation of different goods needed for the tourists due to their wide presence in the parks (ibid).

2.5 BIOENVIRONMENTAL FUNCTION OF GREEN SPACE

The bioenvironmental functions of the green spaces are the most important effects of them on the cities which have made the cities, as the environment of the human community, meaningful and have challenged the destroying effects of the development of the industry and improved the quality of the civilization of the cities. At present, urban planning is significant in regard to the importance of the urban environment and is expressed as the most necessary element of sustainable development. The increasing growth of population has caused destroying the natural resources, environment and also has caused air pollution, while the protection of environment has been enacted as the public duty based on the fifth article of constitution (Yousefi, 2007: 20).

2.5.1 SIGNIFICANT EFFECTS OF GREEN SPACE ON THE CITIES

The most important effects of green space on the cities include the reduction of air pollution, reduction of noise pollution, temperature modification, increase of relative moisture, air moderation and dust absorption. The other effects of the green space on the cities are relative, but all its effects make their presence in the cities inevitable; in such a way that the cities cannot remain sustainable without it. So, if the green space is a necessity as a component of the urban tissue and also as a part of urban services, it cannot be separated from the requirements of community. Therefore, the green space should be qualitatively and quantitatively concordant to the physical volume of the city and buildings and should be built with regard to the situation (streets and roads) and needs of the community and also mentally , it should be based on their free time and health requirements and

ecologic condition of the city so that the green space as the active space can have continuous bioenvironmental output (Javaheri, 2006: 23).

2.5.2 SOCIO-CULTURAL FUNCTION OF GREEN SPACE

These areas are of special importance in terms of the provision of bioenvironmental needs of the citizens and also a provision of leisure areas and the communication bed and social interaction. Here, it is referred to the most important functions of green spaces in the cities:

Recreational function: Parks are the best places for resting and refreshment. Nowadays, a part of the recreational functions of the family, neighborhood relationships, market and so forth have been replaced by the recreational functions of the parks and green spaces.

Sanitary function: Parks and green spaces can be regarded as the providers of the physical and mental health of the individuals. The wide role of green space on the neural concentration of individuals is an obvious matter.

Communicative function: Parks are providers of the unwritten organized relations which are formed and continued according to the needs of different social groups.

Educational function: Playing and entertainment play an effective role in the physical and mental training of the children. Although parks have a few playing materials, they provide the situation for the children to gain skill and creativity.

Trading function: Despite the fact that parks are the places for resting and recreation, they are also a suitable place for the presentation of different goods needed for the tourists due to their wide presence in the parks. In a general classification, the social effects resulting from the creation and expansion of urban green space can be presented as

1) Demographic effects,
2) Cultural effects,
3) Psychological (mental) effects: The mental effects of the green space on the quality of urban life; the human being's nature has been created in such a way that s/he has many abilities and these abilities are converted to the depression and lethargy without connecting with the natural beauties in the urban life that are the same green spaces and his/ her creativities are naturally prospered by enjoying the green space and, the human being keeps the evolutionary path in his/her life. Although most city citizens are not aware of the advantages and indirect effects of the green spaces on their life, this effect and reaction between enjoying and not enjoying the green space in their life have been confirmed by different researches. For instance, it has been referred in the words of scientists and also narrations and Holy Qur'an, too. It is derived from the verses and narrations that 1) looking at the green space removes the human being's grief, gives him/ her the peace and makes him/ her happy. 2) Enjoying the green space removes the feeling of disappointment from the human being and creates and reinforces hope in him/ her. 3) The green space has considerable effect on the treatment of mental and psychological diseases in such a way that these problems are removed by looking at the green landscapes and walking and breathing in the green space. 4) The connection with the green space creates happiness and motivation for the move toward elevation and evolution (Javaheri, 2006: 24).

2.6 ECONOMIC FUNCTION OF GREEN SPACE

The proper function of the green space has many positive effects on the economics of the countries. Here, some cases have been. The green space, especially the proper planting of the trees can have a considerable effect on the consumption of energy in the buildings. The costs of heating or cooling the buildings are reduced by the proper planting of the trees. The trees can cause the absorption of 9 percent of solar energy in the summer and reduce the internal heat of the buildings. If the trees can be planted in suitable places that the certain points of the buildings be under the shade of the trees, it results in the considerable saving of the fuel. For example, the Americans economize two million dollars yearly by planting the trees in the specific and strategic places beside the houses and residential buildings. Planting the trees in the residential places which are located in the areas exposed to the wind can act as the windbreak and reduce the costs of heating the buildings. In addition to saving the energy by the proper application of green space, proper tourism spaces can be created by the attraction of domestic and foreign tourists by the special design of green space concordant to the effect of climate and help to the economy of the country (Salehifard, 2008; Modaresi & Kazemi, 2019).

2.7 TRAFFIC FUNCTION OF GREEN SPACE

The green space of passages; this area is permanently placed on the side of the width of passages that the growth of plant does not damage the buildings, sidewalks, carriages, rivers, and canals and, furthermore, the shade of buildings is controlled (Salehifard, 2008: 4).

The green spaces of passages are subdivided into the following kinds:

- Slow- growing- accessed green spaces: The purpose of their planting is to control the noise and light of the streets` traffic.
- Fast-growing- accessed green spaces: Their margin tissue is for the beauty of the environment, controlling voice and changing the streets placed in the neighborhood of the building.
- Fastest fast-growing accessed green spaces: Their margin tissue is created for the beauty of the environment, controlling voice and disturbing lights resulting from the traffic and also the prevention of air pollution.

Green spaces of refuges: The refuges are the green spaces built along the middle of the length of roads to prevent the damages resulting from the counter light and to beautify the path. These spaces are created across the road width to separate the movement of cars from two lanes, too. The refuges have a striped form and their width is at least 115cm. Planting long-stemmed trees and also planting the shrubs and plants' bushes with little height is necessary for the fast-growing- accessed refuge and fastest fast-growing- accessed refuge, respectively (Salehifard, 2008: 5).

2.8 VISUAL AND AESTHETIC FUNCTION OF GREEN SPACE

The beauty of cities and their optimality for a living depend on beautifying the green space with its different forms. The green space moderates the considerable part of the inelegance of the cities as the human- building phenomenon against the natural systems to some extent.

The mental philosophy of " beauty and city" started from the nineteenth century and today, it is used in the notion of the monument- building and beautifying the urban space. The " urban aesthetic movement" is a developed approach, which is studied not only for the reason of beautifying but also as the means of social control by keeping the people satisfied and providing their needs. The beautification operation is a process that develops the quality of urban space and improves the quality

of urban life to create a healthy, cultural and human-centered city. The city is beautiful that has been built logically and properly based on the environmental conditions and human requirements, a city that respects the quality of life and spirit of the human being. The operational goals of the beautification based on the thought of human-centered city and philosophy of beauty are improvement of visual function and quality, creation of special effects, expansion of sidewalk space. The urban artistic works including three main parts of the urban design, environment design and city look (outward appearance)/ urban furniture/ urban arts (valuable artistic works) of the visual quality should compete with the other factors of the environment to represent its beauty and even be superior in comparison to them. A part of health and happiness of human beings depends on the quality of urban spaces, interactions and social- mental communications resulting from the aesthetic effects. Although the green space in every scale and of every kind is enchanting per se, the attention to the designing principles reduplicates the role of this function (Salehi, 2004).

2.7.1 VISUAL CHARACTERISTICS AND ADVANTAGES OF GREEN SPACE

In the case of green space and its effect on the quality of human being's perception, it can be referred to the importance of landscaping in the urban space that means the use of plants in the design in such a way that causes the improvement of " gardening" aspect of landscaping or, in better words, the visual aspects of the environment. The plants are one of the main elements of the green space that the growing habits, tissue, color, and size are the important factors considered in the selection of plants for creating a picture with permanent beauty. The plants can be used for guiding the walking individuals, their encouragement to spend their time in the public open spaces, an increase of social interactions, creation of happiness and memorable feeling in the environment and creation of coordination in the disordered visual landscapes (ibid).

2.7.2 PSYCHOLOGICAL (MENTAL) EFFECTS OF THE EXPANSION OF GREEN SPACE ON CITIZENS

The effect of landscape and green area on the mental and psychological health has been extended in the recent decades and different theories have been expressed in this case; such as the theory of stress management of Olrik who believes that the natural potential landscapes can reduce the stress, while the existing built (active) landscapes not only do not prevent the stress, but also they themselves can be the reason of stress (Henrik, 1995: 20). Principally, a suitable green space in the cities, in addition to physical health, causes mental tranquility, further work output and better quality of life (Kafi, 2002: 9-10).

While, in most of our cities, the non-attention to the human aspects in the design and architecture of urban space has caused that the mental and social health in the cities is exposed to damage more than the villages. One of the factors resulting in the creation of such problems is the non-attention to the urban green space and also to this fact that the structure existing in the green spaces is based on the new mental structures and there has been created a kind of contradiction in the nearly traditional physical structure and the modern thinking structure of the users. Therefore, the manner of building and formation of green spaces can have direct effects on the mind and spirit of the clients; in such a way that the researches indicated that the considerable part of healing purposes of the landscape is resulted from looking at the natural landscapes not from doing activity in the natural landscapes and

green spaces (Kaplan; 1992: 125).

3. DEFINITION OF BIO-ENVIRONMENT

There are two attitudes toward this term: One is that the concept of the natural environment has been constituted of two words of bio and environment that means the place for life in Persian. This concept lexically does not involve the cases such as air pollution, strategies for preventing the destruction of nature and so on; but nowadays, different concepts of that are presented, such as climate, jungle, mountain, birds and animals' rights, strategies for preventing the air pollution, strategies for eliminating the destructive factors of nature and so on. The natural environment is applied to all the threatening or improving factors of the living environment.

The other attitude is that there is nothing titled the environment and this term has a relative meaning which means environs; that is, what has been surrounded by its environs. What is worth mentioning here is that it is important to know to which creature the meant natural environment is related; because what improves the condition of a place for living a type of alive creature can destroy the natural environment of the other creature. Generally, it can be said that the natural environment includes all the things surrounding the living process that involves it and is interacting with that. Regarding this definition, is it possible to determine a specific border for the natural environment? Is the life process possible without the water and soil? Is it possible to produce food materials without logical use of soil and provide the healthy food of the increasing population?

Accordingly, it is observed that the natural environment consists of all the things including human beings, nature, and the relationship between these two. The natural environment affects and is affected by all the human being's activities. The environment of an alive creature is a space by which s/he is surrounded and connected with that by different interactions. In other words, the environment can be considered as all the animate and inanimate factors which affect the alive creature in a certain space and in a specific time. Of course, the inanimate phenomena also can have an environment, but not the natural one; for example, affected by the environmental factors (physical, chemical and biologic destruction), the parent rock is converted to the soil. When a living creature changes its location, its environment is changed, too; like going from house to street, park, or office. But all these movements and replacements are done in the scope of natural environment, because the concept of bio- environment, either lexically or its reality, includes all the living spaces of the terrestrial globe. In other words, it is a natural environment that includes different environments (Badri, 2016).

3.1 TYPES OF ENVIRONMENT

With regard to various appearances of the terrestrial globe and also the wide bioenvironmental issues, it should be tried to represent some operational definitions for the natural environment. For this purpose, all that have surrounded us, affecting and being affected by us can be subdivided into three general sections: 1) The natural environment, 2) social environment, 3) artificial environment (Habibian et al. 2014).

3.2 EFFECTIVE FACTORS ON URBAN ENVIRONMENT

The effective factors on the urban environment can be classified as

- Pollution, kinds of pollution and manner of their control
- Urban sewage and its management
- Rubbish and manner of its collection and recycling

- Park and green space
- Urban furniture
- Natural factors
- Urban resident population
- Healthy drinking water
- Development of non-motorized transportation (Habibian et al. 2014).

3.3 POINTS FOR URBAN ENVIRONMENT

3.3.1 MANAGEMENT OF URBAN GREEN SPACE AND PARKS

The greenbelt should be created outskirts the cities. It is a catastrophe that the cities be connected to each other without planning. The efforts must be made so that the parks not to be converted to the parking lots. The speed is the creature of our era, however, deprives the human being from the beauty. For the maximum use of green space, the sidewalks inside the green spaces should be designed curved and long to reduce the speed and enjoy the green spaces considerably. The considerable attention should be paid to the neighborhood parks to increase the level of culture; the neighborhood parks should be like a unit in the center of the desert that comfort the people around that neighborhood. The biggest duty of the city is to create a special kind of social life in which the communication between (you and me) is expressed and the neighborhood parks create such conditions. For the use of green space, the attention should be paid to the people's income and the role and importance of green space as the connector circle in the city. The green space can be a connector which, in addition to the moderation of ecologic space of city, can cause the balance of urban environment or land use. The freshness of neighborhood parks represents the performance of the municipalities and the neighborhood people's culture and their interest in the environment. The managers of urban affairs should pay specific attention to these parks; the stumps of the trees and pruned branches should be used for designing the chair and table and fence. This brings nature to the city. Regarding the shortage or being high of the land price for the development of green space in the cities, it is suggested to create the vertical green spaces by planting the ivies by the use of scientific and technical methods (Madanipour and Mortazayi. 2005; Modaresi & Kazemi, 2019).

3.4 URBAN FURNITURE, A NECESSITY FOR CITIZENS' HEALTH

3.4.1 URBAN FURNITURE

Based on the resolution of the metropolises` beautification committee of the country in 2001, the beautification is all the deliberate measures taken by the municipalities to improve the quality of the urban environment that makes the city suitable for living. The aim of beautification is to provide an environment in which all citizen's pleasure. Looking to beautification at the city is to gain the same mentioned definitions and to improve the quality of urban environment. For this purpose, four methods are generally applied as following: beautification, enactment of urban laws, principles, and regulations for creating and retaining the beauties, establishment, and improvement of various suitable urban spaces and application of standard proper urban furniture. The experts believe that nowadays it should be accepted that the city is the place of living the people with different needs and interests; a big house in which nobody can dominate his/ her personal or organizational interest. It is possible only in such a condition that the public participation of people in all the regional and national activities is provided (Kokabi, 2007).

3.5 URBAN FURNITURE: A TRANSFORMATIONAL AND REMUNERATIVE ELEMENT

The urban furniture and paying attention to the environmental atmosphere in today's cities is recognized as a transformational and remunerative element which can introduce the city as the internal and international symbol to all the people. The urban furniture includes all the wide set of tools, materials, equipment, signs, small buildings, spaces, and elements which are known in this name because they have been placed in the city and street and generally in the open space and are used by the public (Kokabi, 2007).

3.6 WATER AND URBAN ENVIRONMENT

The activities related to the development of water- resources result in some changes in the environment. The bioenvironmental effects of systems of water- resources development can be either useful or harmful. For instance, the dam reservoirs often destroy some parts of the floodgate bed of river and also the watershed; while they, on the other side, create a lake and accordingly some of bioenvironmental and ecologic characteristics of these rivers are demolished in the watersheds. The increase in earth temperature means that the level of seawater would be increased and the coastal zones and rivers would be flooded by the water and would destroy the lives of more than 100 million people. In addition, the raining patterns are undoubtedly changed and agriculture is deranged. Furthermore, this change of pattern causes the storm and whirlwind be powerful and causes the flood to fly (Habibian et al. 2014).

3.7 POPULATION AND URBAN ENVIRONMENT

The relationship between the population and environment is of reciprocal one; it means that the population and its features affect the environment and the environment affects the human populations and their features, too. The factors which are imposed on the environment by the increase of urban population are:

- Creation of hole on the Ozone layer and production of greenhouse gases
- Climate changes and air pollution
- Reduction of jungles
- Expansion of deserts
- Pollution of water resources (Mousavian, 2012)

3.8 DEVELOPMENT OF NON-MOTORIZED TRANSPORTATIONS, A STEP TOWARD MAKING THE URBAN ENVIRONMENT HEALTHY

Many international organizations have been established around the world to help the development of countries especially the developing ones. The environment program of the United Nations is one of these organizations. This organization has introduced several key programs to achieve its goals that one of them is the program titled "sharing the path" stated for making the roads and streets more applicable for multi-purpose use.

Design of streets: The creativity in designing the streets with three attitudes of security, sustainability, and accessibility is one of the key programs of the organization (Mousavian, 2012).

4. RESULT AND DISCUSSION

Alienation is one of the origins of problems as involved with people all around the world. This issue mostly emerges among people and their artificial environment (Hanna, 1958:148). Public green

spaces are of great importance in terms of fulfilling the environmental needs of urban dwellers and in terms of leisure space and their social interaction ground. Thus, urban green space is a type of urban land use with artificial vegetation with social and ecological returns (Suzanchi, 2004, 5). Population increase, development of cities, creation of metropolises and being removed of the traditional and natural texture of cities caused that theorists of urban environment designers try to renovate vital needs of cities as green space and natural landscapes and they use new equipment to do this. The theorists of urbanization and architecture have always attempted to turn the noisy environment to a calm space for the residents. The important point is the importance of green space. They believe that green space leads to mental safety in people and in most cases is most important factor in reduction of environmental pollution. Green space links urban persons to nature and it fulfills aesthetic desires of urban dwellers and is effective in fulfilling health, environment, mental and social expectations of urban community. The industrial human being attempts to invite natural life effects by creating green space and accepting high costs. The most important effect of green space in cities is its environmental function as making the cities as human community environment meaningful and fights against the adverse effects of industrial development and increases living quality of cities. The components of urban development effects can disturb living system of cities by various methods. Suitable green space in cities is one of the effective factors on reduction of these effects namely air pollution and dust, quasi-forest green space are breathing lungs of cities. Generally, green spaces and their effect on cities are unavoidable as, without it, the cities are not sustainable. If green space is used as a texture of cities and a part of urban services, it cannot be separated from the needs of urban community. Thus, green space should be consistent with physical volume of city from quantitative and qualitative aspects (buildings, streets and roads) and society needs (mentally, spending leisure time and health needs) and based on ecological conditions of city and its future development to be used as active green space with environmental and continuous return (Majnunian, 1995, 45). One of the basic problems of Iran in recent decades is rapid increase in population namely its urban population. This rapid increase is based on migration of villagers to city and it causes that some small villages and cities are turned into big cities and middle cities are turned into metropolises and this issue increases the problems in cities namely metropolises. On the other hand, urban development in recent decades has been as it led to inconsistencies in using urban land and imbalance in distribution of public services in cities. The spatial manifestation of local and regional imbalance is observed in formation of rich and poor townships, unduly use of cars for intercity trips, the use of a low-income class of public transportation and ascending trend of intercity trips. Among various urban services, green urban spaces and parks are considered for their recreational aspects and also they play important role in balance of urban environment and reduction of air pollution. Also, urban green spaces reduce building density and develop physical and mental aspects of citizens (Shie, 2012, 315-321)

5. CONCLUSION

According to the obtained reports, the urban population of the world is increasing. This increase means the demolition of natural resources and the change of these resources to the consumer good and ultimately the production of further contaminants and rubbishes in the environment and, regarding the condition of the environment, the kind and amount of production of wastage should be

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concordant to the ability of absorption and digestion of urban system. The existence of characteristics such as the tendency to participation, trust in each other, attention to public issues and membership in the institutions and voluntary and civil associations among the citizens (social capitals) is the fundamental factor in the success of urban environmental institutions.

According to the important functions of urban green space and their role in development of urban sustainability, it is concluded from this study that, in fact, the creation of optimal green space is a solution for most of urban severe problems that, in addition to improvement of quality of city landscape, it is effective on the aesthetic categories and perception of identity that can prevent the physical and economic destruction, reduce life quality, pollution, accumulation, and movement of middle class from the city center , and cause the freshness in the central areas of city and its outskirts and persuade the people to voluntarily presentation. Generally, the psychological effect of green space on the citizens can be stated as follows:

1. Creation of mental and psychological peace
2. Positive effects on individuals' physical health
3. Improvement of performance efficiency of individuals (an increase of productivity)
4. A solution of individuals' challenges and difficulties by the discussion, friendly consultations and so on in the formal and informal clubs established in parks and green spaces
5. Having suitable physical and mental states of an individual by the continuous presence in the green spaces such as limbering and exercising in these spaces
6. Affecting human beings' behavior and their behavioral and mental dynamism

6. MATERIAL AND DATA AVAILABILITY

All information of this study has been included in this study. This study generates no data.

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ROLES OF ORGANIZATIONAL POLITICS IN LINKING ORGANIZATIONAL CULTURE AND EMPLOYEES PERFORMANCE IN HIGHER EDUCATION OF PAKISTAN

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ABSTRACT

The universities are playing a leading role in teaching and learning activities by developing the abilities, knowledge, and skills of individuals to make them effective students at the institutional level thereby helping them to become successful professionals in their practical lives. To achieve these tasks effectively, higher institutions are required to put emphasis more on workforces' performances which are squarely anchored on different dynamic factors like the organizational culture, workforces' performance and organizational politics. Thus, this study aimed at exploring the impact of organizational culture on employees' performance over facilitating role of the organizational politics in the higher educational context. The result from statistical procedures confirms the positive and significant association and impact of organizational politics and employees' performance.

1. INTRODUCTION

The higher education institutions, due to their indispensable role in offering efficient, effective, updated and applicable knowledge, are considered as dynamic gears for social change and sustainable development (Cullen et al., 2003). In developing countries like Pakistan, this role of universities needs additional efforts on the part of institutional management and government functionaries as these institutions currently facing various financial and administrative restraints which bring the credibility of institutions at stake (Mace & Niazi, 2006). In this perspective, the success and desired ranking of universities are dependents on performance level of institutions. In this regard, the best performances on the part of universities are only a success factor for groomed and developed societies in developing countries like Pakistan (Haider, & Sultan, 2008). In this connection, there are certain other parameters, when not managed properly, can be held liable for performance of institutions in which organizational culture is foremost. Likewise, favoritism and influence for the authority are outcomes of organizational politics which is solely responsible for the credibility and success of

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institutions (Tuhaih & Fleet, 2011).

For institutional credibility and success, organizational culture is considered as an effective player in shaping attitude and behavior of their workforces as per to the norms and values of institutions (Ali & Musah, 2012). The esteemed and strong culture is recognized widely as active element for the efficient performance of the workforces and continuous sustainable competitive developments of the higher institutions (Saima & Akhtar, 2015). The organizational politics has been considered as crucial element in affecting institutional credibility since it has been widely recognized to have undesirable impact upon the success of higher institutions. The organizational politics denotes to individuals activities which procure the usages of influence and authority to achieve predictable outcome (favorable) (Labrague et al., 2017). The best performances of the workforces are actually considered the respectable performances of institutions. The experts from various contexts are always involved to enhance the strategic organizational development and performance to achieve required aims and objectives of concerned institutions (Anastasios & Chatzoglou, 2019).

2. LITERATURE REVIEW

The research variables which are extracted from existing research have been presented in the literature review which represents the research variables, their definitions, and inter-relationships with other variables under considerations in particular context (higher education). This section also presented the theoretical framework of study which has been constructed by converted the extracted variables into the conceptual framework from where the research hypotheses have been extracted.

2.1 ORGANIZATIONAL CULTURE

In the context of higher educational institutions, the effective culture is no doubt considered as the basic component for institutional excellence and sustainability in a competitive scenario where the institutional reputation and performances are at stake. The concept of organizational culture is broader term that is not confined into the margins (Thornton & Audrey, 2008). The organizational culture can comprehend in different aspects that what is culture and how to understand it as the culture related to organizational performance and significant factor which possess strong position in organizational success (Ali & Musah, 2012). In the context of higher educational institutions the organizational culture consists of social and ethical norms comes on front line to acquire and achieve moral and cultural values with its diverse features included involvement, consistency, mission, and adaptability (Saima & Akhtar, 2015). The organizational culture is mixture of certain vital parameters which when combined together frame the overall culture of institutions. These parameters are mainly concerned with the development of a strong culture in the institutions (Loong et al., 2018).

2.2 EMPLOYEES PERFORMANCE

The employees' performance is considered as a building block for institutional performance as best performances of employees are the guarantee of institutional success. In the contemporary era, most of institutions are moving towards criteria for evaluating different methods in order to manage the organizational performance according to achieve the desired motives and goals of organization (Bartram & Casimir, 2006). The employees' performance depends entirely on the management strategies for the purpose to acquire the mention goals and objectives which are the main pivot of every institution (Asif & Searcy, 2013). The stability and reputation of institution yield the

performance and outcomes that are measured to meet institutional aims and motives (Ghazi & Abbas, 2018). The term employees' performance includes three basic aspects of the institutional effectiveness and stability which comprise efficiency, effectiveness, responsiveness, and commitment. However, institutional performance involves the actual outcomes linked with institutional credibility and success which is the actual outcome of the performance of their workforce (Anastasios & Chatzoglou, 2019)

2.3 ORGANIZATIONAL POLITICS

In the contemporary era, organizational politics is considered as root cause of organizational destruction and downfall. Organizational politics refers to those deeds of the individuals or groups that are occurred for the purpose to acquire personal or group benefits through unfair means and activities (Harris et al., 2007). The organizational politics is broader term to comprehend and describe in words because the term politics underline informal attitude of the groups and individual concerning the different aspects of the working environment in institution, usually disrupting, illegal practice of authority, biased manner, also come into power not through appropriate means of the authority (Utami et al., 2014). The organizational politics denotes to interests of specific group of individuals for their particular interests in the institutions (Labrague et al., 2017). The organizational politics have diverse effects on performances of the employees and institutions since when personal interests are prioritized instead of the institutional interests (Hossein & Hassan, 2019).

2.4 THEORETICAL SUPPORT

In this research study, each variable/concept is supported by certain theories those which are operative in the background and through the concerned concepts get developed. In this connection, researcher used the theories bridging technique as recommended by Ormont (1990) to bridge the supporting theories and to obtain the desired outcomes. The researcher used Denison and Mishra (1995) theory and instrument for the organizational culture, Ferris (2002) theory and instrument for the organizational politics and Uphoff and Muharir (1994) theory and instrument for the employees' performance. The research tried to bridge the said theories in order to obtain desired information by linking one theory with another theory to introduce new knowledge/information about the research variables and their inter-relationships in particular context.

3. RESEARCH METHODOLOGY

In research methodology, this study is conducted from its inception to its completion by using different statistical methods and procedures. The research design of this study offered the complete package of the systematic applications of different tools and techniques which are prerequisites for conducting the research study thereby achieving the desired objectives.

3.1 RESEARCH DESIGN

This study research design comprises the inferential research design wherein the relationship among research variables is prioritized. The main theme behind the inferential design is to examine the existence of relationship among research variables wherein researchers plan minutely every possible dimension of the research likewise from problem identification to its presentation or communication (Creswell, 2007).

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3.2 SURVEY APPROACH

There are several approached recommended by researchers in social science to access the population of the study. The previous studies recommend that the survey approach is widely used to approach the collect primary (first-hand) data from population by using the interviews and questionnaires about opinions and feelings of the respondents (population) to reach conclusions of the study comprehensively (Vehovar & Lozar, 2008).

3.3 POPULATION & SAMPLE

This study population consists of the teaching faculty from four Pakistani universities (two old universities & two newly emerged) comprising the total population of 900 teaching faculty wherein a sample of 276 was selected by using statistical procedures. Among 276 questionnaires, 256 were recollected.

3.4 DATA COLLECTION AND ANALYSIS

The data collection need to be accurate and sufficient data as it is essential to produce systematic and reliable results/outcomes. The primary data is collected from the structured questionnaire as adapted from the previous research studies. In this regard, the correlation, regression and the test of significance tools have been used to analyze the primary data of the study.

4. DATA ANALYSIS & DISCUSSION

The research finding is obtained through data analysis via statistical procedures. The correlation is used to examine association among research variables while hierarchical regression is used to examine cause-effect relationship among research variables under study.

4.1 CORRELATION ANALYSIS

The correlation between variables is presented in Table 1. The hypothesis about association among research variables was examined over correlation and the results provide valuable information. The correlation table shows that there is variables and significant association between employees performance and organizational culture (0.498 & <0.001), between the employees' performance and organizational politics (0.509 & <0.001) and between the organizational culture and organizational politics (0.460 & <0.001). From results, the hypothesis about association is thus accepted and substantiated. The results from the correlation validated the results as the similar results have been presented in existing studies (Harris et al., 2007; Ali & Musah, 2012; Ghazi & Abbas, 2018).

Table 1 Correlation Analysis (Hypothesis # 1) (N =256)

Variables		Organizational Culture	Organizational Politics
Organizational Culture	Pearson Correlation	1	0.460**
	Sig. (2-tailed)		<0.001
Organizational Politics	Pearson Correlation	0.460**	1
	Sig. (2-tailed)	<0.001	
Employees Performance	Pearson Correlation	**0.498****	**0.509****
	Sig. (2-tailed)	<0.001	<0.001

**. Correlation is significant at the 0.01 level (2-tailed).

4.2 REGRESSION ANALYSIS

The second hypothesis was about mediation role organizational politics in the relationship between organizational culture and employees' performance. Table 2 result of indirect relationship (path a) shows 40.5% variation in organizational politics due to organizational culture. The result shows that organizational culture has significant impact on organizational politics (.599 & .000).

Therefore, first path of mediation confirmed the Barren and Kenny (1986) condition that path a must be significant.

Table 2 Regression Procedure (Path a)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.460[a]	0.405	0.404	0.43808

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81.769	1	135.769	417.091	<0.001
	Residual	63.540	254	0.290		
	Total	249.309	255			

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.452	0.165		2.734	0.007
	Organizational Culture	0.599	0.032	0.640	24.639	<0.001

Predictors: (Constant), Organizational Culture, Dependent Variable: Organizational Politics

Table 3 Regression Procedure (Path b, ć, c)

Model Summary									
Model	R	R^2	Adjusted R^2	SEE	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.498[a]	.530	.525	.30166	.630	1043.986	1	254	<0.001
2	.523[b]	.651	.647	.47086	.021	25.318	1	253	<0.001

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	313.066	1	313.066	1243.986	<0.001[b]
	Residual	63.923	254	.252		
	Total	376.989	255			
2	Regression	320.896	2	160.448	723.691	<0.001[c]
	Residual	56.092	253	.222		
	Total	376.989	255			

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.936	.154		-6.080	<0.001
	Organizational Culture	1.067	.030	.911	35.270	<0.001
2	(Constant)	-1.084	.147		-7.389	<0.001
	Organizational Culture	.806	.052	.688	15.419	<0.001
	Organizational Politics	.326	.055	.265	5.943	<0.001

a. Predictors: Organizational Culture
b. Mediator: Organizational Politics
c. Dependent: Employees Performance

The remaining steps of mediation also confirmed the mediation conditions, Table 3. In model 1 concerning direct relationship (c), the results show a 53% variation in employees' performance is due to organizational culture with significant results (1.067 & <0.000). The second model of regression show 65.1% variation in employees' performance is due to the organizational culture and politics with significant outcomes (.806 & .000 and .326 & <0.000) respectively. Therefore, results confirmed all the mediation conditions by showing that all the paths are significant. The results also confirmed the partial mediation as the increase in R square from 53% to 65.1% and the decrease in Beta value for organizational culture in model 1 (1.067) to (0.806) in model 2. Thus, hypothesis#2 about the

mediation is accepted. The results of the study are in line with previous study results (Ahmad & Shalik 2012; Danish et al., 2014; Nazir & Zamir, 2015; Abbas & Awan, 2017).

5. CONCLUSION

This study aimed at examining the mediating role of organizational politics in relationship between organizational culture and employees' performance. As per suggestions of the existing researchers, the strong culture is stronger predictor of the employees' decent performances as the employees feel satisfied in a cultured environment which is also confirmed by the results of this study. The study confirmed significant association and impact between organizational culture and organizational politics, however, the politics in the institutions can bring some undesirable consequences towards the institutional norms and values. The study also confirmed the positive and significant association and impact of organizational politics and employees' performance as the active politics concerning personal interests can affect the performance of employees undesirably. Therefore, the management of higher institutions is direly needed to take certain well-concerted measures to bring at par the situation by managing and controlling the dynamic forces under considerations in this study. The management of higher institutions is required to manage the politics in the institutions to promote positive culture and to increase performances of their employees and the institutions as well.

6. DATA AND MATERIAL AVAILABILITY

All information on this study can be requested to the corresponding author.

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DEVELOPMENT OF MATERIALISM AMONG ADOLESCENTS IN PAKISTAN

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ABSTRACT

The tendency of materialism is making its roots deeper among adolescents around the world. Similarly, it is a threat for Pakistani youth to lose their cultural and religious values. The study intends to use several factors to predict materialism among adolescents in Pakistan. To find the relationship between the variables such as gender, age, communication with peers, consumption pattern, self-esteem and attention to advertising, the study has been conducted in which questions were asked from young people of different universities to analyze how society and their parents have influence on the development of young generation. Results showed that our young generation is influenced by materialism and that can be seen in their consumption pattern of everyday life.

1. INTRODUCTION

A number for different in spite of the fact that similar definitions of materialism need to be created from many authors and psychologists (Kilbourne, Grünhagen, & Foley, 2005). Materialism is an introduction which recognizes cash and material questions as discriminating for social advancement and for the personal bliss (Ward & Wackman, 1971). Furthermore, the material support also neglects the higher needs of belonging, nature for aggregation and representation toward oneself (Inglehart, 1981).The subject matter of materialism and It has on impact as in the Greek philosophers. Materialism could make viewed as likewise any over the top depending on customer products to acquire the finish states tendency of desire, uplift confidence, upper economic wellbeing and create handy interactive association (Bindah & Othman, 2012). Materialism is considered a worth that can be explained as organizing primary morals that provide direction to the people's behavior and picks in each day's routines. It is an ongoing phenomenon that increased in the last years with the process of socialization.

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2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 MATERIALISM AND COMMUNICATION WITH FRIENDS

The procedure by which youngsters and youths obtain aptitudes, learning, and states of mind pertinent to their observing as buyers in the commercial center is characterized as buyer socialization. The two most famous personalities from where youth get inspired and know about things are either their parents or their friends (Anderson, 2004). Material belongings have two implications they speak to intending to their proprietors as in individual values and to society everywhere as in correspondence of qualities. Comparing yourself with someone who is below you as in wealth and status wise gives you a positive mean and if you compare yourself with someone that is higher in status as compared to you give more rise to materialism (Schiffman & Kanuk, 2004). Guardians and companions are essential models of support and acknowledgment and this support is critical to the improvement of solid confidence in youngsters and teenagers (Kasser & Kanner, 2004). Therefore, the first hypothesis is

H_{01}: Social comparison with friends has no impact on the development of Materialism.

2.2 MATERIALISM AND COMMUNICATION WITH PARENTS

A TV plug for individual advance administration included a father getting his child from a primary school. As a result of the father's modest outfit, the youngster moved in the opposite direction of him. The advertisement recommended that the father acquired cash starting the publicist as well as spruced up. The kid came back to the father's grip. Parents pass on materialistic values to their young ones by the representation of these values. Researchers have also reported positive correlations between materialism and socio-oriented family communication (Goldberg et al., 2003). Parents and siblings are key sources of support and acknowledgment, and this support is vital to the improvement of solid confidence in kids and youths. In this segment, we recommend that youths with more supportive parents and siblings have higher confidence, and therefore, find less requirement for material products to make up for sentiments of low self-esteem (Arndt et al, 2004). Hence, second hypothesis

H_{02}: Communication with parents has a positive impact on the development of Materialism.

2.3 MATERIALISM AND SOCIAL COMPARISON WITH FRIENDS

Materialism is antagonistic esteem since it conflicts with relational connections and is contrarily connected with satisfaction and subjective well-being (Kasser & Kanner, 2004). The estimation of the social face will maintain the owning of typical products to enhance individual approaches inside the social adapted values (Keong et al., 2012). Social comparison has been an imperative idea in the investigation of how consumers follow ideal pictures from advertisements and then they apply it on themselves (Gulas & McKeage, 2000). Youngsters need to figure another personality and set up self-governance from their parents. They progress toward becoming freer in their decisions. Subsequently, youngsters tend to look for individual connections that offer an incentive to their points of view and guarantee that their sentiments are caught on (Khan et al., 2019). Peer gatherings, with their mutual experience, are an inescapable wellspring of these connections. Therefore, youngsters like to relate to peers. The regular association with peers, considerably more successive than with guardians can prompt companions getting to be the essential reason for social correlation.(Collett-White & Saunders, 2001). Therefore, the third hypothesis is stated as

H_{03}: Social comparison with friends has no impact on the development of Materialism.

2.4 MATERIALISM AND ADVERTISEMENT

Planned advertising impacts refer to kids' image mindfulness, mark states of mind, and buying goals. This examination concentrates on the not premeditated impacts of promoting, for illustration, on the family struggle and the materialistic qualities. At the end of the day, not deliberate impacts are the auxiliary, typically negative, impacts of kids' presentation to advertising (Xu, 2008). It has been confirmed that kids in early adolescence (ages two to seven) are more ineffective against significant data since they have less involvement and area particular learning that they can utilize while preparing advertisements (Buijzen & Valkenburg, 2003). Marketing tactics can promote materialism since it "focuses on what we have, not our identity" moreover it focuses on what should we do rather than who we are and what our ancestors have taught us about life Sirgy et al. (2012). Advertisements of goods and services and other consumables that are shown on the Television sometimes advertiser link them with the status which further creates materialism (Moschis et al., 2011). The fourth hypothesis of the study is stated as:

H_{04}: Advertising has no impact on the development of Materialism.

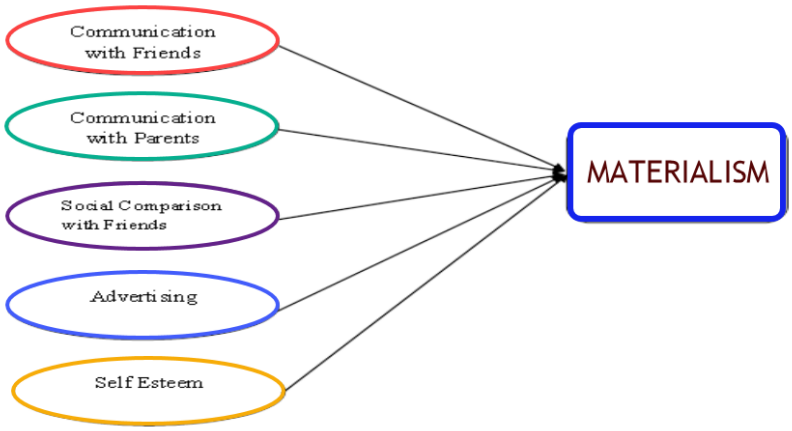

Figure 1: The simple study framework of five factors affecting materialism.

2.5 MATERIALISM AND SELF ESTEEM

Most scientists trust that materialistic products are an instrument for people to adapt to or make up for questions about their security, skill, and self-esteem (Khan et al. 2019). The decrease in confidence from center youth to early youthfulness has been clarified by a few components, including physical changes going with pubescence that make youngsters extremely basic and reluctant, disparities between a perfect self and moving into middle schools where they are the most youthful and minimum imperative individuals of the school (Simmons & Simmons, 1994). Analysts have clarified that young people deal with their impressions by wearing brands and items utilized by their social circles and peers, for example, dress, music and even cigarettes, using them as props to look for an associate acknowledgment (Collett-White & Saunders, 2001). The confidence starts to bounce back and the accentuation on material belonging is diminished. As more established teenagers turn out to be more practical about their self-esteem and more alright with their social condition the requirement for adapting procedures to defeat emotions of low self-esteem turns out to be less earnest (McCarthy, 2005).

H_{05}: Self Esteem has no impact on the development of Materialism.

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According to Kasser and Kanner (2004) Model, consumers including children and adolescents develop materialism through a sense of insecurity. On the basis of above discussion the proposed theoretical framework of the study is shown in Figure 1.

3. RESEARCH METHODOLOGY

As the research is based on the adolescents so we float questionnaires among students of three universities namely COMSATS University, Bahria University, and Air University. Apart from them, E Questionnaires were float in order to check the response from throughout Pakistan. If someone living abroad wants to take data from Pakistan so this paper will be helpful that's why data was gathered from other respondents as well using Google forms. The questionnaires among 350 youth and about 350 responses were floated. The data has also collected the questionnaires over Google forms as well in order to see response of students and children sitting throughout in Pakistan just to make the research more effective. A standardized questionnaire was used for the collection of data in which Likert scale was applied which is from 1-5 (Strongly Agree to Strongly Disagree).

4. ANALYSIS OF DATA

A total of 350 questionnaires were floated among students of three universities and 250 were received as well. Both male and female respondents participated actively and showed a very positive response towards this research. Some questionnaires were floated over the Google forms as well in order to see the response of people throughout Pakistan. Reliability means how much the procedures utilized for gathering and examination of data are required to be comparative in results to past reviews. Measuring unwavering quality gives data about how reliably the factors can be measured. Cronbach's alpha is the most generally used formula for measuring reliability on the basis of internal consistency.

4.1 RELIABILITY ANALYSIS

As per Malhotra (1987), the average minimum value for Cronbach's Alpha is between 0.5-0.9 and since the value of Cronbach's Alpha for Materialism is 0.728 for this study, it is sufficient to confirm the goodness of the measure. Table 1 shows the reliability values of all the variables under study.

Table 1: Reliability Statistics

Variables	Cronbach's Alpha	No. of Items
Materialism	0.728	9
Communication with Parents	0.521	4
Communication with Friends	0.521	4
Social Comparison with Friends	0.656	4
Self Esteem	0.656	4
Attention to TV Advertising	0.753	6

As the value of Cronbach's Alpha for Communication with Parents is 0.521 for this study, it is enough to confirm the goodness of the measure. Since the value of Cronbach's Alpha for Communication with Friends is 0.521 for this study, it is satisfactory to confirm the goodness of the measure. In this case, the value of Cronbach's Alpha Communication with friends is 0.656 for this study, it is appropriate to confirm the goodness of the measure. The value of Cronbach's Alpha is for Self Esteem is 0.656 for this study which is abundant to confirm the goodness of the measure. Since the value of Cronbach's Alpha is 0.753 for Attention to TV Advertising, it is ample to confirm

the goodness of the measure.

4.2 REGRESSION ANALYSIS

In statistical modeling, regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables when the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). Explained in statistics, the coefficient of determination (R^2) is used to calculate a prediction of future outcomes and test to what extent this model fits. The value of R^2 ranges from 0 to 1.0, used to tell how much regression is fitting with the data on which regression analysis is applied. If the value of R^2 is closer to 1.0, it indicates that regression line fits the data well and there is relationship between the dependent and independent variables. Similarly if this value is close to 0 that indicates there is no strong relationship between two variables in which relation is being checked and the model that is used in also not appropriate for the current studies. For this research data we have seen that the value is greater than 0.5 which is providing a clear indication that there is relationship between dependent and independent variables. R^2 value in our case is 0.757 which proves that 75.7 variations in the dependent variable were proved through some variation in the independent variable. Table 2 shows the regression values of the model under investigation.

Table 2: Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.852	0.068		12.606	<0.001
	Communication with Parents (X1)	0.194	0.026	0.230	7.532	<0.001
	Communication with Friends (X2)	0.464	0.049	0.735	9.381	<0.001
	Social Comparison with Friends (X3)	0.366	0.049	1.093	13.412	<0.001
	Self Esteem (X4)	-0.031	0.018	-0.071	-1.765	0.078
	Attention to TV Advertising (X5)	0.576	0.028	1.021	20.356	<0.001
Adjusted R square		0.753		F value		214.132
a. Dependent Variable: Materialism						

The fitted model for this research is Y= 0.852 + 0.19*X1 + 0.464*X2 + 0.3660*X3 -0.031X4+ 0.576*X5. This equation shows that that one unit change in our independent variable i.e. communication with friends brings a 0.19% change in the dependent variable whereas one unit change in communication with friends brings a change of 0.46% in the dependent variable. The one-unit change in our independent variable i.e. social comparison with friends brings a 0.66% change in the dependent variable. The one-unit change in our independent variable i.e. attention to TV advertising brings 0.57% change in the dependent variable. All these variables excluding self-esteem have positive relationship with materialism and hence prove that communication between friends, parents, social comparison with friends results in developing materialism in adolescents in Pakistan. Overall our analysis proves that variables chosen promote materialism in Pakistan.

5. DISCUSSION

Technology is playing a very important role in grooming the personalities of kids, youngsters, and professionals. Most of the time we do not need something but we buy them after watching the advertisement on the television or seeing someone using that particular item. In the same way,

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marketing plays a vital role in developing feelings in the buyer's mind. Marketing agencies and marketers should use marketing tools for healthy activities. There should be positive word of mouth rather than negative. It is the responsibility of marketers to create positive materialism among consumers and buyers. Brands should also create a positive image. The findings of this research have concluded some advisable behavior for marketers, groupmates, social gathering and guardians. Guardians and teachers ought to talk about with kids and teenagers how to adapt to their own status of material belonging. The Government of Pakistan should start a training and education program for the youths who are entering their professional life in which it should create some positive materialism in the mind of youths rather than negative values.

6. CONCLUSION

All studied variables, excluding self-esteem, have a positive relationship with materialism and hence prove that communication between friends, parents, social comparison with friends results in developing materialism in adolescents in Pakistan. Overall our analysis proves that variables chosen promote materialism in Pakistan. The outcomes showed that guardians are not so much mindful of the negative results materialism can have on their kids. It was likewise uncovered that the larger part of guardians and kids relate achievement, self-satisfaction to the responsibility for belonging. Communication with friends has an influence on materialism as when youth or students see their friends that what are they wearing, what's going on in their friends' life. The consumers also want to do that as they are communicating with their friends and hence it gives rise to materialism. Discussed in the literature review friends are role models for youngsters and most of the time young consumers follow their friends as role model and there is positive relationship between communication with peers and materialism. Social comparison with friends has also a positive relation with materialism as when students go out of the home and they start learning together with friends or hanging out with their friends they have been continuously watching and monitoring their friend's habits and noticing them and most of the time when people grow up when they enter in college and university they like to share their problems with their friends as well as level of confidence has been established between them and their friends. Likewise it gives there is continuous learning process and hence they follow their social gang's living pattern, their buying behavior, their likes and dislikes and hence give rises to materialism. So there is a constructive correlation between materialism and social comparison with friends. The estimation of societal correlation in this review included upward correlation as it were. Along these lines, the discoveries strengthen upward social correlation of utilization supports materialistic desires. As we have seen that there is a positive correlation between these advertising and materialism two. The outcomes show that significant consideration regarding notices was adequate to create effect on materialistic qualities. The proof in this review shows that restricting youngster's introduction to promotion may not be a powerful methodology in discouraging realism. TV had positive relationship with consideration regarding TV promoting. However, daily papers and the web had no positive relationship with consideration regarding TV advertising.

There might be two explanations behind it. In the first place, the time spent on daily paper was the most reduced between the four medium chose. The restricted time depleted on the medium may bring about an irrelevant effect on individual qualities. Second, as regard for TV advertising was measured and not a wide range of ads, it was sensible to uncover that respondents investing more

energy in the television course pay more regard for ads in that medium than respondents investing less energy in the TV programs.

7. AVAILABILITY OF DATA AND MATERIAL

Data can be made available by contacting the corresponding authors

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A HUMAN RESOURCE INDIVIDUAL DEVELOPMENT MODEL BASED ON THE GROUNDED THEORY APPROACH

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ABSTRACT

This study developed a Human Resources Individual Development (HRID) model for Tehran,'s Special Security Organization. This is a qualitative study using the grounded theory as a research method. The population of this study was human resource development (HRD) experts and managers of the social security organization. A total of 16 HRD specialists were selected purposefully to be interviewed. Data were collected from a semi-structured interview. Collected data was analyzed in three phases: open coding, axial coding, and selective coding. The data analysis result identified 32 concepts for six aspects of the HRID model for Tehran's Special Security Organization as follows: four concepts for causative conditions (knowledge-centered, performance management, individual identity, motivation), four concepts for contextual conditions (personal and inter-personal communication, learning and education infrastructure, attention to human capital, stable and meritorious management), five concepts for main phenomena (ethic and professionalism, self-efficacy, creativity, information and technology skills, team-work and communication skills, psychological and behavior features), six concepts for intervening conditions (participation and foresight, justice and work ethics, specialization, personal growth, performance system evaluation, participation and foresight), eight concepts for strategies (analysis and feedback, self-esteem, organizational and job commitment, technological infrastructure, analytical and systematic thinking, transparency and safety, education and research, planning), and six concepts for actions (employees' efficiency, meritocracy and specialization, up-to-date knowledge, higher-order thinking skills, psychological needs improvement, organizational performance improvement). These concepts altogether create the HRID model for Tehran,'s Special Security Organization.

1. INTRODUCTION

From the past, development has always been one of the main concerns of organizations (Brewster et al., 2016). One of the most important development factors is the development of human

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resources. Human resource development is one of the variables that affect innovation, performance, productivity, satisfaction, commitment and organizational culture (Ivanova, 2015; Hosseini et al., 2017). Due to the competitive environment of the business environment, access to appropriate resources is considered to be the most obvious factor for the success of organizations. In the meantime, human resources are the only source that is more distinct from other sources and does not have the negative features of other resources such as mortality, imitation, etc. (Khaef-Elahi, Rouhani & Niri, 2017). Human resources are of great importance as the infrastructure, context, and basis for national and native development (Brown, & Latham, 2018; Nasehifar et al., 2018). McFadden (2015) states that in the era of globalization and rapid technological progress, human resources are considered to be the most important capital of organizations, which includes a set of skills, knowledge and general characteristics of individuals in an organization that can represent the capacity to do today's work and the potential of tomorrow's work. Of course, the meaning of human resources is a powerful and knowledgeable human resource that is promoted through human resource development systems and processes (Golipour et al., 2017). Since the 1980s, when the role of human resources in the investment portfolio of the organizations and their achievement was confirmed, the HRD unit played a significant role in realizing organizational strategies and became a strategic category (McGuire, 2014). From the point of view of the experts, HRM is considered to be strategic and long-term. However, human resources strategy knowledge does not reach 35 years of age (Snell et al., 2015). The value of finding a human factor as the driving force behind strategic initiatives has led to the widespread acceptance of the leaders of the organizations coming from this new knowledge and has led to new approaches to human resources, including recruitment and placement, apprenticeship training, compensation services, and human resource performance assessment (Bratton, & Gold, 2017). Actions related to human resource development have a significant impact on organizational performance. So, organizations are doing their best to develop their human resources. These actions include designing and providing education, training, and development to improve organizational effectiveness (Snell et al., 2015). Human Resource Development is a framework for helping employees develop their individual skills and competencies, through the provision of training opportunities, career development, substitution programs, management and performance development, organizational coaching and organizational development for achieving organizational goals (Cascio, 2018; Albrecht et al., 2015; Marchington et al., 2016; Lussier, & Hendon, 2017).

Lussier and Hendon (2017) argue that human resource development is being developed to develop knowledge, expertise, productivity, and work satisfaction at a variety of individual, team, organizational or national levels. Human resource development at the individual level can be divided into two categories: the development of the individual as a person and the development of capabilities and capabilities as a value for human resources (Garavan et al., 2004). Russ-Eft (2000) states the importance of individual human resource development and says that in the development of human resources, human capabilities and capabilities should be addressed not the number of human resources.

The levels of analysis in human resource development can be divided into three levels of individual, organizational and social. The social level of human resource development emphasizes community development, national competitiveness, and networking (Garavan et al., 2004). The level of organizational development of human resources emphasizes the aspect of human resources development resources. At this level of analysis, human resource development should develop

development activities or interventions that support the achievement of organizational goals. At the individual level, the human dimension of human resource development is generally emphasized. This level focuses on the analysis of concepts such as self-efficacy, self-esteem, learning motivation and motivation through expectations (Tonkenejad, & Davari, 2009). Accordingly, a large part of the research carried out at the individual level in the field of human resource development is based on a humanistic philosophical approach. The two main streams of this level can be personal development and the development of competencies and valuable capabilities for the job market (Garavan et al., 2004).

Individual development of human resources has a special emphasis on human capital and believes that the development of employees in the organization as a source can provide a competitive advantage. In a competitive environment today, human resource management is considered the key to the success of any organization (Steffen et al, 2015). Individual development of human resources is one of the key issues that undoubtedly plays a decisive role in different organizational dimensions and organizations are required to develop human resources in order to achieve long-term goals and sustainability in the competitive world of modern business. The importance of individual development of human resources in organizations can be classified into several categories, some of which are:

- The empowerment of organizations means developing people to achieve amazing achievements.
- Sustainability and employee satisfaction. Sustainability is the result of the maintenance of human resources and the development and empowerment of the forces themselves will result in the survival of human resources.
- Creativity. Individually-developed staffs feel that they are influencing their outcomes through their abilities, skill, and endeavors, hence the likelihood of creativity and innovation.
- The satisfaction of customers. Individually-developed staff can better handle the issues and, as a result, seek satisfaction from the client.
- Other benefits of individual HR development include improving organizational performance, human resource productivity, satisfaction, organizational success, promoting creativity and innovation, increasing learning and developing capabilities and capabilities of employees.

Therefore, one of the most important pillars of development in any organization is the development of human resources, especially at the individual level. The role of human resource development in employee satisfaction, organizational performance, productivity, organizational effectiveness, organizational innovation has been investigated and confirmed (Hossienpour, & Gorbani-Baji, 2017; Rasouli et al., 2016; Jazni et al., 2010). But despite the importance of developing human resources on an individual level, no significant research has been done. In particular, research that seeks to explain a comprehensive model for individual human resource development has not been seen. Therefore, the present study was aimed at explaining and designing the individual development model of human resources. The context for this study was Tehran's Social Security Organization.

2. METHODOLOGY

This fundamental research develops a set of knowledge on individual human resource development (HRD). This research has been carried out within the framework of a qualitative approach by using the grounded theory method. The population of this study was HRD experts and

managers of the social security organization. 16 HRD specialists were selected purposefully to be interviewed. Theoretical sampling logic was used to determine the sample size, and with this logic, the sampling process was performed until theoretical saturation. In other words, the data collection process was continued until there was no new information collected by the new interviewee. In view of this logic, in order to gather information, by selecting a targeted sampling method, 16 experts familiar with human resource development issues as well as social security organization managers were selected for the interview. Among the experts and managers participating in the study, 14 participants (88%) were men and 2 women (12%). The largest age range of participants in the study was between 30 and 40 years old, of which 6 (38%) and then the age range of 20 to 30 years were 4 (24%). Interviewees from 40 to 50 years old, including 3 (19%), as well as participants over 50 years old, also included 3 interviewees (19%). Of the 16 interviewees, 12 (75%) were experts in human resource development and 4 (25%) including Tehran Social Security Managers. The academic degree of 10 participants were (63%) PhD and 5 of the interviewees (31%) had MA and 1 (6%) had a BS degree. Data were collected by doing a semi-structured interview. Interview questions were presented in the form of a paradigmatic model of grounded theory that included the causative conditions, interventional conditions, contextual conditions, strategies, main categories, and outcomes. To analyze data, three open coding, axial coding, and selective coding phases were followed. In the open coding step, naming and categorizing data was done in which often referred to as a single thread. In the axial coding step, we were looking for an exploration of the relationship of the code that was extracted in the open coding step. In other words, axial coding was a process in which data that decomposed into concepts and categories were studied in a new way, in order to link between one category and concepts within it and even other categories. In the selective coding step, we used the results of the previous coding steps and chose the main categories and systematically linked them to other categories and validated the communications. This coding process was based on the methodology developed by Strauss and Corbin (1998). The data analysis tool was NVivo11 software, powerful software in qualitative data analysis.

3. FINDINGS

The results of the qualitative analysis of data show the extraction of 132 final codes and 32 concepts and 6 main categories that are presented in the paradigm-model of the individual development model of human resources. The validity of the model was confirmed by the Content Validity Ratio (CVR) and Content Validity Index (CVI).

The reliability of the model was also reported 0.64 through the CAPA test, which is confirmed due to the high number of this numeric value for the Kappa index (0.60). The results of this study are reported in (Table 1) and (Table 2) and the model is presented at the end.

Table 1: Content validity ratio (CVR) results

Category	Concept	No. of experts agree	No. of experts do not agree	CVR
Causative Conditions	Knowledge orientation	13	3	0.81
	Performance management	13	3	0.81
	Identity	14	2	0.87
	Motivation	13	3	0.81
Contextual Conditions	Personal and interpersonal communications	14	2	0.87
	Learning and educational infrastructure	13	3	0.81
	Human capital	14	2	0.87
	Stable and meritorious management	15	1	0.94
Interventional	Justice and work ethic	13	3	0.81

Category	Concept	No. of experts agree	No. of experts do not agree	CVR
Conditions	specialization	14	2	0.87
	Personal growth	15	1	0.94
	Performance system evaluation	13	3	0.81
	Participation and foresight	10	6	0.86
Main Phenomena	Psychological and behavior features	13	3	0.81
	Teamwork and communication skills	13	3	0.81
	Technological and information skills	14	2	0.87
	creativity	15	1	0.94
	Ethics and professionalism	14	2	0.87
	Self-efficacy	14	2	0.87
Strategies	Analysis and feedback	13	3	0.81
	Self-esteem	14	2	0.87
	Organizational commitment	15	1	0.94
	Management and technological infrastructure	14	2	0.87
	Analytical and systematic thinking	13	3	0.81
	Transparency and safety	14	2	0.87
	Education and research	15	1	0.94
	planning	15	1	0.94
Actions	Efficiency	14	2	0.87
	Specialization and meritocracy	14	2	0.87
	Up-to-date knowledge	14	2	0.87
	Higher order thinking skills	14	2	0.87
	Psychological needs improvement	15	1	0.94
	Performance improvement	14	2	0.87
	Management improvement	13	3	0.81

According to the results of the analysis of the Content Validity Index (CVR), we find that all of the concepts have a content validity ratio.

Table 2. Content validity index (CVI) results

Category	Concept	Code	No. of experts agree	No. of experts do not agree	CVI
Causative conditions	Knowledge orientation	Knowledge management	14	2	0.87
		Up-to-date knowledge	14	3	0.81
		Employee training	14	2	0.87
	Performance management	Performance assessment system	15	1	0.94
		Application of modern technologies	14	2	0.87
		Matching individual goals with organizational goals	13	3	0.81
		Management support	15	1	0.94
		Experience transfer opportunity	15	1	0.94
	Identity	Create a thought room	14	2	0.87
		Feedback system	13	3	0.81
		Attention to individual identity	14	2	0.87
	Motivation	Merit-based promotion	14	2	0.87
		Clear job description	13	3	0.81
		Employee reward system	13	3	0.81
Contextual conditions	Personal and interpersonal communications	The synergic relationship among employees	15	1	0.94
		The synergic relationship between managers and employees	14	2	0.87
		Socialization of employees	15	1	0.94
	Learning and educational infrastructure	Creating a learning system	14	2	0.87
		Employees Learning networks	14	2	0.87
		Collaborative learning	13	3	0.81
		Educational budget	15	1	0.94
		Educational technologies	13	3	0.81
	Human capital	Job satisfaction	14	2	0.87
		Attention to staff comments and ideas	14	2	0.87
		Freedom of actions	15	1	0.94
		Social capitalism	14	2	0.87
		Attention to self-efficacy	13	3	0.81
	Stable and meritorious management	Management stability	14	2	0.87
		Develop a sense of accountability	14	2	0.87
		Performance support system	15	1	0.94
		Healthy and sympathetic workspace	13	3	0.81
Interventional conditions	Justice and work ethic	Payment based on justice	13	3	0.81
		Attention to equality	13	3	0.81
		Professionalism and ethic	15	1	0.94

Category	Concept	Code	No. of experts agree	No. of experts do not agree	CVI
	specialization	Attention to the expertise	14	2	0.87
		Knowledge-based decision	13	3	0.81
		Scientific membership	14	2	0.87
	Personal growth	Employees expectations	13	3	0.81
		Free space	14	2	0.87
		Attention to cognitive skills	15	1	0.94
		Talent management	13	3	0.81
		employees interests	14	2	0.87
	Performance system evaluation	Goal-based performance assessment	14	2	0.87
		Cost efficiency evaluation	14	2	0.87
		Performance system management	13	3	0.81
	Participation and foresight	Internship courses	11	5	0.87
		Staff training gaps	10	6	0.81
		Teamwork and participation	10	6	0.94
		Futurology in human resources development	9	7	0.87
Main phenomena	Psychological and behavior features	Employees motivational factors	14	2	0.87
		Psychological needs	13	3	0.81
		Employee expectations	14	2	0.87
		Personality traits	15	1	0.94
		Behavioral characteristics	15	1	0.94
	Teamwork and communication skills	Promoting verbal communication skills	14	2	0.87
		Promotion of non-verbal communication skills	15	1	0.94
		Principles of individual communication	13	3	0.81
		Employees teamwork	14	2	0.87
	Technological and information skills	Media literacy of employee	14	2	0.87
		Information literacy of employee	14	2	0.87
		Technological skills of employee	13	3	0.81
	creativity	Enhance creative thinking	14	2	0.87
		Sense of discovery	15	1	0.94
		Attention to ideas	14	2	0.87
		Critical thinking skills	13	3	0.81
	Ethics and professionalism	Modesty and honesty	15	1	0.94
		Ethical values	14	2	0.87
		Responsibility	13	3	0.81
		Commitment	15	1	0.94
	Self-efficacy	Potential and actual capabilities	14	2	0.87
		Self-actualization	14	2	0.87
		Mental health	13	3	0.81
		Perfectionism	14	2	0.87
		Desire for success	15	1	0.94
Strategies	Analysis and feedback	Performance feedback system	14	2	0.87
		Problem-solving skills	13	3	0.81
		SWOT matrix	14	2	0.87
		The balance between performance and payment	15	1	0.94
	Self-esteem	Strengthening self-esteem	14	2	0.87
		Sense of social dignity	13	3	0.81
		Self-esteem improvement strategies	14	2	0.87
		Self-regulation skills	13	3	0.81
		Attitude assessment system	14	2	0.87
	Organizational commitment	Job commitment	14	2	0.87
		Organizational affiliation	14	2	0.87
		Emotional attachment to organization	14	2	0.87
	Management and technological infrastructure	Technology infrastructure	13	3	0.81
		Development policy	14	2	0.87
		Readiness for change	15	1	0.94
		Strategic management	14	2	0.87
	Analytical and systematic thinking	Analytical thinking skills	13	3	0.81
		Systematic thinking skills	13	3	0.81
		Interpersonal communication requirements	13	3	0.81
	Transparency and safety	Transparent process	13	3	0.81
		Secure workspace	14	2	0.87
		Intellectual capital	13	3	0.81
	Education and research	Training needs	14	2	0.87
		Research abilities	15	1	0.94
		instruction	14	2	0.87
	planning	Proportionality of powers and responsibilities	13	3	0.81
		Importance of planning	13	3	0.81
Actions	Efficiency	Increased efficiency	14	2	0.87
		Empowering employees	15	1	0.94
		Improve staff performance	14	2	0.87
		Improve problem-solving skills	14	2	0.87
	Specialization and meritocracy	Improve specialization	13	3	0.81
		Improve meritocracy	14	2	0.87
	Up-to-date knowledge	up-to-date staff	14	2	0.87
		Improve verbal and non-verbal communication skills	14	2	0.87

Category	Concept	Code	No. of experts agree	No. of experts do not agree	CVI
		Pleasant working environment	14	2	0.87
	Higher order thinking skills	Improve systematic thinking	14	2	0.87
		Improve analytical thinking	15	1	0.94
		Improve information literacy	15	1	0.94
		Improve technological skills	15	1	0.94
	Psychological needs improvement	Increased motivation	14	2	0.87
		Improved self-efficacy	14	2	0.87
		Personal growth	15	1	0.94
		Improved self-esteem	15	1	0.94
		Mental health	14	2	0.87
	Performance improvement	Improve job commitment	13	3	0.81
		Improve job satisfaction	13	3	0.81
		Organizational belonging	14	2	0.87
	Management improvement	Improved performance-based payment system	14	2	0.87
		Improved performance management	15	1	0.94
		Increase of employee retention	14	2	0.87
		Avoid Wasting Talent	14	2	0.87
		Reducing conflicts of interest in the organization	13	3	0.81
		Improve sense of responsibility	13	3	0.81
		Improved accountability	15	1	0.94

According to the results obtained for the Content Validity Index (CVI), all items in the category of the terms of the intervention have valid content validity.

4. THE BUILT HRID MODEL

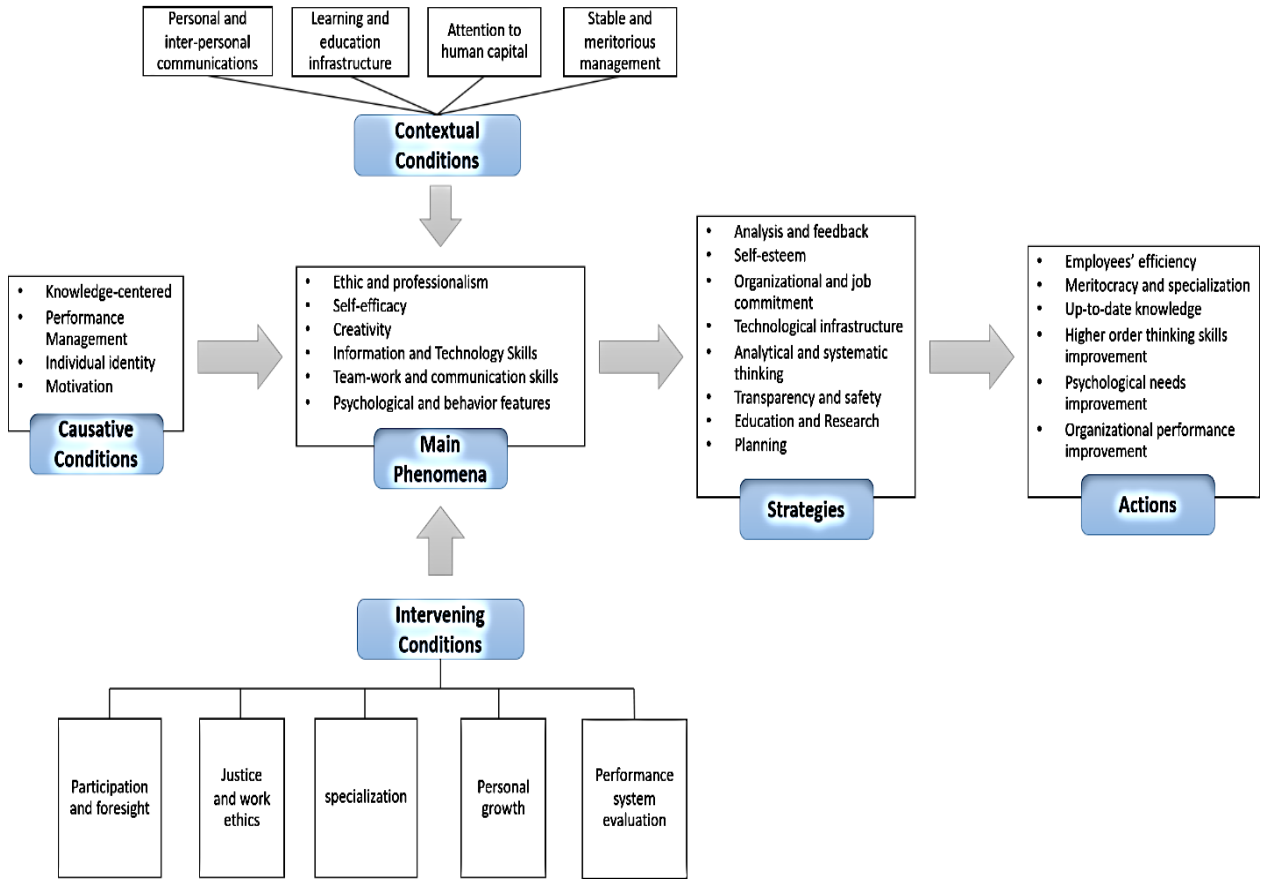

Figure 1: The HRID model obtained from this study.

The theoretical model presented in (Figure 1), which is based on the analysis of interview data with experts, shows that in the individual development of human resources in the organization, six factors play a key role. (1) causative conditions (knowledge-centered, performance management, individual identity, motivation), (2) contextual conditions (personal and inter-personal communication, learning and education infrastructure, attention to human capital, stable and

meritorious management), (3) main phenomena (ethic and professionalism, self-efficacy, creativity, information and technology skills, team-work and communication skills, psychological and behavior features), (4) intervening conditions (participation and foresight, justice and work ethics, specialization, personal growth, performance system evaluation, participation and foresight), (5) strategies (analysis and feedback, self-esteem, organizational and job commitment, technological infrastructure, analytical and systematic thinking, transparency and safety, education and research, planning), and (6) actions (employees' efficiency, meritocracy and specialization, up-to-date knowledge, higher-order thinking skills, psychological needs improvement, organizational performance improvement).

5. CONCLUSION

This study was an effort to bridge between theory and practice in terms of human recourse individual development. The results were led to an HRID model which can be used by Social Security Organizations. Four main concepts were extracted for causative conditions. In explaining these findings, it can be said that attention to knowledge management is the key to the survival of organizations in the twenty-first century (Lehrer, 2018). Golipour et al. (2017) point out that one of the features of a powerful human resource is having the necessary knowledge. Other research also supports the role of the agents of performance management, individual identity, and motivation in human resource development (Liao, & Wu, 2010; Nam Nguyen, & Mohamed, 2011; Mills, & Smith, 2011; Van Dooren et al., 2015; Kearney, 2018; Pekuri et al., 2015). In terms of contextual conditions, it can be said that on the one hand, meritocracy is the key to success and victory of corrective movements and the condition of survival, durability, and continuity of organizations. On the other hand, one of the main factors in the ability of organizations is to raise the level of knowledge and expertise of managers and organizers of the organization. Research also shows the positive effect of continuous management and meritocracy on employee productivity, employee satisfaction, organizational membership and organizational trust (Ansari-Renani, & Tabataba'i, 2005). Considering human capital is also very important because of the role of human capital in development (Acemoglu et al., 2015) and attention to human capital in the individual development of human resources is necessary and necessary, which provides the ground for the formation of individual development. Another important issue is the formation of human resource development, the infrastructure for learning and learning. Research shows that employees' education and learning have a positive and significant relationship with development, performance, innovation and knowledge management (Giniuniene, & Jurksiene, 2015; Hamilton, & Scandura, 2003). Another factor is the interpersonal and personal communication. Communication is one of the most important indicators of the life of any society. Healthy communication brings personal and social vitality and is, in fact, one of the main tools for meeting human needs. Paying attention to the principles of individual and interpersonal communication is one of the important indicators of individual development of human resources in any organization and it promotes organizational productivity and improves organizational innovation (Hellweg, & Phillips, 1982).

According to the results of qualitative analysis of data, the factors influencing individual development of human resources as interventional conditions are performance evaluation system, attention to the personal growth of employees, specialization, participation and prospective, core justice and professional ethics. Interventional conditions can facilitate or limit the development of

individual human resources. The absence of the four factors can limit the development of individual human resources and the presence of these factors can facilitate the formation of individual human resources development. The results of the data analysis for the main phenomenon show that six categories can be considered as the main categories in the individual development of human resources. In explaining of these findings it can be said that work ethics is considered to be the most important cultural factor in economic development, that is, work ethic is a cultural norm that gives a positive and positive spiritual value to the work of the community and believes in it that work itself has an intrinsic value. Researches also show the effect of work ethics on organizational performance, job satisfaction, organizational commitment, and job stress (Eskandari, & Irandoost, 2014). Self-efficacy is a person's ability to organize and implement necessary actions in the situations ahead. If employees of the organization have high self-efficacy, they can expect to control their stress, act in a more effective way, improve their performance, have better mental health, have a higher incentive to perform their activities (Walumbwa, & Hartnell, 2011). Another major factor in the individual development of human resources is creativity and ideas. Due to the rapid development of technology in different fields and the design of new needs in society, the need for expert and creative expertise in all aspects is essential. Research also shows a positive relationship between creativity and productivity. The other main category is technological and informational skills. The UNESCO organization has provided information and media literacy or, in other words, information and technology skills as one of the fundamental skills of human rights in the twenty-first century (UNESCO, 2007). In addition to information skills, communication skills are also important for individual employee development. Constructive communication among employees of the organization leads to improved teamwork and active participation and effectiveness in the organizational process and leads to increased organizational productivity. Another major issue is to pay attention to the psychological and behavioral characteristics of individual employee development. The significance of this issue becomes more apparent when we see that even some of the researchers of individual development of human resources are only subject to the development of individual psychological characteristics such as self-esteem, self-efficacy, motivation, personal growth, needs, expectations and learning motivation (Tonkenejad, & Davari, 2009).

For strategies aspect, eight concepts were extracted. The category of analysis and feedback as a strategy for the individual development of human resources in the organization helps employees receive information about their performance and to identify their strengths and weaknesses and grow themselves (Ashford, & Tsui, 1991). There is a need for feedback for individual HR development because, without feedback, it is not possible for employees to be aware of their performance status within the organization. The second strategic category is self-esteem. Self-esteem has different dimensions, one of these dimensions is organizational self-esteem (Sadegian et al., 2009). Organizational self-esteem is a degree of belief in members of the organization that they can meet their needs by sharing their roles within the organization. This refers to the self-perceived value of individuals about themselves as organizational members in which they act (Gurney, 2018). The third strategic category is occupational and organizational commitment. Job and organizational commitment will increase the sense of responsibility of employees, and subsequently, employees become sensitive to the future of the organization. The importance of this is when we know that the survival of the organization depends on the presence of up-to-date, dedicated and committed employees. Infrastructure of technology and education as the fourth strategy of personal development

of human resources in the organization is raised. The existence of technology and education infrastructure to empower workers and, consequently, individual development of human resources is essential. Systemic and analytic thinking as high-level thinking skills is an effective feature of individuals. The systemic and analytical thinking of the process of knowledge is based on analysis and composition in order to achieve a complete and comprehensive understanding of a subject and to have such a thinking helps employees understand the whole system (organization), its components, the relationships between the components and the relationships with the environment. Research also confirms that systemic and analytic thinking leads to improved employee performance (Fishaei et al., 2010). Transparency and security are another strategic issue. Organizational transparency refers to the availability of information, the openness of the basis of decisions and mechanisms governing the distribution of power, revenue and other resources in the organization. An organization that has transparency does not create ambiguity in the minds of its employees. Organizational transparency as a sustainable competitive advantage is a prerequisite for an effective organizational performance (Schnackenberg, & Tomlinson, 2016). Another important strategic issue in the individual development of human resources is research. In addition to training, research is also important in individual human resource development. Training or apprenticeship helps employees improve their skills and, in fact, plays an important role in empowering employees. The outcomes of human recourse individual development include: improving employee performance, specialization and meritocracy, knowledge and communication, improving high-level thinking skills, improving psychological needs, improving organizational performance.

If we want to conclude from the findings of this research, we should mention the importance of individual development of human resources as one of the sources of the survival and prosperity of the organization's employees and it is expected that the findings of this research would lead to operational and operational implications in line with Individual development of human resources in organizations, especially the social welfare organization.

6. DATA AVAILABILITY AND MATERIAL

Data involved in this study can be requested to the corresponding author.

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SUPPLY CHAIN MANAGEMENT AND ANALYSIS OF PHARMACEUTICAL DISTRIBUTION MODELS IN PHARMACEUTICAL COMPANIES

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ABSTRACT

The pharmaceutical industry is defined as a set of processes, operations, and organizations involved in the discovery, creation, and production of drugs. Given the extent of the drug supply chain, this article focuses on supplier selection and what factors should be considered to select a supplier in a supply chain to reduce the risk involved in the supply chain. This study seeks to understand the factors affecting the drug supply chain in the country. This research is practical and developmental in terms of goal and it is descriptive in terms of performance. The data collection method uses interviews and questionnaires. The content validity was used to determine the validity and reliability of the questionnaire and the professors and experts were asked about the relation of question with topic and the visibility and clarity of the question. Cronbach's alpha gives reliability estimation higher than 0.7 using SPSS software. Data were analyzed by factor analysis of SPSS software. MADM algorithm was used with Fuzzy TOPSIS method for weighting the components. In this study, according to risk reduction strategies in supply chain and consulting of supply chain professors and experts and pharmacy, a checklist was obtained for supplier selection with eight main indexes and 30 sub-indexes in the field of selecting top supplier and four main indexes and 9 sub-indexes in the field of influential environmental risks. Finally, seven main indexes "quality, flexibility, delivery, technology, communication, and Information technology system, cost and background" with 24 sub-indexes on top supplier selection and four main indexes "economic, political, natural and cultural/social disasters" with 8 sub-indexes in the field of environmental risks were obtained. This research can be used by pharmaceutical industry activists, professors, researchers, and students to improve the current status of supplier selection.

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1. INTRODUCTION

Organizations were trying to take an effective step towards increasing their customers by standardizing and improving processes in order to increase competitiveness, in the '60s and '70s. In the '90s, these efforts continued with the development of human resources management strategies suppliers and logistics operations. (Ferazelle, 2001)

Continuously improving performance in a dynamic business has become a complex task for most suppliers, manufacturers, and retailers, that are seeking to compete and continue it. A complicated performance management system includes a wide range of management processes such as identification of criteria, defining Goals, planning, communication, monitoring, reporting, and feedback. Since the supply chain includes all of these, therefore, supply chain and its proper management are essential for the business.

Uncertainty in the supply chain affects the performance of the supply chain. Supply chain uncertainty comes from three sources:

a) The uncertainty of supplier results from the supplier's inability in providing production unit need;
b) The uncertainty of the process that results from the distrust of the production process and is due to the failure of the machinery;
c) The uncertainty of demand results from the inability to accurately predicting demand.

To decrease the uncertainty, there is a missing link called risk management throughout the chain that enables us to act more confidently in the value chain for our own selection by identifying the risks involved in the chain, particularly in the suppliers' section. According to these cases, supply chain risk analysis is one of the main scientific issues of the present era.

The drug supply chain includes organizations with facilities, equipment, and activities that have activity in the production and presentation or service units. A typical drug supply chain includes the following components: primary manufacturing, secondary production, market warehouses/distribution centers, wholesalers, retailers/hospitals and patients (Shah, 2004).

Outsourcing organizations and companies are facing a variety of choice situations, during selecting an external source because of increasing the number of service providers outside of the main organization in recent years. Along with this issue, increasing commercial competitiveness and expanding global markets has been led to organizations focus more on optimizing their business processes across all aspects of competitiveness, which has also been included in the choice of suppliers. Outsourcing decision-makers, when they are selecting a supplier, try to select an option that can supply all needs of the outsourced process from among the volunteer resources (suppliers). (Razny, Jaafar et al., 2008)

Since supply chain risks are very widespread, this article seeks to identify the risks involved in the selection of drug suppliers through targeted research and present a model for selecting suppliers with a risk reduction approach. The following questions are raised in this regard:

What are the effective factors on the selection of suppliers in the pharmaceutical industry of the country?

What are the risks in the supply chain?

What is a suitable algorithm for decreasing the risks in the supply chain?

2. THEORETICAL FOUNDATIONS

2.1 SUPPLY CHAIN MANAGEMENT

Intensifying competition, since the 1990s, put companies under pressure to improve their performance in all aspects. On the other hand, increasing variables led to dedicating more resources to predict demand and supply to more strengthening of the supply chain.

Researchers believe that effective supply chain management empowers the performance of the organization strongly and also, is a valuable way to protect competitive advantage. (Childerhouse et al., 2003)Supply chain management as an integrated approach to the suitable management of materials and goods flow, information and money flow is capable of responding to these conditions. The supply chain of an integrated system is from related processes and in order to:

1) Accessing to needed materials and components
2) Converting primary materials into product
3) Products Valuation
4) Distributing products to customers
5) Simplifying the transfer of information between components of a chain (suppliers, manufacturers, distributors, intermediaries, retailers, and customers). (Shafizadeh, 2004)

2.2 RISK

The actions that produce profitable effects often include risks. Richie and Brandley define business risk as to the level of exposure to uncertainties that a company must understand and manages it effectively to access its business goals during implementing its strategies. (Ritchie and Brindley, 2007).

2.3 SUPPLY CHAIN RISK MANAGEMENT (SCRM)

(SCRM) is an important issue in supply chain management. The importance of this is related to increasing outsourcing strategy in factories, globalization of markets, increasing confidence in suppliers for specific capabilities and innovations, relying on the supply chain for competitive advantage and emergence of information technology that enables control and expansion of the supply chain. (Narasimhan, R., Tallur, S, 2009)

(SCRM) can be considered as a management strategy activity that affects the executive, marketing and financial performance of the factory. (Duncan, 1972)

As long as the outsourcing process is an important strategy in the factories, works continue on both identification and evaluation of risk and decreasing risk (methods and theories). (Narasimhan, R., Tallur, S., 2009)

Fizal et al., and Tang (2006) believe that nowadays, Supply chain effective risk management is a necessity for factories. Factors like Ericsson and Nokia have realized this for a long time. Primary researches, in any field, begin with identifying and introducing concepts and determining categories or classifications. Primary works about (SCRM) also followed this approach. Lee (2002) provided a framework based on supply chain risks and demand risks in a range of basic or innovative products for the first time. He also said that supply chain strategies need to connect to a correct and specific level of supply and demand risks. (Oke and Gopalakrishnan, 2009).

Supply chains are exposed to risks that increase in association with supply problems. (Kleindorfer, P.R., Saad, G.H., 2005). Supply chains are also exposed to distribution risks or risks with high impact and low possibility of occurrence or low impact and high possibility of occurrence.

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These risks affect the organization extensively. (Chopra, S., Sodhi, M.S., 2004)

2.4 THE MAIN RISK FACTORS IN THE SUPPLY CHAIN

Micheli et al. (2008) studied the relationship between (SCRM) and suppliers' selection at the Polytechnic University of Milan. According to them, the risks in the supply chain can be divided into three categories: product risks, market risks, and suppliers' risks. Manuj & Mentzer (2008) classified supply chain risks based on many others' works.

Table 1: Supply Chain Risks.

Risk	Definition
Financial	Change of currency rate
Transit time	Changes in transit time that includes transportation and discharge
Prediction	Error in estimating needs leading to a lack of inventory or excess inventory
Quality	Wrong, corrupted and unfinished products, components and materials in different places
Safety	Products that endanger the safety
Business disruption	Inability to produce products or sell to customers
Survival	The bankruptcy of the factory
Tool and inventory ownership	Arguing over inventory ownership; arguing over excessive use of device owned by another
Culture	Insufficient information about people, culture and language
Opportunism	Supplier or customer with opportunistic behavior
Oil price	Changes in oil price

Zsidisin focused only on the supply risk in his article. He divided supply risk into two categories: supplier failures and market limitations. But motives of risk can result from three sources: the primary doods or material, the supplier and the whole supply market. (Zsidisin, 2003)

Christopher (2004) divides supply chain risks into five categories: supply risk, process risk, demand risk, control risk, and environmental risk:

Supply Risk: is the most important supply chain risk that it can be the source of other risks. When we pay for a product or service, we expose ourselves to this risk that the supplier will not deliver the order in a timely and accurate manner that is called the supply risk.

Process Risk: a product is not produced in a specific part in a timely manner with the required quantity and quality.

Demand Risk: There is no demand for a product or facing a lack of demand.

Risk control: a result from inadequate quality control.

Environmental Risk: The risk result from environmental effects that can arise from the physical, social, political, legal, operational and economic environment.

2.5 SUPPLY CHAIN MANAGEMENT IN THE PHARMACEUTICAL INDUSTRY

The pharmaceutical market is regulated by the nature of supply and demand for the drug in many countries. Given the competitiveness of the drug market, governments must balance economic and health benefits. (Hakonsen and Horn, 2009)

The pharmaceutical part plays an important role in the medical and health system. The pharmaceutical industry is rapidly expanding due to increasing the population and ages, the economy's rapid growth and increasing the prevalence of chronic diseases (such as cardiovascular diseases, cancer, and chronic respiratory diseases). (Wang et al., 2005)

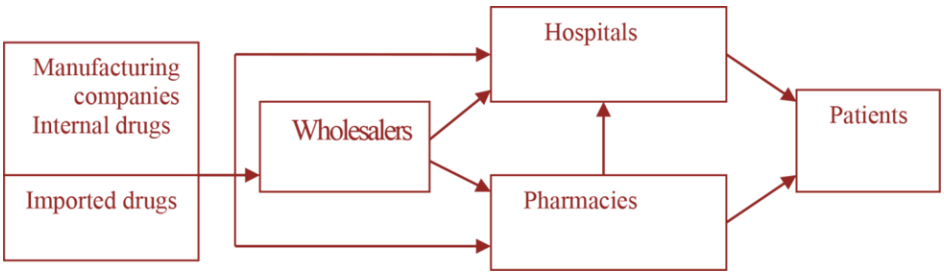

Figure 1: The supply chain of the drug.

Some of the problems that may arise in the transition from a planned economy to a strong supply chain in the pharmaceutical industry include:

Ineffective and no result supervision

A higher price for a drug equals more benefit for manufacturers

Violation and departure from approved and fixed prices

Lack of reliable pharmaceutical instruction (Yu X., Li a B., Shib Y., Yua M., 2010)

3. THEORETICAL FRAMEWORK OF RESEARCH

In order to manage risk in the supply chain, it is necessary to identify, evaluate and implement the necessary risks in all four areas of "supply, process, demand, and environment:"

Figure 2: Four areas of supply chain risk management.

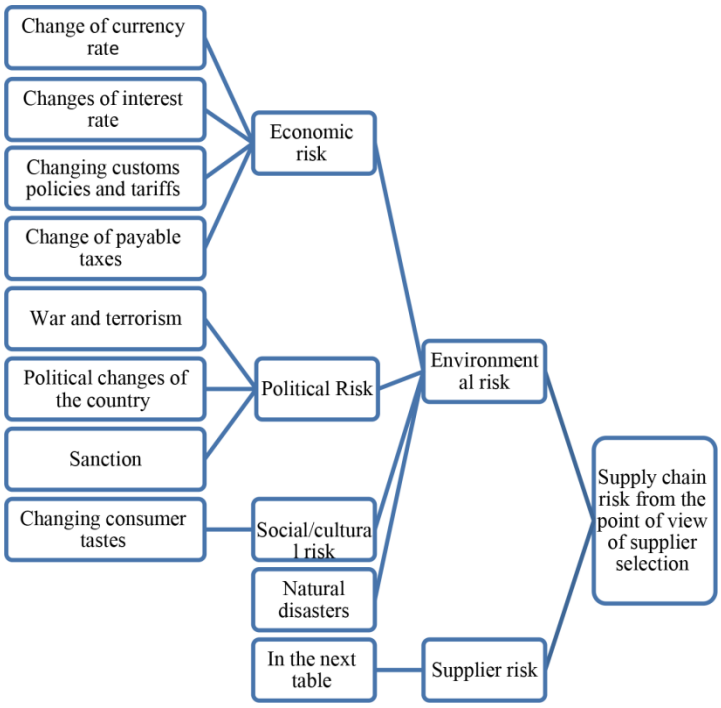

Figure 3: Effective factors in the supply chain risk management from an environmental risk point of view.

Considering the literature and the subject of risk management research in the area of "supplier

selection is pursued in the supply chain" and environmental risks affect all three parts of the supply chain including "supply risk", therefore, environmental risks management is also considered.

From the point of view of supplier selection, supply chain risk is divided into two distinct parts (Figure 4). The first is an environmental risk, which is divided into four sub-categories: "economic, political, cultural/social and natural disasters". The second part considers the factors influencing the selection of the top supplier, which consists of eight distinct areas: quality, environmental issues, flexibility, delivery, supplier technology, communication, and information technology systems, and product cost and supplier history.

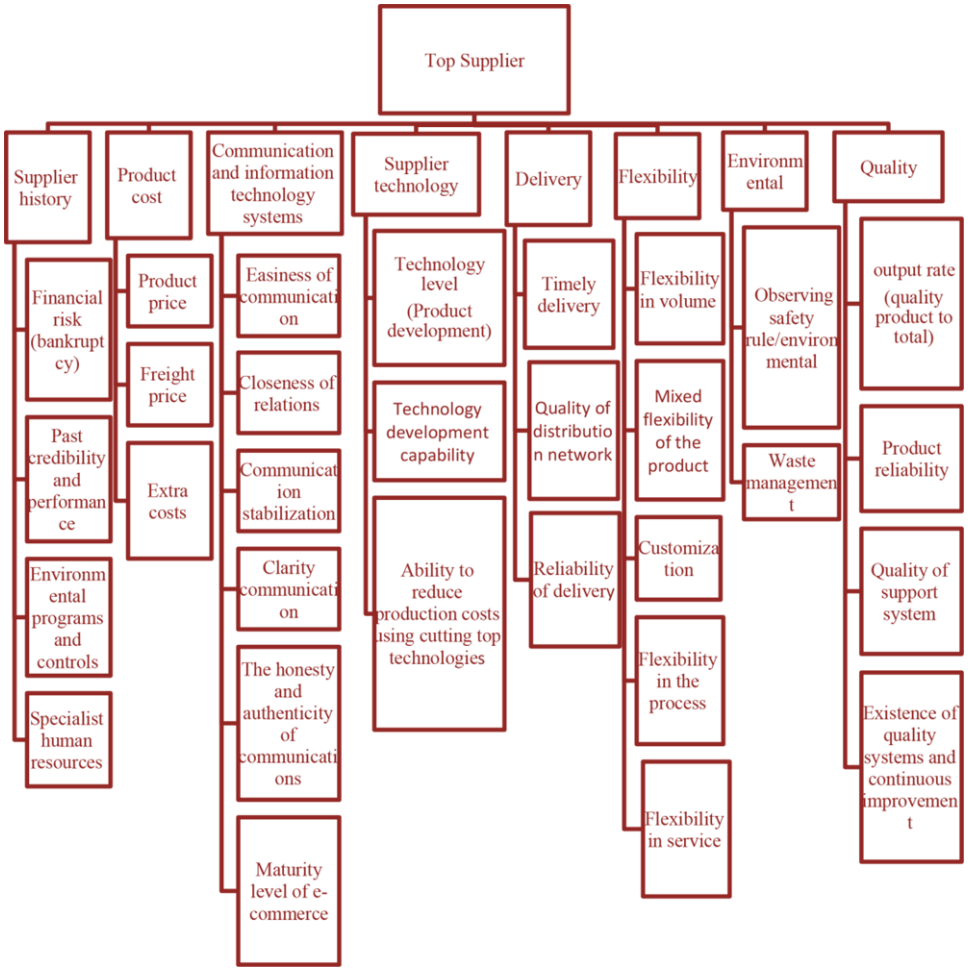

Figure 4: Effective factors in supply chain risk management from a supplier selection point of view.

4. RESEARCH METHOD

Since the present study seeks to understand the effective factors on the pharmaceutical supply chain of the country, the type of this research is practical in terms of goal and it is developmental from exploratory type developmental purpose and it is descriptive in terms of performance. The pharmaceutical industry is the statistical population in this study. In the sampling, the questionnaires are collected and evaluated from three major drug holdings of the country Drou Pakhsh, Alborz and Pars Darou. The reasons for choosing these three holdings as a statistical sample are as follows: There are four pharmaceutical holding in the country that manages more than 75% of the country's pharmaceutical industry, including the supply pharmaceutical group (TPICO), is consists of Daroupakhsh,Pars Darou group, Shafadarou group, Alborz group and HITT group. This study evaluates three groups of pharmaceuticals: Daroupakhsh, Pars Darou and Alborz, which include

about 65% of the country's pharmaceutical market share, which is a significant sample in the country's pharmaceutical industry. The market share of each of these groups in the production and distribution of drugs will be as follows.

Table 2: Market share of the holdings under study.

Holding	Production market share	Distribution market share
Darou Pakhsh	22.90	30.65
Alborz	15.86	21.47
Parsdarou	6.55	8.91

It should be noted that, since suppliers do not operate separately and independently and are a subsidiary or part of the producer companies, they do not have a separate market share. The sampling method is available sampling and our sampling is purposive/judgmental.

Considering the research literature and focusing on suppliers selection in the supply chain, effective factors were extracted from the articles on supplier selection in order to decrease risk and and main Indexes and its subsections were categorized in consultation with professors and experts of supply and pharmacy chain as there are eight main indexes about supplier risk: quality, environmental issues, flexibility, delivery, technology, communication, and information technology systems, cost and history. Each of these indexes was divided into other sub-categories, in which 30 sub-indexes of question were evaluated totally. Environmental risks were also divided into four categories: economic, political, natural disasters and cultural/social issues, which were also evaluated by 9 sub-indexes of question. In the following, based on previous studies, a conceptual model was presented for risk management supplier selection in the supply chain and it was expressed as the final research model at the end.

In this study, content validity is used to determine the validity and reliability of the questionnaire, and the professors and experts are asked into two options about the relationship of the question with the topic and the clarity and transparency of the question. After making corrections and confirming the validity and reliability of the questionnaire, it will be used as a data collection tool. Cronbach's alpha coefficient was calculated 0.80 in the questionnaire of managers and experts in the pharmaceutical industry, Tables 3 and 4. Therefore, the questionnaire is valid because it is more than 0.7.

Table 3: Cronbach's alpha coefficient between indexes.

Cronbach's alpha coefficient	Number of questions
0.806	39

Table 4: Cronbach's alpha coefficient between groups.

Cronbach's alpha coefficient	Number of groups
0.732	9

The MADM algorithm is used to prioritize the risks that considering the type of problem and the number of factors and other issues in this study, the Fuzzy TOPSIS technique is selected. In the risk management algorithm, there are four phases of identification, evaluation, control, and tracking. The potential risks in the supply chain and the sources of risks need to be identified, structured and documented in the supply chain risk identification which is the first phase. The classification of risks

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identified at this point seems suitable. Then, the potential risks have to be evaluated in the supply chain risk evaluation phase. A suitable way is to draw the possibility and effect of risk sources on the risk map. The possibility of occurrence and its severity can be qualitative or quantitative. Based on this evaluation, the decision is made on how to deal with these risks. Supply chain risk control phase after evaluating and estimating and selecting, it is the action for controlling the risks and lastly, supply chain risk tracking phase evaluated implementation and effect of selected actions and enables the company to have a clear view of the status of supply chain risks at all times.

Table 5: Linguistic variables.

Very low	1	0 , 0.1 , 0.2
Low	2	0.1 , 0.25 , 0.4
Medium	3	0.3 , 0.5 , 0.7
Very	4	0.6 , 0.75 , 0.9
Very much	5	0.8 , 0.9 , 1.0

Table 6: Prioritization of supplier risks based on the Fuzzy Topsis technique.

Question	Subgroup	Ci
12-Just in time delivery	Delivery	0.140
23-Low price of the product compared to supplier competitors	Cost	0.158
14-Reliability of delivery (No interruption of the product at once)	Delivery	0.169
5-Having valid GMP certificates	Quality	0.185
1-Having a high output rate of the product received from the supplier	Quality	0.207
25-Decreasing extra costs compared to supplier competitors	Cost	0.215
27-Having positive performance and positive credit in work history	History	0.227
21-Clear and honest communications with each other (Mutual trust)	Communicational and information technology systems	0.237
18-Easiness of communication with each other	Communicational and information technology systems	0.248
2-The suitable quality of the supplier's support system	Quality	0.248
24-Decreasing freight price compared to supplier competitors	Cost	0.262
13-Quality of the distribution network (correct transportation) of supplier	Delivery	0.284
10-Customization	Flexibility	0.306
29-Specialist human resources	History	0.329
3-Quality management systems and continuous improvement in the supplier factory	Quality	0.339
4- Existence of sense and bilateral partnership	Quality	0.344
11- Flexibility in service	Flexibility	0.362
26- No bankruptcy (financial risk) in work history	History	0.367
15- The level of technology (product development) in the supplier factory	Technology	0.374
8- Flexibility in volume	Flexibility	0.391
20- Relationships stability	Communicational and information technology systems	0.397
17- Ability to decrease production costs using top technologies	Technology	0.399
9- Flexibility in the variety of products and received primary materials	Flexibility	0.414
19- Closeness of relationships with each other	Communicational and information technology systems	0.452
22- The maturity level of IT e-commerce	Communicational and information technology systems	0.490
6- Observing environmental standards in the supplier factory	Environmental	0.498
28- Having programs to control environmental factors	History	0.515
16- The ability to develop technology in the near future at the supplier factory	Technology	0.533
7. Waste management in the supplier factory	Environmental	0.567
30- Number of supplier agreements with multinational companies	History	0.597

5. RESEARCH RESULT

The questionnaire components have been classified by the Fuzzy TOPSIS technique. Fuzzy theory is used in uncertainty conditions, mathematical model for ambiguous priorities. (Khavarpour et al., 2009). The questionnaire uses Likert with options as very high, high, medium, low and very low, which is assigned to very low number 1 and very high number 5. In order to use triangular Fuzzy numbers, based on the studies conducted on various articles linguistic numbers are used as see in Table 5 . All the questions have a positive aspect and the weight of all questionnaires is equal to 1. Table 6 shows the final results of the components in order of priority (the most important component to the least important component), with Consistency Index (Ci).

Table 7: Prioritization of environmental risks based on the Fuzzy TOPSIS technique.

Question	Subgroup	Ci
31-Change of currency rate	Environmental risks	0.156
36- Sanctions	Environmental risks	0.207
33- Changing customs policies and tariffs	Environmental risks	0.254
32- Change of interest rate	Environmental risks	0.326
35- Political changes in the country	Environmental risks	0.329
37- War and terrorism	Environmental risks	0.385
34- Change of paid tax	Environmental risks	0.402
37- War and terrorism	Environmental risks	0.493
39- Changing consumer's tastes	Environmental risks	0.680

Table 8: Average priority of groups, respectively, in supplier selection.

Group	Component	Ci average
Delivery	12-Timely delivery	40.96%
	13- Quality of the distribution network (correct transportation) of supplier	83.09%
	14-Reliability of delivery (No interruption of the product at once)	49.44%
Cost	23-Low price of the product compared to supplier competitors	46.23%
	24-Decreasing freight price compared to supplier competitors	76.65%
	25-Decreasing extra costs compared to supplier competitors	62.90%
Quality	1-Having a high output rate of the product/ primary material received from the supplier	60.56%
	2-The suitable quality of the supplier's support system	72.56%
	3-Existence of quality management systems and continuous improvement in the supplier factory	99.18%
	4- Existence of sense and bilateral partnership	100.64%
	5-Having valid GMP certificates	54.13%
Communicational and information technology systems	18-Easiness of communication with each other	72.56%
	19- Closeness of relationships with each other	132.24%
	20- Relationships stability	116.15%
	21-Clear and honest communications with each other (Mutual trust)	69.34%
	22- The maturity level of IT e-commerce	143.36%
Flexibility	10-Customization	89.53%
	11- Flexibility in service	105.91%
	8- Flexibility in volume	114.39%
	9- Flexibility in the variety of products and received primary materials	121.12%
History	26- No bankruptcy (financial risk) in work history	107.37%
	27-Having positive performance and positive credit in work history	66.41%
	28- Having programs to control environmental factors	150.67%
	29-Specialist human resources	96.26%
	30- The number of supplier agreements with multinational companies	174.66%
Technology	15- The level of technology (product development) in the supplier factory	109.42%
	16- The ability to develop technology in the near future at the supplier factory	155.94%
	17- Ability to decrease production costs using top technologies	116.73%
Environmental	6- Observing environmental standards in the supplier factory	145.70%
	7. Waste management in the supplier factory	165.89%
Total		100%

Due to the advantages achieved in the Fuzzy TOPSIS technique, data that are above the 20% average are eliminated. (The reason for the top 20% removal is the removal of the least important ones)

6. DISCUSSION

Answering the first question: What are the effective factors on the suppliers' selection in the country's pharmaceutical industry?

Answering the second question: What risks are there in the supply chain?

Table 9: The average priority of groups, respectively, in the environmental risks.

Group	Component	Ci average
Economic	31-Change of currency rate	43.44%
	33- Changing customs policies and tariffs	70.73%
	32- Change of interest rate	90.78%
	34- Change of paid tax	111.94%
Political	36- Sanctions	57.64%
	35- Political changes in the country	91.62%
	37- War and terrorism	107.21%
Natural disasters	37- War and terrorism	137.28%
Cultural / Social	39- Changing consumer's tastes	189.36%
Total		100%

As stated in the Ci averages Table 8, "the level of e-commerce maturity, having plans to control environmental factors, supplier agreements with multinationals companies, the ability to develop technology in the near future of supplier factory and overall environmental index, such as observing environmental standards and waste management at the supplier's factory, have less important in the selection of the supplier, according to the experts of the pharmaceutical industry in the country, and it is better to be removed from the top supplier selection indexes in the country's pharmaceutical industry.

According to the Ci averages Table 9 in the environmental risks, "changing consumer tastes" has no effect on the country's pharmaceutical industry, in other words, according to the expert of this industry, the consumer's attention in the pharmaceutical industry has low value for the management of environmental risks.

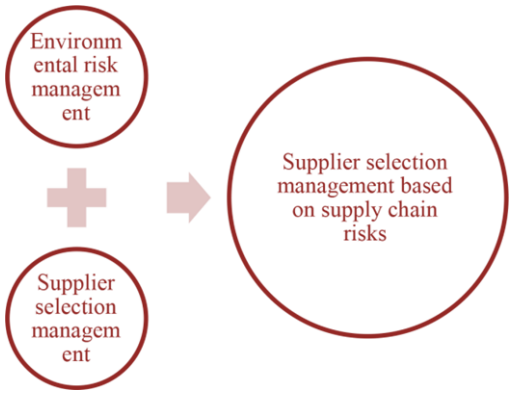

Figure 5: the final model of suppliers' selection management based on supply chain risks.

6.1 THE FINAL MODEL OF RESEARCH

The final model is presented based on these findings (Figures 5, 6).

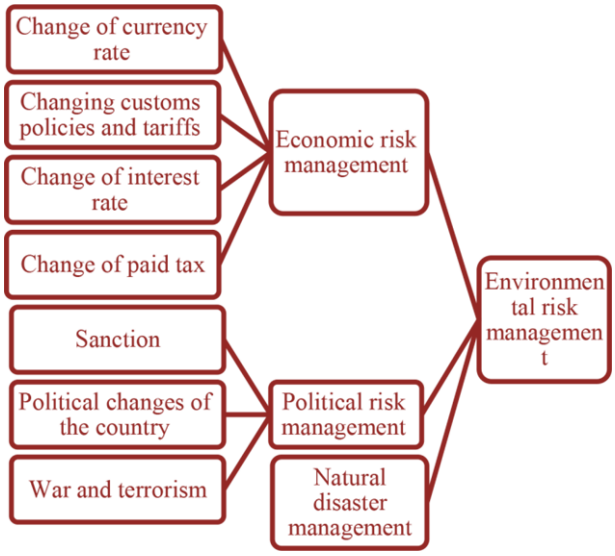

Figure 6: The final model of environmental risk management in the supply chain.

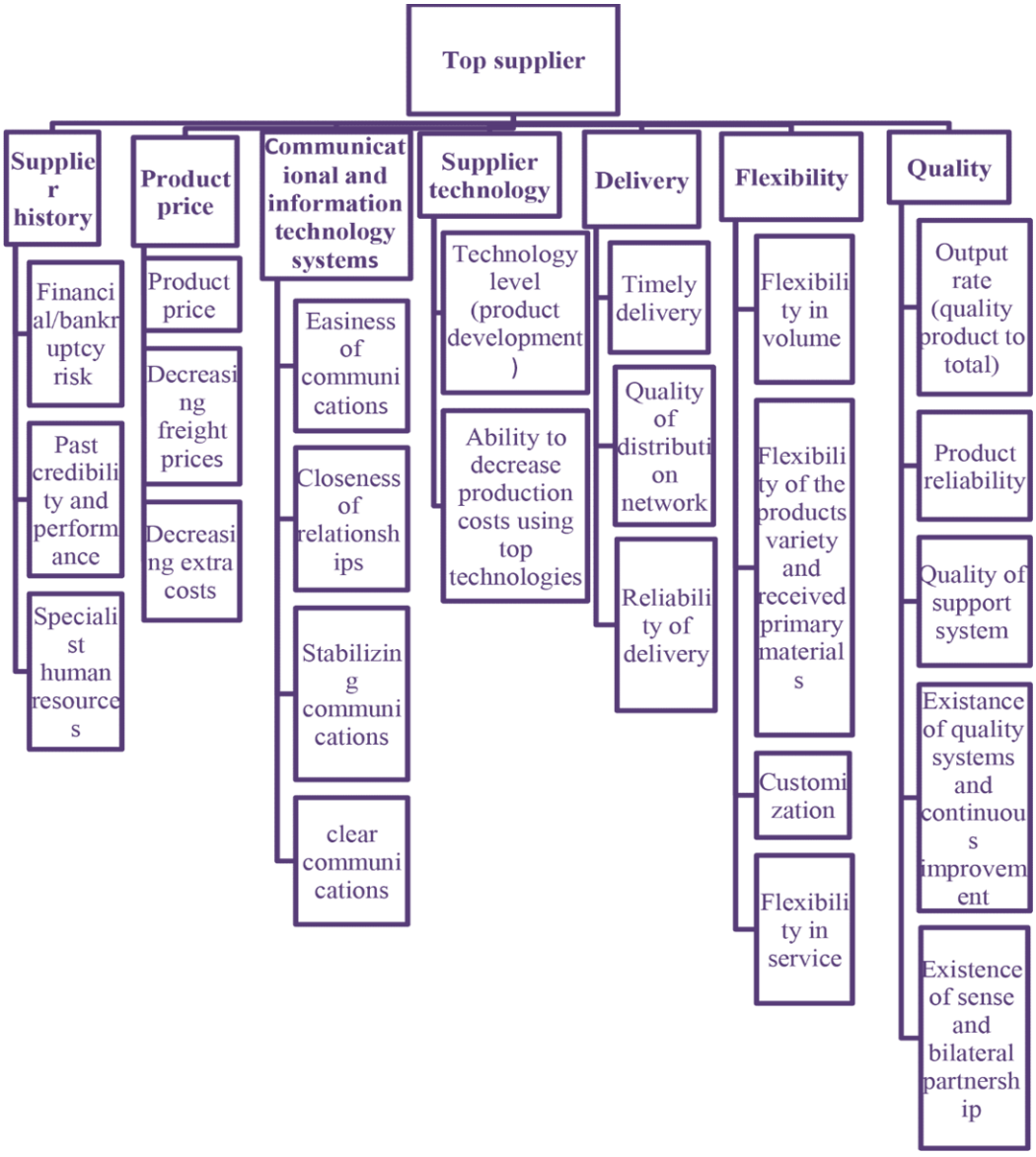

Figure 7: The final model of top supplier selection management.

According to the presented model of top supplier selection and environmental risks, the top supplier selection indexes should be used in order to manage supplier selection risk and the three

effective main indexes should be controlled on the supply chain environmental risks. Also, be controlled. So, suppliers are the top priorities who have plans to manage these risks.

Answering the third question: What is the suitable algorithm for decreasing the supply chain risks?

6.2 IDENTIFICATION PHASE

According to Chopra & Sodhi's (2004) theory, the main risks in the supply chain include inventory, capacity, receipt, something which are received, supplies, prediction, delay and disruption risks, *see* Table 10.

Table 10: Supply chain risks and its derivatives based on the article by Chopra & Sodhi (2004).

Risk classification	Their derivatives
Disruptions	Natural disasters Workers argue Supplier bankruptcy War and terrorism
Delay	Use all supplier capacity No flexibility in the supplier Poor/low-quality product of the supplier Excessive displacement due to changes in transportation model
Prediction	False prediction due to long lead time, seasonality and variety of products, short life cycle, small customer base, "BULLWHIP EFFECT" or false information based on sales promotion, encouragers, lack of supply chain clarity and demand exaggeration in times of product shortages
Supplies, customers (Collection risk)	Currency rate risk Percentage of main elements and raw materials prepared from a supplier Using full capacity Long-term contracts versus short-term contracts
Something which received	The number of customers Financial ability of customers
Inventory	The rate of obsolescence of products Cost of inventory property Product value Supply and demand uncertainty
Capacity	Cost of capacity Flexible capacity

6.3 EVALUATION PHASE

Evaluating risks in the supply chain, tcihe area of action is determined after determining the possibility of occurrence (impossible, low, medium, high and very high) and the severity of the effect (ineffective, low, medium, severe, catastrophic), Figure 8. According to the risk evaluation, the risks are either within the safe range, or need to immediate action, or need continuous monitoring to increase the possibility of occurrence or the high number of events.

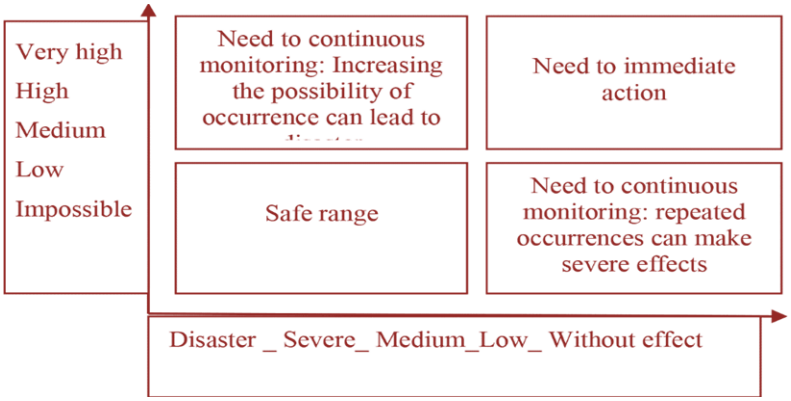

Figure 8: Matrix risk.

6.4 CONTROL PHASE

After the risk evaluation by the experts, it is time for the reductive approaches. To decrease each of the risks, Chopra & Sodhi (2004) presented approaches and expressed the effect of each of these reductive strategies on the different risks. (Chopra, S., Sodhi, M.S., 2004)

Table 11: Suitable strategies for risk reduction in the supply chain.

Reduction approach	Suitable strategies
Increasing capacity	Focus on the low-cost and decentralized capacity for predictable demand Creating a centralized capacity for unpredictable demand Increasing decentralization during reducing capacity costs
Using additional supplier	Paying more attention to high-number products compared with low-number products, focus on the excessive supply on low-number products with limited suppliers
Increasing speed in the reaction	Paying attention to the cost rather than the speed for interaction for consumable products Paying attention to the speed in the reaction rather than the cost for short-lived products
Increasing inventory	Decentralization in the inventory of predictable low-value products Focus on the inventory of high-value products with less predictability
Increasing flexibility	Preferring the cost rather than flexibility for high-number products and predictable Preferring flexibility for unpredictable low-number products Focus on flexibility in a few places if it is possible
Merging demand	Increasing merge during unpredictable grows.
Increasing capability	Preferring the ability over the cost for high-risk and high-value products Preferring the cost over the ability for low-value consumables products Focus on the high ability for flexible source if it is possible

Linking to Table 11, Table 12 shows the effect of each of the strategies on the risks stated in terms of the effect of increasing or decreasing the risk, which, according to the factory's capabilities and expert opinions, is the best option to extract from the strategies. Control and prevention programs and measures will be adopted according to the selected strategy.

Table 12: Supply chain risk reduction strategies.

Reduction strategies	Disruption	Delay	Prediction risk	Supplies risk	Risk of something which is received	Capacity risk	Inventory risk
Increasing capacity		↓		▼		↑	▼
Increasing inventory	▼	↓		▼		▼	↑
Alternative suppliers	↓			▼		▲	
Increasing response speed		↓	↓				↓
Increasing flexibility		▼		▼		↓	▼
Tensile or integrated demand		↓				↓	↓
Increasing ability		▼					▼
Having more customers					▼		

Note:

High decreasing the risk ↑	High increasing the risk ↓
Decreasing the risk ▲	Increasing the risk ▼

6.5 TRACKING PHASE

The supply chain risk tracking phase evaluates the implementation and effect of selected actions and enables the company to have a clear view of the supply chain risk situation at all times. This stage should not be neglected because, given today's dynamic business world, the risks that may be evaluated in the safe evaluation phase will become completely disruptive, after some time. Therefore, managers must continuously monitor their own internal and external conditions of the supply chain.

7. CONCLUSION

To decrease the risk of supplier selection in the supply chain, the following points should be considered. In supplier selection, priority is given to those who do delivery and cost indexes best so, they must deliver in a timely manner, their distribution network has the necessary qualifications, and not hanging up presenting the primary material/product suddenly. On the other hand, their finished price has lower quality than their competitors.

Having valid certifications, such as those from the Ministry of Health and GMP, etc. is also a priority for decision making, though it is necessary to obtain a Ministry of Health license for pharmaceutical ingredients. In the pharmaceutical industry, flexibility in the volume and service and variety of received products is of little use because pharmaceutical primary materials follow certain standards and conditions that are not desirable to the consumer under the circumstances.

Considering the desirable conditions of supplier selection, environmental risks should not be neglected. Accordingly, suppliers are the top choice to plan for economic-political risks. If a change of currency rate, sanctions, change of customs tariffs, and so on, be done without previous prediction can lead to disrupting presenting the product.The change of consumer tastes is not an invaluable factor in the pharmaceutical industry.

8. AVAILABILITY OF DATA AND MATERIAL

Data can be made available by contacting the corresponding authors.

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THREE DIMENSIONAL DYNAMIC ANALYSIS OF REINFORCED EARTH SLOPE BY GEOGRID UNDER OVERHEAD EFFECTS

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ABSTRACT

Today, analysis of the stability and study of the behaviors of retaining walls and soil slopes are important topics in soil mechanics/geotechnical engineering. Soil improvements, especially performance must give attention to behaviors particularly for reinforced earth slopes is their performance against earthquakes. In this study, we attempt to perform numerical modeling studies using FLAC3D finite difference software. With the FISH programming language available in this software as well as the existing attenuation models, some arbitrary behavior and precise modeling are done. The main purpose of this study is to investigate the dynamic and nonlinear behavior of reinforced earth slope. For this purpose, an instrumented articulated roof attic that has been constructed and operated as a road embankment is used as the base model. Seismic conditions are applied to the model using the acceleration mapping of several major earthquakes of Iran and the world. The soil behavioral model has been based on a soft or hardened Mohr-Coulomb model with the capability to incorporate nonlinear behavior in static analysis with nonlinear attenuation models in dynamic analysis.

1. INTRODUCTION

The invention of the reinforced earth system in the 1960s and its ever-expanding development opened a new chapter in soil engineering [1]. Benefits such as improved ductility and enhanced resistance to embankment behaviors, the use of built-in elements, and economic savings have led to the expansion and use of this system worldwide [2], [3].

The emerging of polymeric reinforcers, or geosynthetics in the 1970s, as a replacement for tape and metal reinforcers, with the aim of solving problems such as corrosion and high cost, accelerated the use of this type of system in became the world [4],[5]. Therefore, the discussion of the behavior of reinforced earth structures has been one of the topics of the day in the scientific forums and the subject of many research articles. From the placement of tensile elements such as steel belts and geogrids as soil reinforcement elements and their protection by coating special weapons arise.

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According to the AASHTO standard, reinforced wall slopes over 75 degrees are called reinforced soil walls and less than reinforced slopes [5], [6].

One of the most important behaviors of reinforced earth slope is its performance against earthquakes. The experience of various earthquakes over the past years has shown the good performance and the behavior of these structures [7],[8]. The percentage of overall failures and breakdowns in the walls and slopes of reinforced soil is limited compared to other traditional stabilization walls and systems. However, a complete lack of understanding of the earthquake response of these structures has led designers to resort to conservative assumptions to avoid the risk of failure. These assumptions include the use of large confidence coefficients in quasi-static design methods. The result of such an approach would be to present non-economic plans [8], [9].

2. LITERATURE REVIEW

During the past four decades, research has been conducted on the performance of reinforced soil structures. The results of these studies show that different parameters are involved in the dynamics and behavior of these structures, which can be divided into four general categories [10],[11]. This classification is as follows: 1) Parameters related to reinforced dams, litter and retained soil. 2) Parameters related to armaments and how they are arranged. 3) Parameters related to the movement of drive inputs such as earthquakes or traffic loads on road bumps or collapses. 4) Geometrical parameters of structures such as elevation and slope angle [12],[13],[14].

Relevant studies have been carried out in the form of general categories, laboratory studies, numerical analyzes, and mathematical theoretical methods. Due to the complexity of the laboratory methods and the problems that exist in these methods, including the effect of boundary conditions, scale effect, instrumentation problems and looking at the available possibilities, the use of numerical methods with regard to its high accuracy and capability providing comprehensive results as an alternative and cost-effective approach seems justified. However, it is necessary to prove the validity of the modeling by making similar numerical models in the software and comparing the results with the physical models [15], [16]. The main purpose of this study is to analyze the 3D dynamic analysis of geogrid reinforcement overhead impacted terrain.

3. RESEARCH METHOD

In this research, the effect of different parameters on the response of a reinforced earth slope is investigated using numerical modeling using FLAC 3D finite-difference software and its internal programming language. The simulations were performed to investigate the dynamic and nonlinear behavior of the arable soil slope. For this purpose, first the numerical modeling accuracy is demonstrated using the results of the dynamic loading of a laboratory model and then the slope behavior under different conditions is analyzed using the numerical model.

The Mohr-Coulomb failure or strength criterion used for soil behavior. The Mohr-Coulomb failure or strength criterion has been widely used for geotechnical applications. Indeed, a large number of routine design calculations in the geotechnical area are still performed using the Mohr-Coulomb criterion. The Mohr-Coulomb criterion assumes that failure is controlled by the maximum shear stress and that this failure shear stress depends on the normal stress. This can be represented by plotting Mohr's circle for states of stress at failure in terms of the maximum and

minimum principal stresses. Figure 1, the Mohr-Coulomb failure line is the best straight line that touches these Mohr's circles. where τ is the shear stress, σ is the normal stress (negative in compression), c is the cohesion of the material, and ϕ is the material angle of friction.

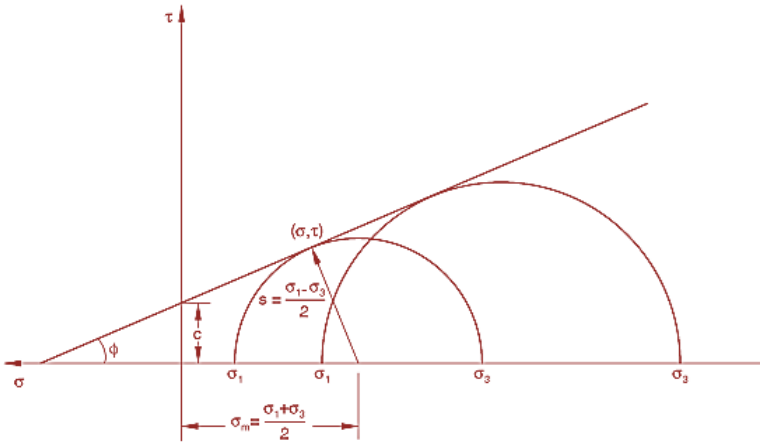

Figure 1: Mohr-Coulomb failure criterion.

4. SIMULATION DESIGN AND VARIABLES

With simulations design, the behavior of a reinforced slope with geogrid under seismic loads have been investigated. The analysis is carried out dynamically and in 3D and the loading is carried out as overhead on the embankment and applying the base acceleration. Since embankment behavior is based on the performance level, the degree of horizontal and vertical deformation is the main criterion for assessing and comparing the behavior of the embankments. The parameters whose effect on the embankment behavior is investigated include

- Soil specifications,
- The angle of gradient,
- The height of the embankment,
- The width of the embankment,
- The amount of overhead on the embankment,
- Arranging the embankment.

5. DATA ANALYSIS

In order to evaluate the impact of soil type on the behavior of soil gradients reinforcement with geogrids, the results of simulations A1 to A4 are investigated, for soil type 1 to 4, respectively. The most important soil parameter is the internal friction angle, setting at 25, 30, 35 and 40 degrees for soil type 1 to 4, respectively. Figure 2, the displacement contours are colored as red is the highest, followed by yellow, green, and blue.

From temporal lateral displacement data in Figure 2 for soil type A4 simulation, the highest displacement seems to be at z/h = 0.5 (where z is the depth from the surface being considered and h is the total embankment depth. So z/h is the ratio of these depths). For all z/h ratios, all the lateral displacement stops after 10s-11s (time unit in seconds).

The distribution of persistent horizontal displacements (after dynamic loading) at the height of the embankment with geogrids is shown in Figure 3 for simulations A1 to A4. Comparing the graphs, it can be said that with increasing soil resistivity parameters, the horizontal displacements have generally decreased.

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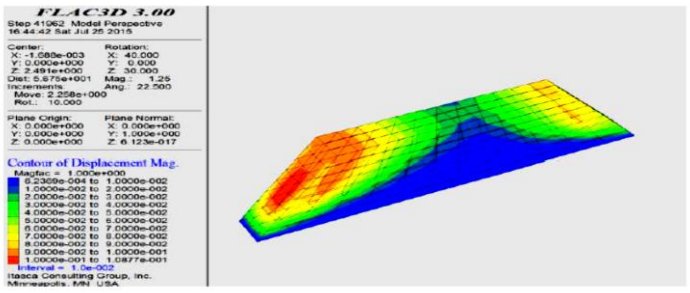
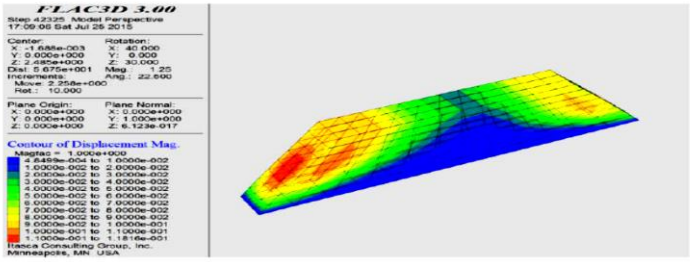
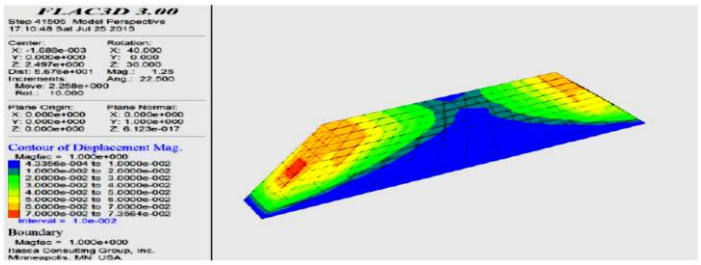


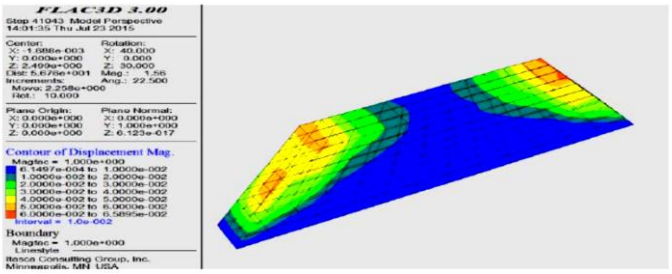
(A1)



(A2)



(A3)



(A4)

Figure 2: Displacement Meters in Simulations A1 to A4.

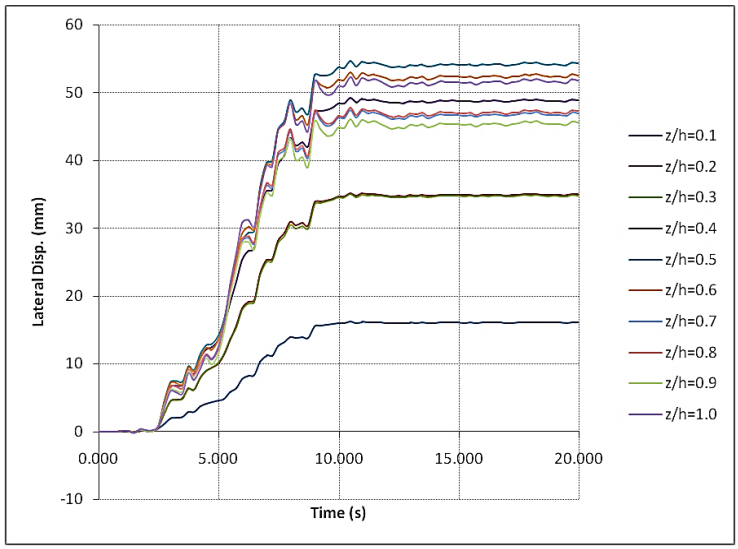


Figure 3: Time history of horizontal embankment shifts at different levels (for A4 simulation).

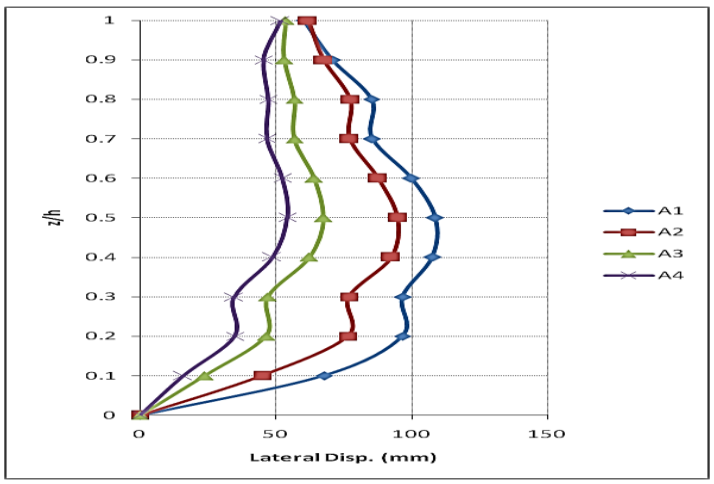


Figure 4: Persistent horizontal embankment shifts at different alignments (simulations A1 to A4).

Variations of the maximum mobilized force in earth slope reinforcers (geogrids) per unit of geogrid width are shown. According to Figure 4, it is observed that with increasing soil strength, the force mobilized in the geogrid elements decreases, that is, the soil tolerates a greater share of the applied forces.

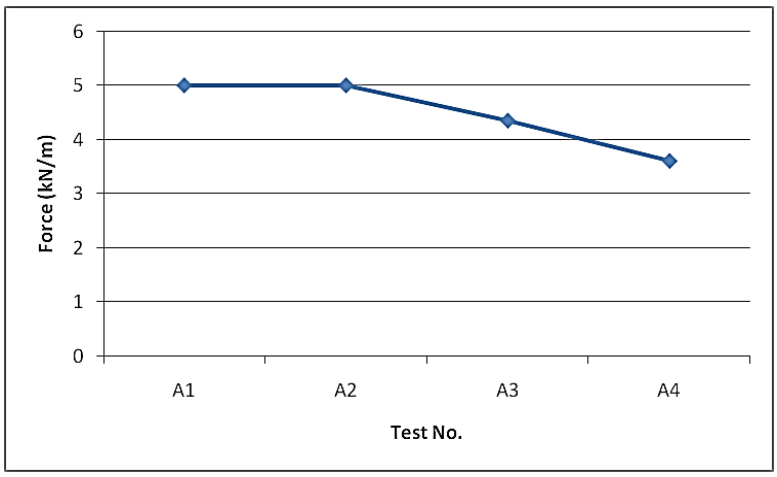


Figure 5: Maximum mobilized force in geogrids (simulations A1 to A4).

5.1 SLOPE ANGLE EFFECT

In order to evaluate the effect of the slope angle on the behavior of geogrid-armed soil slopes, the results of simulations B1 to B4 are investigated. In these simulations, the slope of the embankment surface to the horizon is 40, 45, 50 and 55, respectively. The time history diagram of the embankment horizontal displacements in different levels corresponding to simulations B1 to B4 is shown in Figure 5. In order to allow for a better comparison, the alignments are expressed in relative terms (the height of the displacement point divided by the total height of the embankment). An example of the B1 simulation is given in Figure 6.

5.2 OVERHEAD EFFECT

Evaluation of overhead impact on the behavior of soil gradients armed with geogrids. The results of simulations E1 to E4 has been investigated. In these simulations, the overhead values are 1, 3, 5, and 7 kPa, respectively. The temporal history of horizontal embankment shifts has been shown in different levels corresponding to simulations E1 to E4. In order to allow for a better comparison, the alignments are expressed in relative terms (the height of the displacement point divided by the total height of the embankment). As can be seen from the comparison of these figures, with the

increase of the overhead value 1-7 kPa, the rate of displacement of the horizontal embankment is increased due to seismic loads. The graphs also show that as the amount of overhead changes, the pattern of increase in horizontal displacement also changes. According to the time history charts of horizontal displacements, it can be said that with the increase of overhead the time of beginning and end of the horizontal displacements did not change much. Figure 7 is for the E1 simulation.

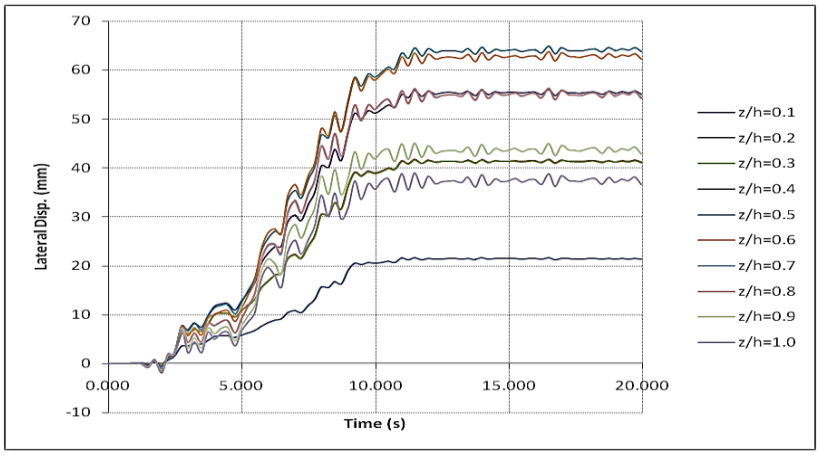


Figure 6: Time history of horizontal embankment shifts at different levels (Simulation B1)

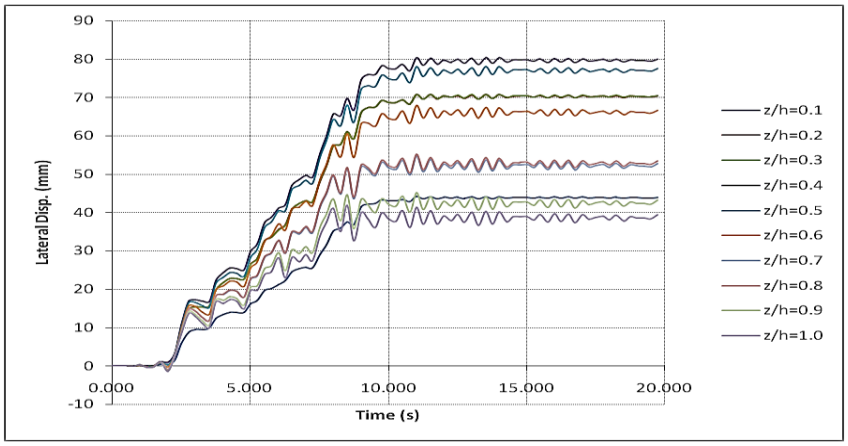


Figure 7: Time history of horizontal embankment shifts at different levels (E1 simulation)

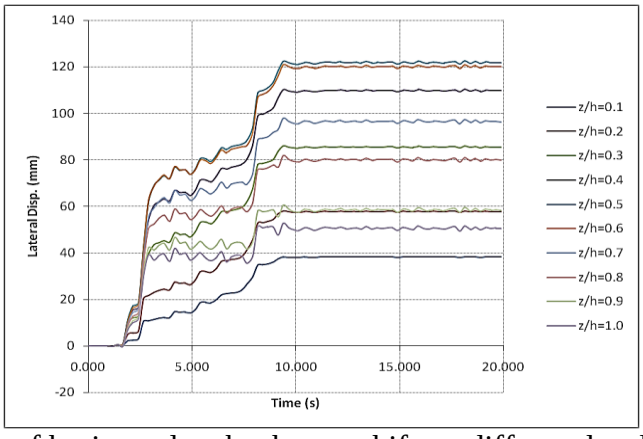


Figure 8: Time history of horizontal embankment shifts at different levels (F1 simulation).

5.3 EFFECT OF GEOGRID LAYER INTERVALS

In order to evaluate the effect of distance between geogrid layers on the behavior of reinforced earth slopes, the results of F1 to F4 simulations are investigated. In these simulations, the distances of the successive geogrid layers are 20, 40, 60, and 80 cm, respectively. These graphs show that the

pattern of increase in horizontal displacements changes significantly with increasing distance of the geogrid layers. According to the time history charts of horizontal displacements, it can be said that with the change of geogrid layers, the time of start and end of horizontal displacements did not change much. F1 simulation is shown in Figure 8.

6. CONCLUSION

In this study, 3D dynamic analysis of reinforced earth slope was investigated using numerical modeling. Based on the studies, it was found that with increasing the internal friction angle of the soil, the amount of change in the horizontal axial load changes due to seismic loads was reduced. Be. Also, with the change of the friction angle, the time of start and end of the change in the horizontal location did not change significantly. Based on the study, it was found that with increasing the slope of the embankment, the rate of change of the horizontal axis of the reinforced soil increases with the application of seismic loads. Also, with increasing seismic height, the change in horizontal seismic load locations due to seismic loads is increased. Comparing the temporal history of soil horizontal displacements at different levels, it is clear that with increasing the width of the embankment, the overall change in the horizontal locations of reinforced terrain is increased by the application of seismic loads, which may be due to the changing dynamic properties of the terrain and how it responds. It was applied to seismic loads. A comparison of the time history of soil horizontal displacements at different levels revealed that the increase in the amount of displacement of the horizontal soil sites was enhanced by the application of seismic loads. Also, a comparison of the temporal history of soil horizontal displacements at different levels showed that with increasing geogrid layers, the amount of displacement of horizontal gray areas due to seismic loads does not show a significant trend. Also, a comparison of the temporal history of soil horizontal displacements at different levels revealed that with increasing hardness of the geogrid layers, the amount of displacement of the embankment horizontally decreases due to seismic loads. Finally, by comparing the temporal history of the axial horizontal displacements at different levels, it was found that with the change of acceleration, the amount of change in the horizontal position of the reinforced soil also changes due to seismic loads, which is due to the varying acceleration frequency content. Applied and different earthquake response to these accelerograms.

7. DATA AND MATERIAL AVAILABILITY

Data involved in this study can be requested to the corresponding author.

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