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Individual Environment, Cognitive Process, Team Environment as Human Factors for Measuring Performance in Workplace

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Abstract:- The work presents a study on individual environment, cognitive process, team environment as human factors for measuring performance in workplace. The study provides new information on several key issues regarding individual Environment, cognitive process, team environment as human factors for measuring performance. The results suggest all the three factors identified support work performance in labour, accuracy, and intelligent demanding tasks. Individual Environment, Cognitive process, Team Environment) with the moderating effect of Teamwork Ethics. The results provided practical implications for workplaces and human resource for the best performance of the workplace.

I. INTRODUCTION

Individual environment, cognitive process, team environment are the major and key elements of human factors for measuring performance in workplace. Extensive studies have investigated the relationship between the team environment and the performance of firms with diverse outcomes. Many of these studies have shown that the team environment tends to significantly influence long-term success for the organization, such as Ajmal and Other studies found a contradictory result, highlighting the negative relationships between the factors, and some reported weak linkages [1-5]. However, others found that several cultural features appear to be closely linked to organizational effectiveness. Some researcher s adopted an exploratory approach to explore and empirically assess the impact of the relationship between the team environment and performance management practices. The survey questionnaire was administered to a sample of 140 employees at the institute of information technology and a regression and correlation statistical analysis was used [6-8]. The findings show that all dimensions of the team environment have a significant and positive relationship to performance management practices. Subsequently, otthers looked at the relationship between the team environment and organizational performance at the operational level, focusing on multidimensional relationships between the team environment and operational performance[8-10]. The findings have established a significant and positive relationship between the team environment and performance. Others studied business strategy, culture and performance using the survey data from 500 top marketing managers. The finding was that cultural orientation plays a role in the creation of superior performance. This is evidence that culture has a significant and positive relationship to performance[11-15]. Moreover, several examined the impact of culture on the effectiveness of leadership and organizational performance around world[16-18]. The findings have shown that the relationship between culture and performance is positively significant. Notwithstanding, other concluded in their survey of project managers, engineers and senior executives of 76 U.S. firms that clan culture (group culture) enhances a cohesive and better performing team spirit of work, resulting in improved project and business performance[19-23]. Some others findings conclude that the team environment is significantly linked to organizational performance and surveyed non-government organizations operating in Nigeria using ordinary least square (OLS) data analysis[24,25]. The findings show a positive relationship between the team environment and organizational performance. Thus, this study posed to examined individual environment, cognitive process, team environment as human factors for measuring performance.

II. METHODS

The study present relationships between human factor (workload, fatigue, stress, communication, teamwork, trust) and ATCOs in Saudi Arabia Airports with the moderating influence of Teamwork Ethics. Therefore, the main question that this study sought to answer is whether workload, fatigue, stress, communication, teamwork, trust) and the moderating influence of Teamwork Ethics can all together determine the performance of ATCOs in Saudi Arabia Airports. The target population of this study is the Saudi airport managements of both domestic and international air controller management. Data were analysed using the Statistical Package for Social Sciences (SPSS) version 22. The factor analysis was conducted to determine the dimensions or components of a set of variables. Factor analysis is a data reduction approach that requires a large sample size and by correlation matrix. The explain that the observed variability can be assumed as a linear combination of certain factors were not considered

III. RESULTS AND DISCUSSIONS

Descriptive tests are used to measure the level of interest and opinions of the respondents for each measure or variable. For this purpose, researchers have calculated an average score of responses or values and using the midpoint of dividing the respondents' views on the level of low, medium, and high. Mean scores are categorized as follows (Table 11).

Table 1: Category of interest and the Views of Respondents

Level	Mean Value
Low	1.00 to 2.25
Medium	2.26 to 3.75
High	3.76 to 5.00

Individual Environment

The mean and standard deviation of Air traffic intensity in a short time (4.25±0.77), Feeling tired and exhausted (4.15±0.86), Working shift cause difficulty falling asleep (4.44±0.84), Scary dreams and nightmares (3.33±1.19), Navigating between work sites the tower and the radar (3.44±1.07), Having personal differences at work (3.82±0.94), High rate of application of administrative sanctions such as discount and warnings (3.98±1.09), The working in the morning period is pouring (3.28±1.23), Have disruption of circadian rhythms (4.11±0.99). Six of the items fall in to high categories, while, three items fall into medium category. The mean ranged between 4.44 to 3.28 and averaged at 3.87. The average standard deviation score at 0.51. Table shows that most respondents agreed on the reliability towards individual environment.

Table 2: Mean of individual environment

	Items	Mean	Std. Deviation
IE4	Air traffic intensity in a short time	4.25	0.77
IE5	Feeling tired and exhausted	4.15	0.86
IE6	Working shift cause difficulty falling asleep	4.44	0.84
IE8	Scary dreams and nightmares	3.33	1.19
IE9	Navigating between work sites the tower and the radar	3.44	1.07
IE11	Having personal differences at work	3.82	0.94
IE13	High rate of application of administrative sanctions such as discount and warnings	3.98	1.09
IE14	The working in the morning period is poring	3.28	1.23
IE15	Have disruption of circadian rhythms	4.11	0.99
	Total average	3.87	0.51

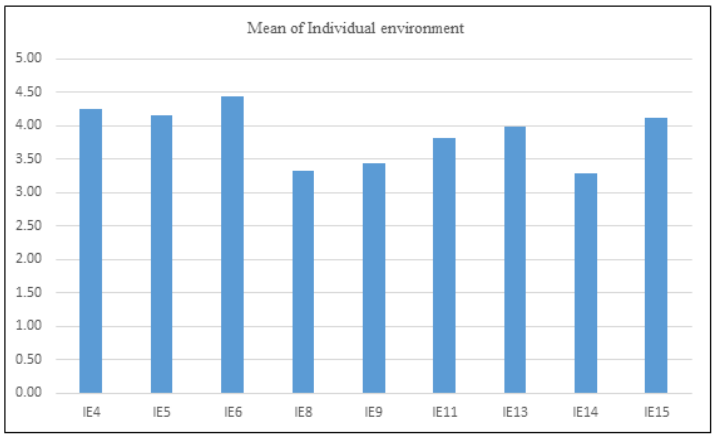

Figure1: Mean of Individual Environment

Cognitive Process

The mean and standard deviation of monitoring the air traffic movements constantly (4.65±0.58), Sometime aircraft conflate happen due to lost the picture (3.50±1.12), concentration will deteriorate faster undertake complex task (3.92±0.95), difficulty to control two or more task at once (3.28±1.03), selective attention skill is essential (4.47±0.61), dual task interference lead to human error (4.06±0.77), ability to pay continuous attention to detect changes (4.20±0.63), detecting changes continuously for safety of air traffic movement (4.22±0.77), maintain both visual and auditory vigilance on position (4.60±0.60). Seven items out of nine falls into high category and overall mean score is 4.10. That's mean, the level of cognitive process was high (table 3).

Table 3: Mean of cognitive process

	Items	Mean	Std. Deviation
CP18	monitoring the air traffic movements constantly	4.65	0.58
CP20	Sometime aircraft conflate happen due to lost the picture	3.50	1.12
CP21	concentration will deteriorate faster undertake complex task	3.92	0.95
CP23	difficulty to control two or more task at once	3.28	1.03
CP24	selective attention skill is essential	4.47	0.61
CP25	dual task interference lead to human error	4.06	0.77
CP28	ability to pay continuous attention to detect changes	4.20	0.63
CP29	detecting changes continuously for safety of air traffic movement	4.22	0.77
CP30	maintain both visual and auditory vigilance on position	4.60	0.60
	Total average	4.10	0.45

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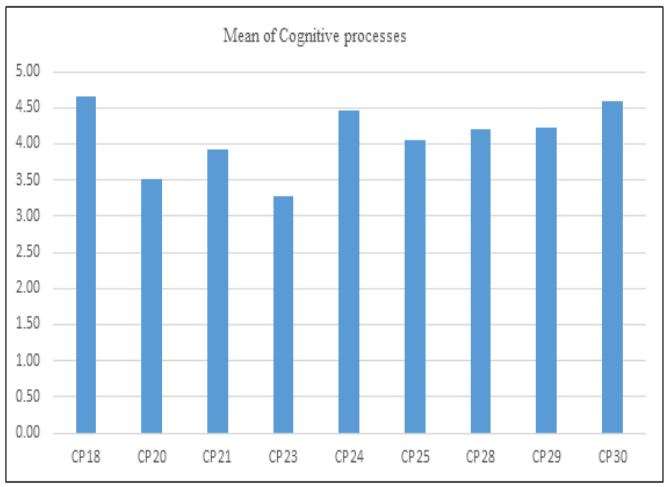

Figure2: Mean of Cognitive Process

Team Environment

The mean and standard deviation of Insufficient efficiency of the air traffic control equipment (3.68±1.05), You Keep all radio communication with pilot's brief and clear (4.08±0.77), lack of language between you and the pilot (3.01±1.08), Lack of confidence in working with a colleague (2.53±1.07), communication is the foundation of ATC (4.33±0.84), coordination between ATC sectors is always (3.95±1.03), You use ICAO standard phraseology in all situations (4.16±0.88), you rely on others controller and pilots to effectively achieve the control task (3.64±1.15). Four items fall into high category and the remaining four items fall into medium category. The overall mean and standard deviation were 3.67 and 0.48 (table 4). It indicated that the respondents considered that the level of team environment was medium.

Table **Error! No text of specified style in document.**: Mean of team environment

	Items	Mean	Std. Deviation
TE31	Insufficient efficiency of the air traffic control equipment	3.68	1.05
TE32	You Keep all radio communication with pilot's brief and clear	4.08	0.77
TE33	lack of language between you and the pilot	3.01	1.08
TE34	Lack of confidence in working with a colleague	2.53	1.07
TE37	communication is the foundation of ATC	4.33	0.84
TE38	coordination between ATC sectors is always	3.95	1.03
TE39	You use ICAO standard phraseology in all situations	4.16	0.88
TE41	you rely on others controller and pilots to effectively achieve the control task	3.64	1.15
	Total average	3.67	0.48

Figure3: Mean of Team Environment

Teamwork Ethics

The mean and standard deviation of Teamwork ethics help us to overcome workload (4.37±0.78), Teamwork ethics give me a trust in air traffic movement (4.47±0.63), Teamwork ethics help me to be more focusing (4.36±0.70), Team work ethics help me to take correct decision making (4.38±0.71), Team work ethics to detecting changes continuously (4.15±0.85). All the items fall into high category and the overall mean score is 4.35. Table 5 shows that the respondents agreed on the reliability towards teamwork ethics which level was high.

Table 5: Mean of teamwork ethics

	Items	Mean	Std. Deviation
TOE45	Teamwork ethics help us to overcome workload	4.37	0.78
TOE46	Teamwork ethics give me a trust in air traffic movement	4.47	0.63
TOE47	Teamwork ethics help me to be more focusing	4.36	0.70
TOE48	Team work ethics help me to take correct decision making	4.38	0.71
TOE49	Team work ethics to detecting changes continuously	4.15	0.85
	Total average	4.35	0.58

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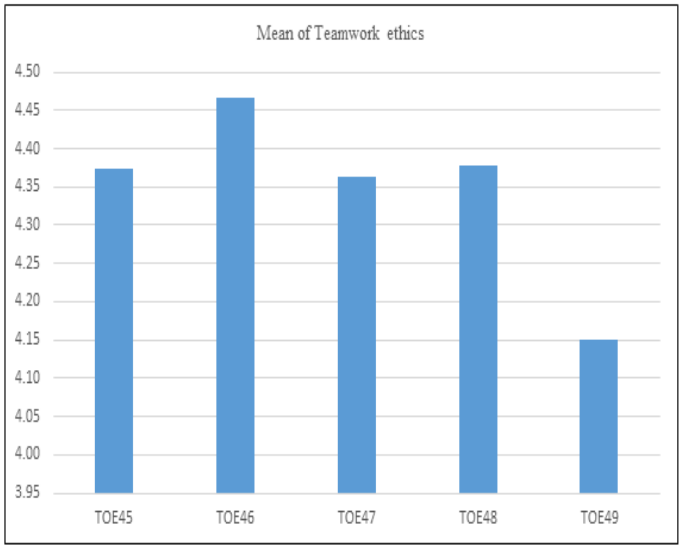

Figure **Error! No text of specified style in document.** :Mean of Teamwork Ethics

ATCOs Performance

The mean and standard deviation of delaying of air traffic movements without logical reasons (2.71±1.35), incidents increase in recent years (3.28±1.21), accidents increase in recent years (2.81±1.15), ATCOs performance is weak compare to last years (2.72±1.39), Air traffic movement safety getting lower in recent years (2.62±1.30), Lack of commitment in procedures issued by ICAO OR SANS (2.67±1.28), Not provide advice useful for the safe efficient conduct of flights (2.82±1.37). All the items of ATCOs performance fall into medium category (table 6). The overall mean and standard deviation were 2.80 and 0.93, respectively. The respondents agreed that the level of team ATCOs performance was moderate.

Table 6: Mean of ATCOs performance

	Items	Mean	Std. Deviation
ATCP51	delaying of air traffic movements without logical reasons	2.71	1.35
ATCP52	incidents increase in recent years	3.28	1.21
ATCP53	accidents increase in recent years	2.81	1.15
ATCP54	ATCOs performance is weak compare to last years	2.72	1.39
ATCP55	Air traffic movement safety getting lower in recent years	2.62	1.30
ATCP56	Lack of commitment in procedures issued by ICAO OR SANS	2.67	1.28
ATCP57	Not provide advice useful for the safe efficient conduct of flights	2.82	1.37
	Total average	2.80	0.93

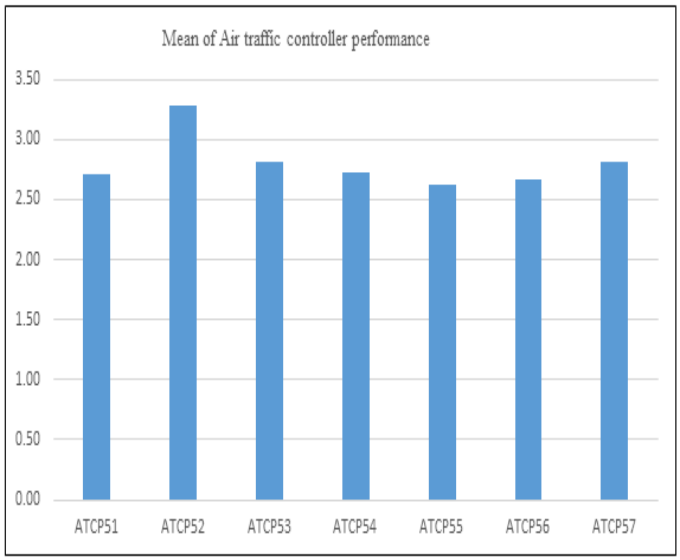

Figure 5: Mean of ATCOs Performance

Factor analysis was adopted in the statistical procedures purposely to validate construct validity of the scale construct of the measured variables reduces the large numbers of variables to smaller set and undrainable factor. (Zikmund et al, 2013).

Individual Environment (Communalities)

The principle component factor analysis procedures were conducted to figure out the factor loading for each scale items. The extraction results indicate the highest number is 0.670 and the lowest 0.143. Researchers had removed the item of IE11 because of low extraction value than 0.4 (table 7). Hence, the validity of the items can be assumed and included in analysis.

Table 7:Individual environment

	Items	Extraction
IE4	Air traffic intensity in a short time	.548
IE5	Feeling tired and exhausted	.660
IE6	Working shift cause difficulty falling asleep	.556
IE8	Scary dreams and nightmares	.589
IE9	Navigating between work sites the tower and the radar	.661
IE11	Having personal differences at work	.143
IE13	High rate of application of administrative sanctions such as discount and warnings	.670
IE14	The working in the morning period is poring	.657
IE15	Have disruption of circadian rhythms	.578

Cognitive Processes (Communalities)

The principle component factor analysis procedures were conducted to figure out the factor loading for each scale items.

The extraction results indicate the highest number is 0.738 and the lowest 0.401, which is more than 0.4 (Table 8). Thus, the validity of the items can be assumed and included in analysis.

Table 8: Cognitive processes (communalities)

	Items	Extraction
CP18	monitoring the air traffic movements constantly	.735
CP20	Sometime aircraft conflate happen due to lost the picture	.664
CP21	concentration will deteriorate faster undertake complex task	.401
CP23	difficulty to control two or more task at once	.669
CP24	selective attention skill is essential	.510
CP25	dual task interference lead to human error	.698
CP28	ability to pay continuous attention to detect changes	.494
CP29	detecting changes continuously for safety of air traffic movement	.494
CP30	maintain both visual and auditory vigilance on position	.738

Team Environment (Communalities)

The principle component factor analysis procedures were conducted to figure out the factor loading for each scale items. The extraction results indicate the highest number is 0.707 and the lowest 0.474, which is more than 0.4 (table 9). Therefore, the validity of the items can be assumed and included in analysis.

Table 9: Team environment (communalities)

	Items	Extraction
TE31	Insufficient efficiency of the air traffic control equipment	.707
TE32	You Keep all radio communication with pilot's brief and clear	.587
TE33	lack of language between you and the pilot	.499
TE34	Lack of confidence in working with a colleague	.645
TE37	communication is the foundation of ATC	.599
TE38	coordination between ATC sectors is always	.474
TE39	You use ICAO standard phraseology in all situations	.567
TE41	you rely on others controller and pilots to effectively achieve the control task	.607

Team Work Ethics (Communalities)

The principal component factor analysis procedures were conducted to figure out the factor loading for each scale items. The extraction results indicate the highest number is 0.693 and the lowest 0.591, which is more than 0.4. Hence, the validity of the items can be assumed and included in analysis.

Table 10: Teamwork ethics (communalities)

	Items	Extraction
TOE45	Teamwork ethics help us to overcome workload	.591
TOE46	Teamwork ethics give me a trust in air traffic movement	.693
TOE47	Teamwork ethics help me to be more focusing	.612
TOE48	Team work ethics help me to take correct decision making	.610
TOE49	Team work ethics to detecting changes continuously	.601

Air Controller Performance (Communalities)

The principle component factor analysis procedures were conducted to figure out the factor loading for each scale items. The extraction results indicate the highest number is 0.815 and the lowest 0.588, which is more than 0.4 (Table 11). Thus, the validity of the items can be assumed and included in analysis.

Table 11: Air traffic controller performance (communalities)

	Items	Extraction
ATCP51	delaying of air traffic movements without logical reasons	.724
ATCP52	incidents increase in recent years	.589
ATCP53	accidents increase in recent years	.627
ATCP54	ATCP54	.815
ATCP55	Air traffic movement safety getting lower in recent years	.788
ATCP56	Lack of commitment in procedures issued by ICAO OR SANS	.588
ATCP57	Not provide advice useful for the safe efficient conduct of flights	.627

Correlation is a method used to investigate the relation between tow variables in a linear manner. Pearson correlation was adopted to examine the associates between two variables. Thus, the change in one variable eventually will lead to change in another variable. The Pearson coefficient (r) will figure out the direction, magnitude and significance of the correlation. Table 12 will explain the Pearson coefficient (r) scale and a perfect positive relationship accoutred if r value is +1.0.

Table12: Pearson correlation scale

Correlation Coefficient	Correlation
r=1	Perfect Positive
$0.5 \leq r < 1$	Strong Positive
$0.3 \leq r < 0.49$	Moderate Positive
$0.1 \leq r < 0.29$	Weak Positive
$0 \leq r < 0.09$	Very Weak Positive
r = 0	Null
$-0.09 < r < 0$	Very Weak Negative
$-029 < r \leq -0.1$	Weak Negative
$-0.49 < r \leq -0.3$	Moderate Negative
$-1 < r \leq -0.5$	Strong Negative
r = -1	Perfect Negative

The result Table13 illustrated that there was weak positive correlation between ATCOs performance and Cognitive process (r = 0.141); moderate positive correlation between ATCOs performance and team environment (r = 0.314); moderate positive correlation between ATCOs performance and teamwork ethics (r = 0.412); moderate positive correlation between ATCOs performance and individual environment (r = 0.380).

Table13: Pearson correlation coefficient between variables

	Y1	Y2	Y3	Y4	Y5
Cognitive process (Y1)	1	.450**	.496**	.141*	.369**
Team environment (Y2)	.450**	1	.411**	.314**	.335**
Teamwork ethics (Y3)	.496**	.411**	1	0.412**	.221**
ATC performance (Y4)	.141*	.314**	0.412**	1	.380**
Individual environment (Y5)	.369**	.335**	.221**	.380**	1

** Correlation is significant at the 0.01 level (2- tailed)
* Correlation is significant at the 0.05 level (2- tailed)

The results of simple regression demonstrated individual environment has significant effect on ATCOs performance [DF1, 210= 35.514, p<0.05] (table 14). As reported R-square show 0.1446 or 14.46% variance contributed by individual performance.

Table 14 Effect of individual environment on ATCOs performance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.279	.428		.651	.516
Individual environment	.652	.109	.380	5.959	.000

Dependent variable ATCOs performance
DF1, 210= 35.514/R Square= 0.1446

IV. CONCLUSION

The work presents a study on individual environment, cognitive process, team environment as human factors for measuring performance in workplace. The study provides new information on several key issues regarding individual Environment, cognitive process, team environment as human factors for measuring performance. The results suggest all the three factors identified support work performance in labour, accuracy, and intelligent demanding tasks. Individual Environment, Cognitive process, Team Environment) with the moderating effect of Teamwork Ethics. The results provided practical implications for workplaces and human resource for the best performance of the workplace where the results of simple regression demonstrated individual environment, cognitive and team works have significant effect on the human factors. Thus, the study successfully examined individual environment, cognitive process, team environment as human factors for measuring performance.

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