

Effect of caffeine supplementation on performance and carcass characteristics of male broilers chicks

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Abstract: Caffeine added to drinks and food as a stimulator drug, and causes HCL secretion in stomach, hypertension and dilated blood vessels. In this experiment 200 1-d-old broiler chicks were randomly assigned to 4 dietary treatments (5 pens/ treatment of 10 male broilers each) in a completely randomized design. First treat was a control and the next three dietary treatments were supplemented with caffeine: 2) 0.5%, 3) 1.00%, 4) 2.00%. Broiler starter, grower and finisher diets, based on corn and soybean meal, were formulated, pelleted, and fed ad libitum. All data were analyzed by the analysis of variance general linear models procedure of SAS/STAT software and when treatment means were significant ($P < 0.05$), Tukey's multiple range tests was used to compare means. Before analysis, the univariate test was used to assess the normality of all data. Results show that with inclusion levels of caffeine, FI and DWG significantly decreased. Different levels of caffeine had no significant effects on FCR. Pancreases, neck and bursa relative weight and carcass percentage in 21 d and neck, gizzard and thymus weight in 42 d significantly increased with higher levels of caffeine. It was concluded that there was no significant difference in 0.5 and 1.00 % of caffeine and 2% caffeine cusses caffeinism in broiler chicks.

Keywords: broiler, caffeine, carcass characteristics, performance.

I. INTRODUCTION

affeine was natural products in coffee and cocoa and Cadded to drinks and food as a stimulator drug, and causes HCL secretion in stomach, hypertension and dilated blood vessels. Although induced vasoconstriction in some blood vessels. Caffeine is one of the most frequently used materials in the world and its effects on the body are, stimulation of gastrointestinal tract and increases intestinal movements, stimulate of central nerve system, high dose of caffeine cusses serotonin accumulation in brain and decreased state of drowsiness, caffeine induced hypertensions and increased urine excretion and fat breakdowns. Use of high dosage of caffeine induces caffeinism which is associated with neurological symptoms. Caffeine can have a calming role. The purpose of this study was to determine the optimal levels of caffeine supplementation in male broilers chickens feed.

II. THEORY AND LITRETURE

There was no re liable published data on caffeine usage and the effects of caffeine supplementation on performance and carcass characteristics in male broiler chickens, so more research was needed in this case. In on study telle (1995) suggested that with inclusion level of caffeine blood cholesterol level was increased which is associated with liver size and weight (11). In another experiment no significant changes occur during caffeine usage (10, 12). The joint effects of caffeine on humans and animals are affecting on offspring weight (2, 6). In a study of mice (4, 1, 8) and rats (3, 5, 9, 13) results show that caffeine level up to 230 and 390 mg/kg Bw⁻¹ dose not have carcinogenic and common clinical symptoms show as

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weight loss with no reduction in feed intake occurs.

III. MATERIALS AND METHODS

Bird Management and Experimental Design

This experiment was conducted to assess the effect of caffeine on growth performance and carcass characteristics of chickens from hatching to 42 days of age in a completely randomized design (CRD) with seven dietary treatments. This study was carried out over a 6-week period, using a total of 200 1-day-old chickens of a commercial genotype (Ross 308). After incubation of chicks delivered from local institutions and entrance hall, weighed, and with the same average weight ($36.5 \text{ g} \pm 0.50$) to ten pieces were distributed in 35 single cages. Treatments were three level of caffeine (0.5, 0.1 and 0.2) prepared from Sigma-Aldrich Chemie GmbH and control treats. Broiler chickens were monitored twice-daily for general health. Broilers were weighed by pen at days 0, 10, 24 and 42. Three birds with close to the average body weight (± 5 gram) from each replicate of treatments were slaughtered at day 21 and 42 for carcass characteristics. Based on the remaining birds and feed at the end of each period, adjusted BWG, FI and FCR measured during starter, grower and finisher periods. The experimental protocol was reviewed and approved by the Animal Care Committee of the Ferdowsi University of Mashhad, Iran.

Statistical Analyses

All data were analyzed by the analysis of variance (ANOVA) general linear models procedure of SAS/STAT software (SAS Institute, 2001) and when treatment means were significant ($P < 0.05$), Tukey's multiple range tests was used to compare means. Before analysis, the univariate test was used to assess the normality of all data Provided per kg of diet: vitamin A, 3,600,000 IU; vitamin D₃, 800,000 IU; vitamin E, 7,200 IU; vitamin K₃, 800 mg; vitamin B₁, 720 mg; vitamin B₂, 2,640 mg; vitamin B₃, 4,000 mg; vitamin B₅, 12,000 mg; vitamin B₆, 1,200 mg; vitamin B₉, 400 mg; vitamin B₁₂, 6 mg; vitamin H₂, 40 mg; choline chloride, 200,000 mg; Mn, 40,000 mg; Fe, 20,000 mg; Zn, 40,000 mg; Cu, 4,000 mg; Se, 80 mg. ³To change MJ/kg to kcal/kg, multiply the values by 239.

IV. RESULTS AND DISCUSSIONS

The results of caffeine supplementation on daily feed intake (DFI) and feed conversion ration (FCR) were illustrated in table 2. Results show that caffeine supplementation had no significant effects on FI during

Table 1. Feed Ingredients (%) and calculated analysis (%) of the experimental diets.

ingredients	starter	Grower	Finisher
Corn (%)	51.02	53.82	55.51
SBM (%)	39.91	36.52	34.77
Soy oil (%)	4.45	5.80	6.29
Dical. Phos. (%)	1.87	1.64	1.53
Limestone (%)	1.09	0.86	0.80
Salt (%)	0.38	0.37	0.37
L-Lysine (%)	0.29	0.15	0.01
Mineral & Vitamin Mix ¹ (%)	0.5	0.5	0.5
DL-Met (%)	0.38	0.29	0.22
L-Thre (%)	0.10	0.05	-
Calculated Analysis			
ME (Kcal/Kg)	3025	3150	3200
Protein (%)	22.57	21.06	20.19
CF (%)	3.94	3.76	3.68
EE (%)	2.26	2.34	2.39
Calcium (%)	1.05	0.90	0.85
Avail. Phos (%)	0.50	0.45	0.42
Potassium (%)	0.95	0.89	0.86
Sodium (%)	0.16	0.16	0.16
Lysine (%)	1.43	1.24	1.09
Met (%)	0.71	0.61	0.52
Met+cys (%)	1.07	0.95	0.86
Trep (%)	0.32	0.30	0.29
Arg (%)	1.45	1.35	1.30
Tre (%)	0.94	0.83	0.76

the starter periods. Moreover, treatment 4 (2% caffeine supplementation) significantly decreased FI in grower and finisher periods as compare with the other treats ($P < 0.05$). Although caffeine supplementation decreased FI in grower, finisher and 0-42d periods, it doesn't have significant effects of FCR ($P > 0.05$). According to FCR formula, caffeine has its effect on daily weight gain.

Effects of caffeine on mean body weight (MBW) and daily weight gain (DWG) were shown in table 3. Caffeine supplementation had no significant effects on mean body weight in day 10. While with inclusion levels of caffeine supplementation in diet mean body weight significantly decreased in 25 and 42 days of age ($P < 0.05$). May indicate the anti-nutritional effects of caffeine in 2% which induces decreased feed intake and result in decreased body weight. As shown in table 2, supplemented caffeine in 2% significantly decreased daily weight gain in grower, finisher and overall periods, which may suggest this effect was as results of high levels of caffeine compared to other levels used in this experiment.

The results of caffeine supplementation on carcass characteristics in 21 and 42 d were shown in 4 and 5. As we see caffeine supplementation had no significant effects on heart, liver, thigh, wing, abdominal fat pad, and gizzard and thymus relative weight in 21d. In the other hand, 2%

caffeine supplementation induces maximum pancreases weight ($P < 0.05$). Moreover, 1% caffeine supplementation induces minimum pancreases weight as compare with the other treats ($P < 0.05$), and there were no significant difference were shown in 0.5% caffeine supplementation and control treat. This may be due to the effects of caffeine supplementation on the 2% on reduction in feed intake and was followed by a decrease body weight. High dosage of caffeine supplementation (2%) significantly increased neck relative weight ($P < 0.05$). Carcass percentage was significantly increased with supplemented caffeine ($P < 0.05$). Also, different levels of caffeine supplementation significantly decreased spleen weight as compare with the control group ($P < 0.05$). Bursa fabrisious relative weight was significantly increased with the 2% caffeine supplementation ($P < 0.05$).

And there were no significant difference was shown with the other caffeine levels ($P > 0.05$). In contrast to the effects of caffeine supplementation on 21d carcass characteristics, caffeine supplementation had significant effect on neck, gizzard and thymus relative weight, thus 2% caffeine supplementation significantly increased neck weight as compare with the other treats ($P < 0.05$). Treatment 4 significantly increased gizzard and thymus weight in 42d ($P < 0.05$), and treatment 3 (1% caffeine supplementation) cusses minimum gizzard and thymus weigh ($P < 0.05$).

V. CONCLUSION

In summery, our study demonstrated that 2% caffeine supplementation in the diets cusses' caffeinism symptoms in broilers and did not recommended. Moreover, there were no differences between 0.5 and 1.00 % caffeine supplementation in broilers growth performance.

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Table 2. Effects of caffeine supplementation on daily feed intake (g/b/d) and feed conversion ratio

	Daily Feed Intake (g/b/d)				Feed Conversion Ratio			
	0-10	11-24	25-42	0-42	0-10	11-24	25-42	0-42
Treatment ¹ 1	23.01	72.20 ^a	162.59 ^a	85.93 ^a	1.34	1.60	2.19	1.71
Treatment 2	22.18	35.37 ^a	160.43 ^a	82.66 ^a	1.31	1.55	2.34	1.73
Treatment 3	23.53	63.28 ^a	164.51 ^a	83.77 ^a	1.30	1.49	2.47	1.75
Treatment 4	22.23	46.24 ^b	138.67 ^b	69.05 ^b	1.29	1.67	2.58	1.85
SEM	0.274	2.564	2.722	1.617	0.019	0.292	0.071	0.028
P	0.24	<0.0001	<0.0001	<0.0001	0.87	0.11	0.23	0.34

¹ Interactions are: 1, control. 2, 0.5% caffeine, 3, 1.00% caffeine, 4, 2% caffeine.

² a-c Means in each column with no common superscripts are significantly different (P< 0.05).

Table 3. Effect of caffeine supplementation in mean body weight (g) and daily weight gain (g)

	Mean Body Weight (g)			Daily Weight Gain (g)			
	10	25	42	0-10	11-24	25-42	0-42
Treatment 1	209.78	871.67 ^a	2228.5 ^a	17.25	45.04 ^a	74.78 ^a	45.69 ^a
Treatment 2	205.64	827.22 ^a	2063.7 ^a	16.91	42.05 ^a	68.69 ^a	42.55 ^a
Treatment 3	219.64	836.56 ^a	2082.1 ^a	18.17	42.10 ^a	67.91 ^a	42.73 ^a
Treatment 4	209.78	620.00 ^b	1586.7 ^b	17.17	27.55 ^b	54.04 ^b	32.92 ^b
SEM	2.738	28.983	66.084	0.268	1.720	2.363	1.283
P	0.33	0.001	0.0002	0.39	<0.0001	0.004	<0.0001

¹ Interactions are: 1, control. 2, 0.5% caffeine, 3, 1.00% caffeine, 4, 2% caffeine.

² a-c Means in each column with no common superscripts are significantly different (P< 0.05).

Table 4. Effect of caffeine supplementation on 21d carcass characteristics (% live weight).

	Heart	Liver	Pancreases	Breast	Thigh	Wing	Neck	Carcass %	Abdominal fat	Gizzard	Spleen	Thymus	Bursa
Treatment 1	0.68	2.78	0.47 ^a	19.19 ^{bc}	17.10	5.48	13.99 ^b	55.78 ^b	0.54	3.19	0.13 ^a	0.28	0.22 ^b
Treatment 2	0.61	2.89	0.43 ^a	20.36 ^{ab}	17.27	5.79	16.43 ^b	59.78 ^a	0.69	2.58	0.07 ^b	0.37	0.28 ^{a,b}
Treatment 3	0.57	2.61	0.36 ^b	22.39 ^a	18.00	5.64	13.97 ^b	59.99 ^a	0.35	2.36	0.06 ^b	0.33	0.22 ^b
Treatment 4	0.71	3.81	0.50 ^a	17.84 ^c	16.02	5.23	21.36 ^a	60.47 ^a	0.44	2.24	0.04 ^b	0.38	0.37 ^a
SEM	0.039	0.230	0.019	0.553	0.287	0.113	0.972	0.623	0.076	0.169	0.010	0.018	0.021
P	0.64	0.26	0.02	0.002	0.07	0.38	0.0006	0.002	0.49	0.19	0.0008	0.30	0.003

¹ Interactions are: 1, control, 2, 0.5% caffeine, 3, 1.00% caffeine, 4, 2% caffeine.

² a-c Means in each column with no common superscripts are significantly different (P < 0.05).

Table 5. Effect of caffeine supplementation on 42d carcass characteristics (% live weight).

	Heart	Liver	Pancreases	Breast	Thigh	Wing	Neck	Carcass %	Abdominal fat	Gizzard	Spleen	Thymus	Bursa
Treatment 1	0.56	2.06	0.20	22.44	17.94	5.22	12.67 ^a	58.28	1.07	1.39 ^{ab}	0.13	0.03 ^b	0.07
Treatment 2	0.48	2.14	0.16	23.15	18.37	5.12	13.39 ^b	60.05	0.97	1.40 ^{ab}	0.08	0.03 ^{a,b}	0.07
Treatment 3	0.55	2.23	0.18	25.41	19.44	5.12	14.39 ^b	64.37	0.91	1.27 ^b	0.10	0.03 ^b	0.07
Treatment 4	0.59	2.51	0.14	36.90	18.25	4.99	21.30 ^a	81.45	0.64	1.97 ^a	0.10	0.07 ^a	0.09
SEM	0.016	0.067	0.012	3.366	0.305	0.132	1.174	4.082	0.062	0.098	0.010	0.005	0.010
P	0.08	0.07	0.39	0.44	0.37	0.96	0.005	0.15	0.07	0.02	0.45	0.02	0.83

¹ Interactions are: 1, control, 2, 0.5% caffeine, 3, 1.00% caffeine, 4, 2% caffeine.

² a-c Means in each column with no common superscripts are significantly different (P < 0.05).

Evaluation of pressure treatments on microorganisms

Parnian Pezeshki and Khashayar Pournia

Abstract: Novel food processing technologies aim to provide safe, high quality foods with desirable nutritional and physico-chemical properties. One of those emerging processes which could serve as an alternative method for food preservation is the use of high hydrostatic pressure. This treatment permits the inactivation of microorganisms and enzymes at low temperatures, whilst valuable low molecular constituents, such as vitamins, colors and flavorings, remain largely unaffected. Hydrostatic high pressure technology is relatively new to food industry and is more and more considered as an alternative to traditional preservation methods like heat processing. Inactivation of bacteria, spores, and virus has been demonstrated.

Keywords: Novel food processing, high hydrostatic pressure, Inactivation of bacteria, spores, yeasts and molds.

I. INTRODUCTION

Novel food processing technologies aim to provide safe, high quality foods with desirable nutritional and physico-chemical properties. More recently with the use of minimal processing treatment concepts have been added to the already existing food processing requirements. Some of them might be beneficial for the improvement of hygiene and the extension of shelf life. One of those emerging processes which could serve as an alternative method for food preservation is the use of high hydrostatic pressure. The use of pressure as a thermodynamically parameter was firstly introduced into the Biology field at the end of the 19th century by Regnard (1884), Royer (1895) and Hite (1899). Then,

over the period 1910–1955, two main teams, the one of Bridgman in the USA and the one of Basset in France had focused their works on this new research area, contributing to its development [1]. After a long period during which high pressure had been mainly developed in other domains (Geology, Geochemistry, Chemistry, and Physics), it was rediscovered in Japan in 1980–1990, in particular for food processing applications. During the last twenty years, an increase of interest for researches dealing with Biology under high pressure have permitted to initiate a large range of biological applications, from food processing to potential developments in medicine [2].

II. DEFINITION OF PRESSURE

Pressure is defined as the force per unit area applied on a surface in a direction perpendicular to this surface: mathematically:

$$P = \frac{F}{A}$$

In which P is the pressure, F is the normal force applied to the surface and A is the area of the surface. The official pressure unit is the Pascal (Pa) (1 Pa=1 N/1 m²=10⁻⁵ bar). The Newton representing a small force and 1 m² corresponding to a large surface, the Pascal unit is a very small pressure unit. Consequently, the Megapascal (MPa) [1MPa=10⁶ Pa] is the pressure unit commonly used in high pressure studies.

Two types of pressures can be considered: static and dynamic pressures.

Static pressures are used in treatments where the pressure value can be maintained over a long time. Two different categories of static pressure can be defined:

- Isostatic pressure, where the pressure value is the same in all the directions of the space. This is in particular the case in water (hydrostatic pressure),
- Non-isostatic pressure, where a pressure gradient is induced versus the structure of the equipment generating the pressure or versus the non-homogeneous compressibility of the medium (in particular in the case of solids with an anisotropic structure).

Dynamic pressures concern super-high pressures

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developed over a short length of time and usually associated with temperature. Shockwaves are mainly used to generate such pressures [3, 4].

III. PROCESSING TECHNOLOGY

High pressure processing (HPP) of foodstuffs is used for the preservation and modification of foodstuffs. Thereby, foodstuffs are normally subjected for periods of a few seconds up to several minutes to hydrostatic pressures above 350 MPa [2]. This treatment permits the inactivation of microorganisms and enzymes at low temperatures, whilst valuable low molecular constituents, such as vitamins, colors and flavorings, remain largely unaffected. The ability of hydrostatic pressures to inactivate microorganisms as well as to denature proteins was demonstrated about a hundred years ago [2,5]. Hydrostatic pressure is generated by increasing the free energy, e.g. by heating in closed systems or by mechanical volume reduction. In biological systems pressure higher than 400 MPa can lead to a reversible and irreversible cleavage of intermolecular bonds [5] In this way structural changes in membranes as well as the inactivation of enzymes involved in vital biochemical reactions are the key targets of microbial kill by high pressure. The inactivation of virus is supposed to depend on the denaturing of capsid proteins essential for host cell attachment [6].

The high pressure process itself is characterized by three parameters: temperature T , pressure p , and pressure exposure time t . Compared to other processes like heat preservation which is based on two parameters only (T , t) the three parametric HPP offers a broad variability for process Design. The justification for applying novel preservation concepts should be: high safety margins, superior quality and reasonable costs [2].

IV. PRESSURE EFFECTS ON PATHOGENS

One of the main applications of HPP in the food industry is the elimination of microbial pathogens. Microorganisms vary in their response to pressure (Fig. 1). The viability of vegetative microorganisms may be affected by inducing structural changes at the cell membrane or by the inactivation of enzyme systems which are responsible for the control of the metabolic actions[7]. Typically, significant inactivation of vegetative bacteria, yeasts and moulds and viruses can be observed within minutes at room temperature and pressures higher 300 MPa [8]. However, increasing the pressure to 700 MPa or higher most inactivation reactions are strongly accelerated.

A. Bacteria

Cell membrane is often considered as the first site of injury in pressure-inactivated bacteria. Indeed, scanning electron microscopy observations show some bud scars on the surface of pressurized cells, suggesting that the cellular wall or membrane may be one of the targets of high pressures [9]. However, membrane damage in some bacteria strains (assayed with Propodium Iodide staining) appears later than cell death [9,10] and disruption of this membrane cannot be observed even at the highest pressure treatments [11]. So, the action of high pressures on cell membrane may involve some other mechanisms. It is known that membrane fluidity decreases when pressure increases, implying that microorganisms with less fluid membranes are more pressure sensitive [12]. This results in alterations of membrane bound enzyme functionality [13]. For example, cell death of *Lactobacillus rhamnosus* can be correlated with inactivation of ATP-mediated dye exclusion system, which is localized on the cell membrane. The degradation of this system impairs the ability of cells to reproduce and develop colonies on nonselective media [10]. Furthermore, analysis of scanning electron microscopy images of *S. aureus* and *E. coli* demonstrates that following pressure inactivation the average cell view area and volume increases. It is proposed that these observations could be associated to modifications of membrane properties, such as the denaturation of membrane bound-proteins or phase transition of the membrane lipid bilayer [14]. Another evidence that membrane bound-proteins may be affected by high pressure treatment is the decrease in cellular ATP content and membrane potential, which could be associated respectively with a dysfunction of the ATPase and the incapacity of the cell to maintain its homeostasis, process that involve several transmembrane proteins [9,11].

As explained earlier, the loss of the integrity of the cell membrane is not enough to explain the pressure inactivation process of bacteria. After high pressure treatment of *E. coli*, the internal structure of the cells is also modified, as shown by the condensation of nucleoids and the aggregation of cellular proteins. However, no absolute correlation between these phenomena and cell inactivation can be defined. The condensation of nucleoids could be due to the direct DNA packing effect in the cells (which is not associated with DNA dysfunction) or by the action of pressure on protein-DNA complexes. The aggregation of cellular proteins could be caused by their denaturing under pressure. It is interesting to underline that these two

effects could also be partially explained by cell membrane damage. Indeed, protein–DNA complexes as well as intracellular proteins such as ribosomes necessitate divalent metal ions for their stabilization. Upon membrane cell damage, leakage of such ions from the cell is highly probable, resulting in destabilization of these entities [15].

The efficacy of high pressure inactivation of bacteria is dependant of many parameters, including the cell itself, the water activity of the system and the temperature used for the high pressure treatment.

Gram positive bacteria appear to be more pressure resistant than Gram negative bacteria. It is assumed that this difference of sensitivity to high pressure could be associated with difference of structures of the cell envelope. Indeed, the cell envelope of Gram negative bacteria is composed of an additional layer: the outer membrane which is more pressure sensitive than the cytoplasmic membrane [14].

The water activity (a_w) of the system is also an important factor for the inactivation of bacteria under high pressure. It appears that as a_w decreases, bacteria become more resistant to the pressure effect. It is assumed that by decreasing the a_w of the cell cytoplasm, this latter become less compressible, and thus the area/volume ratio, which seems to be involved in cell inactivation, is modified [16].

pressure stability of microorganisms often appears to be maximal at 20–40 °C whereas stability is decreased at lower temperatures. This might be explained by the increase of water and cell cytoplasm compressibility with decreasing temperature and thus, an increased transfer of mechanical energy to the microbial cell. Assuming microbial cell death is initiated at a certain threshold of mechanical energy transferred into the cellular system, at low temperatures, this lethal threshold is achieved at lower pressures than the pressure needed at higher temperatures [17]. The inactivation efficiency of high pressure treatments on bacteria, as *E. coli* for example, is increased when applied at subzero temperatures [16]. Under these conditions, high pressures appear to be more effective when they induce phase transition between ice I and ice III, and this could be associated with the stress caused by the phase transition itself [18]. It is suggested that when high pressure treatment is applied at subzero temperature, the inactivation process occurs mainly during the transiently permeabilized state [17].

B. Yeasts and molds

In general, yeasts and fungi are more sensitive to high pressure than vegetative bacteria. The inactivation

mechanism for yeasts by high pressure is close to the one for bacteria, in that high pressure affects the cell membrane permeability and cellular structures, is responsible for protein denaturation [19]. Indeed, a mild high pressure treatment (300 MPa, 15 min, 25 °C) modifies cell walls and plasma membrane of *Saccharomyces cerevisiae*, but it seems that the intracellular membrane is the first target in the inactivation process [20]. The idea that membrane permeability is affected by high pressure is reinforced by the cell volume decrease observed after treatment. This implies a water flux which is possible if the cell membrane becomes more permeable and allows internal molecules to exit [1]. Contrary to bacteria, yeasts are eukaryotic cells and thus possess mitochondria. It appears that mitochondria could be one of the elements altered over the pressure inactivation process. High pressures may cause the release of cytochrome c from mitochondria, which are presumed to be a key signalling step in the apoptosis process, leading to cell death [20].

C. Bacterial spores

Bacterial spores are not by themselves an hazard to the food industry. It is the eventual germination, outgrowth, and proliferation of the organism which results in toxification or spoilage of food during the post-processing storage. Bacterial endospores, as compared to vegetative cells, display a considerably higher resistance to temperature and high pressure. This process of sporulation is initiated when there is a lack of nutrients. The high resistance of spores to numerous stresses, such as heat, radiation, desiccation, chemicals, is mainly due to their particular structure made up of a number of layers. The cortex, which is responsible for the establishment and maintenance of the low water content in the spore core, is probably the main origin of the high pressure resistance of spores [19,21]. The direct inactivation of spores by high pressure necessitates the application of very high pressures, as high as 827 MPa for 30 min at 75 °C [22]. On the other hand, many other bacterial endospores, which are relevant to food are inactivated at pressures 600 MPa or greater in combination with initial temperature above 60 °C [23].

D. Viruses

The pressure resistance of viruses varies greatly among virus strains [1]. Viruses are generally classified in two groups: the enveloped and the non enveloped viruses, according to their structure which is either a membrane enveloped or non enveloped protein shell and nucleic acid [24]. Most of the studies have been conducted on

enveloped viruses. In this case, high pressure can affect three types of interactions: protein–lipid, protein–protein, and protein–nucleic acid. This later seems to remain intact under high pressure [25]. After high pressure treatment, the overall structure of the virus is not altered, and the only noticeable difference with electron microscopy observations is the presence of a bulge in the surface, which can be explained by a displacement of the capsid subunits retained under the lipid and protein membrane [26]. These subtle conformational changes in the viral coat proteins and/or its envelope glycoproteins, induced by high pressure, mimic the binding process of the viral particles to the host cellular receptors, the so-called “fusion-active state” [25, 27]. The transition to the fusogenic state impedes the binding of the virus to its cellular receptors and thus prevents endocytosis and virus infection [24]. Non enveloped viruses are usually more pressure resistant than enveloped viruses. The fusogenic state described for enveloped viruses can also be found in pressure-inactivated non enveloped viruses. It is often proposed that under pressure, the capsid disassembles and when pressure is released, there is reassociation to a non-infectious particle, which resembles the fusion intermediate state described for enveloped viruses [24,28]. in contrast to proteins, pressure induced stabilization of viruses towards heat inactivation is not a general phenomenon, but has been observed in isolated cases[2]. On the other hand, a number of reports have indicated that the dissociation and denaturation of proteins and viruses by pressure is promoted by low temperatures. Under these conditions, proteins can undergo cold denaturation due to a synergistic destabilization of hydrogen bonds and hydration of hydrophobic groups, leading to the loss of quaternary and tertiary structures [1, 29].

V. CONCLUSIONS

HPP is a process that can inactivate microorganisms, spores and virus at low or moderate temperatures whilst retaining sensory and nutritional properties. This ‘novel’ non-thermal technology has the potential to be used in the development of a whole new generation of value added foods. Although food safety issues and the achievable extension of shelf-life and the legislative situation need to be inspected case-by-case the existing experimental data can be helpful in exploring potential fields of application for high pressure processing. HPP is not likely to replace all traditional processing methods, but it may complement such methods or find niche applications. In addition, novel physico-chemical and sensory properties obtained from this technology offer

exciting opportunities for industry.

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TABLE 1. SENSITIVITY OF SELECTED MICRO-ORGANISMS TO HIGH HYDROSTATIC PRESSURE

	Micro-organism	Substrate	Treatment conditions	Inactivation (log ₁₀ units of reduction)
Bacteria	Campylobacter jejuni	Pork slurry	300 MPa/25°C /10 min	3
	Escherichia coli O157:H7	UHT Poultry meat	milk 600 MPa/20°C /15 min	<2 3
	Staphylococcus aureus	UHT milk Poultry meat	600 MPa/20°C /15 min	2 3
Yeast & Molds	Saccharomyces cerevisiae	Pork slurry	300 MPa/20 °C/10 min	2
Bacterial Spores	Byssoschlamys nivea	Grape juice, a _w =0.97	700 MPa/70 °C/30 min	4
	C. botulinum type E spores (Alaska)	Sorensen phosphate buffer (0.067 mol l ⁻¹ , pH= 7.0)	827 MPa /50°C/5 min	5
	C. sporogenes spores	Chicken breast	680 MPa/80°C /20 min	2
Viruses	HIV-1	Culture medium	550 MPa/25°C /10 min	Infectivity titre reduced by 4log ₁₀ units
	Hepatitis A	Tissue culture Medium	450 MPa/21°C / 5 min	>6log ₁₀ reduction in plaque-forming units
		Sea water	450 MPa/21°C / 5 min	<2log ₁₀ inactivation
	Poliovirus	Tissue culture medium	450 MPa/21°C / 5 min	No reduction in plaque-forming units

Optimization production method of red Ray onion cultivar for sustainable cultivation

Azin Ghavami

Abstract—Onion is one of the important vegetables. Onion production was done by seed planting and transplanting methods. Transplant age, plant density and its interaction with transplant age is important subjects. Research was done in Mohammad-Shahr Karaj in 2012. The experimental design was split plot in RCBD base at 4 replications. Main factor was plant density (5, 7.5, 10, 12.5 cm), sub factor was transplant age (45, 55, 65 days). Each plot had 6 rows that the length of them, was 4 meters & 30 cm distances. Statistical operations were done by Dakan method with MSTATC software. The results showed that using of 45 and 55 days transplants and 5 and 7.5 cm plant distances were the highest in the traits.

Keywords—Onion, Plant density, Transplanting

I. INTRODUCTION

Onion is an important vegetable in the country of Iran. Economically and nutrition is very important. Vegetable cultivation and an annual production are of about 50,000 acres, about 2 million tons. One of the most popular in Tehran onions, red ray that is at a level of about one thousand acres are cultivated. Onions are grown by seed. This late addition to the product, additional expenses in the early stages of thinning and irrigation makes the cost of production. So, change the system of cultivation, from seeds to seedlings of onion cultivation is important for applications. One of the key factors in methods of transplanting is planting seedlings in the size and age appropriate. In relation to this result will become some onion, studies show that high performance is obtained by the method of transplanting.

This product has been in decline in twinning. Planting seedlings could establish the optimum plant size in the field,

increase productivity and create more economic benefits of early maturity can bring. Density field is also an important factor that should be examined in the transplanting size factor and the interaction between age and density set of transplants. In other words, to determine the appropriate age for transplanting density which product is superior in terms of quantity and quality. Therefore, this study introduces the transplant culture system, the optimum age of seedlings, planting density and interaction factors were examined. The results of this study are applied. Farmers in cultivation of this vegetable can be used.

II. MATERIALS AND METHODS

The research in the field of Agricultural Research and Higher Education Center located in the city of Karaj Mohammad-shahr in the form of a field trial was conducted. Treatments include age seedlings (A) at three levels (45, 55, and 65 days) as the main plot and subplot density (B) in the four-row plant spacing (5 and 7/5 and 10 and 12/5 cm) in a split plot statistical design based on RCBD with four replications (fig 1). Onion seeds in early March in the nursery were planted at three time intervals of 10 days apart.

After preparing the seedling transplanting the seedling main farm operation was performed. Seedlings in 3 ages 45 and 55 and 65 days, on 10 May, were transferred to the main land. During the growth period, routine care including watering, fighting weeds and spraying was performed. Immediately after planting seedlings in the field was done, were watering. 15 days after planting seedlings were first nitrogen fertilizer application. 15 days after the second application of fertilizer was applied. Fighting weeds in a field with four hand weeding was done. At the end of vegetative growth, vegetative growth traits including plant

height and diameter of the neck and plant fresh weight were recorded.

At the end of July, sprayed with poison Mtasystvks (60%) were performed against onion thrips. The spraying was repeated 20 days later. In mid-September, the onions are ready to harvest, farm irrigation experiment was discontinued. After harvest, yield (tons per acre), yield components, quality attributes, such as bulb dry matter and soluble solids were recorded. Harvest end of September, the two middle lines of each plot was conducted.

Fig 1- Research plan

REP1	A1B1	A1B2	A1B3	A1B4	A2B1	A2B2	A2B3	A2B4	A3B1	A3B2	A3B3	A3B4
REP2	A3B4	A3B3	A3B2	A3B1	A1B2	A1B1	A1B3	A1B4	A2B2	A2B1	A2B3	A2B4
REP3	A3B2	A3B4	A3B1	A3B3	A2B1	A2B2	A2B3	A2B4	A1B3	A1B2	A1B1	A1B4
REP4	A1B3	A1B1	A1B4	A1B2	A3B4	A3B3	A3B1	A3B2	A2B3	A2B4	A2B1	A2B2

Other traits recorded after harvest, the average diameter of the neck and bulb diameter, bulb fresh weight, yield, dry matter and firmness of the bulb. In this paper, the importance of attributes, only the results of yield (tons per acre), single bulb weight (g), dry matter and soluble solids bulbs are paid. After data entry, analysis of variance and mean comparison was done by Duncan Mstac software.

III. RESULTS AND DISCUSSION

There was no significant difference between study characteristics in different iterations. Old seedlings were

significantly different in yield and other traits were not significant. The compression factor, the weight of single bulb and percentage of dry matter can create significant. There was no significant difference in other traits. Seedling age interaction on the density, single bulb weight was significant. The other traits were not significant. (Table 1).

Table 1 - Analysis of variance (mean squares) investigated traits

Dry bulb	TSS	Single bulb(g)	yield	Degrees Of freedom	Sources of variation
8.29ns	3.59ns	449.64ns	154.90ns	3	Repeat (R)
3.66ns	2.29ns	32.255ns	283.03*	2	Old seedlings (a)
4.10	1.37	331.36	80.04	6	A error
8.48**	2.49Ns	565.68*	92.09ns	3	Accumulation of plant
0.606ns	1.017ns	295.99*	29.92ns	6	Age × Density (ab)
1.47	1.204	131.67	51.21	27	B error
				47	Total
12.18	9.03	12.63	19.75		Coefficient of Variation (%)

Comparison results show the highest mean seedling traits at age 45 years and 55 days, respectively, with the yield on the 71/38 and 62/38 tons per hectare.

The ages of the 65-day transplant are significant (Table 2).

Table 2 - comparing the results mean seedling traits under study at different ages

Dry Bulb	Percent TSS	single bulb (g)	Yield (Tons per acre)	Age Transplanting
9.90a	11.87a	91.14a	38.71a	45 days a1
9.52a	12.013a	92.119a	3862a	55days a2
10.47a	12.580a	89.32a	31.38b	65days a3

No significant difference between the mean of the other

ISSN (Online): 2305-0225

Issue 12(4), July 2014, pp. 378-381

characters. Table 3 shows the results of the comparison between average grain densities grow, the plant between 5 and 7/5 cm, yield significant advantages over higher distances. But the single bulb weight was between the 10 and 12/5 cm less than the distances are significant.

Table 3 - Results of comparison of traits in the plant density study

Dry bulb	Percent TSS	single bulb (g)	Yield (Tons per acre)	Density Bush
11.10a	12.410ab	83.92c	39.76a	Plant distance of 5 cm (b1)
9.83b	12.083ab	86.23bc	36.98a	Plant distance 7/5 cm (b2)
9.86b	12.58a	95.07ab	34.87b	Plant distance 10 cm (b3)
9.06b	11.55b	98.21a	33.37b	Plant distance 12/5 cm (b4)

Increasing the distance between the plant and increase the space for the bulb, each bulb weight increased significantly. Dry matter per bulb at a distance of 5 cm, the highest ranking 90/9 percent is accounted for. The TSS bulb at the top of the plant between 12/5 inch minimum ratings of 11/55 percent is (Table 3).

From Table 3 we can see that with decreasing distance significantly increased plant performance. This property at 10 and 12/5 cm has been significantly reduced. The reason for this can be attributed to increased bulbs production.

Table 4 - Results of comparison study characteristics, the interaction of factors

yield (Tons per acre)	Treatment
43.62(a)	a ₁ b ₁
40.12(ab)	a ₁ b ₂
33.37(ab)	a ₁ b ₃
37.75(ab)	a ₁ b ₄
43.25(a)	a ₂ b ₁
37.75(ab)	a ₂ b ₂

39.00(ab)	a ₂ b ₃
43.25(ab)	a ₂ b ₄
32.17(ab)	a ₃ b ₁
33.00(ab)	a ₃ b ₂
32.25(ab)	a ₃ b ₃
28.12(b)	a ₃ b ₄

On the other hand, with increasing distance from the plant, especially in the 10 and 12/5 cm single bulb weight increased significantly. However, this increase did not lead to superior yield. In other words, the yield, the number of bulbs, plants and their products, have been decisive.

Leskovar, and Vavrina (1999) in their study of the effects of plant density on yield and yield components were studied. Given the significance of interactions yield factors, the results in Table 4 show that treatment with a₁b₁ and a₂b₁ with 62/43 and 25/43 and a₃b₄ with 12/28 t ha respectively have the highest and lowest ranking are.

IV. CONCLUSION

In conclusion, one can say, transplanting results in terms of earliness product and economic justification of the seed crop was diagnosed better.

The cultivation of transplanting in the ages of 45 and 55-day fasting and plant with a distance of 5 cm is advisable that this result is evident in the case of very high performance. While other traits as well, in total use of transplanting with age 65-day is not advisable. In the case of combined results together and offer the best type of application, it can be said with regard to market onions size and even produced it is better applied to 55-day plantings were pre-planted.

By changing the distance between plants on the row can be resized to reuse the manufacturing and control and reuse the medium weight followed by changing the size of the average weight of the bulb, bulb manufacturing and onions with the desired size and market-friendly production. These results can also be used to set the size of the manufactures special bulb for enhancing market mindedness as well as mechanized harvest and export the product as well as aspects of fashion.

ACKNOWLEDGMENT

This study was funded by Horticulture PHD Student of the university from Tehran Agricultural Science & Research Branch and Development Center Islamic Azad University-Iran.

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Re-Construction Management on Urbanities based on spatial approaches

Azita Rajabi, Ai Najafi

Abstract: In the case of developing countries, the pace of urbanization is rapid compared to their level of industrialization, resulting in irregular settlements. It has been pointed out that the phenomenon of “over-urbanization” occurs as the urban population swells more than the level of economic development can support. Thus, it is now recognized that poverty is an important driving factor in the growth of cities in developing countries. The types and severities of urban environmental problems differ depending on the development level of “hardware” (infrastructure such as mass transportation systems, water supply and sewerage systems, and waste treatment facilities) and “software” (such as legal systems and market economy mechanisms) for a given level of urban economic activity. With this over-urbanization phenomenon, urban environmental infrastructure is a cause of shortages, and poverty is an important factor preventing the formation of financial mechanisms that could facilitate urban environmental infrastructure improvements (Kidokoro 1998).

Nevertheless, since the 1980s, the economic growth of cities has been helped along by increases in foreign direct investment (FDI), as cities became connected to the global economy. Factors such as these are changing the patterns of urban growth. While such urban economic growth can be a factor that drives improvements in urban environmental infrastructure, it also encourages urban population growth. Moreover, this can intensify problems associated with both environment and environmental infrastructure. In following subsections, the issues related to urbanization, economic growth, environmental problems, and their inter-relationship are discussed.

Keywords: Urban environment – management-
Spatial instructions -curricula – Development –
approach – practical implications

1. Introduction and Background

The United Nations estimates indicate that at mid 1990s, about 43 per cent of the world population lived in urban areas. With the urban population growing two and a half times faster than its rural counterpart, the level of urbanization is projected to cross the 50 per cent mark in 2005. United Nations projections further show that by 2025, more than three- fifth of the world population will live in urban areas (U. N. 1993).

Cities play a central role in the evolution and advance of culture, economy, and politics. The “urbanized” economy expands due to the advantages of economic concentration in cities. Demand for various services emerges and increases the amount of employment in service industries. Then wage gaps with the neighboring areas and disparities in work opportunities causes a population flow to the city. This influx of people then creates a self-reinforcing cycle, generating more demand for services.

1.2. Urbanization in the World and Asia

In the year 2000, about 30% of the population in the Asia region lived in cities (World Bank, 2003). There are, however, major disparities in the pace of urbanization within the region. Figure 1 shows the growth of urbanization in Asia from 1960–1999. As can be seen, urbanization proceeded rapidly first in Japan followed by South Korea during the 1960s; over 79% of the populations of both countries now live in urban areas. In Southeast Asia, urbanization started at a slower rate but gained momentum during the 1970s and 1980s. In Indonesia, for instance, the annual urbanization rate increased by an average of only 2.5% between 1960 and 1970, but by 5.1% from 1970 to 1980, 7.5 % from 1980 to 1990, and 10.3 % from 1990 to 2000. The urban population represented about 30% of the population in Malaysia and in the Philippines in 1960; it has been growing at 3% to 5% per year, and in 2000, the urban population was

just under 60%. In Thailand, as well as in Indonesia, the urban population is around 30% and the urbanization pace is accelerating.

The speed of Asia's urbanization is without historical precedent. The urbanization of Europe in the 19th and 20th centuries occurred much more slowly. Moreover, while urbanization in developed countries has reached a stable state, the developing countries in Asia were the main global players in population growth and urbanization in the latter half of the 20th century. Since the 1970s, Asia has been engaged in a process of rapid economic growth through

industrialization, with urban populations growing rapidly. Rapid urbanization in Asia has been synchronous with dramatic rates of economic growth as well as severe environmental problems.

Asia now has more major cities than any other region in the world. Table 1 and Table 2 show percentage of population residing in urban areas by regions from 1980-2010 and table 2 shows the distribution of larger cities in Asia compared with the world total. China and India, the most highly populated countries, have the largest number of major cities.

Table 1: Percentage of Population Residing in Urban Areas by Region, 1980-2010

World/Region	1980		1985		1990		2000		2010	
	%	,000	%	,000	%	,000	%	,000	%	,000
World	39.4	1752	41.2	1997	43.1	2282	47.6	2962	52.8	3779
More Developed Region	70.2	797	71.5	838	72.7	880	75.8	968	79.1	1060
Less Developed Region	28.8	954	31.5	1159	34.3	1401	40.3	1993	46.8	2717
Africa	27.3	130	29.6	164	32.0	205	37.6	322	44.2	493
Asia	26.2	678	28.6	813	31.2	974	37.1	1369	43.8	1845
Latin America	65.0	233	68.4	273	71.5	315	76.6	400	80.4	482

Source : World Urbanization Prospects- The 1992 Revision, United Nations, New York, 1993.

Table 2. Population in Asian urban agglomerations of more than 3 and 5 million population, 1990

More than 5 million	More than 3 million			
	Number of Cities	Population (millions)	Number of Cities	Population (millions)
China	4	36.11	8	50.91
India	4	37.27	7	49.17
Indonesia	1	9.42	2	12.42
Japan	2	31.01	2	31.01
Korea	1	11.33	2	16.08
Pakistan	1	7.67	2	11.75
Philippines	1	8.40	1	8.40
Thailand	1	7.16	1	7.16
Vietnam	-	-	1	3.17
Sub Total	15	148.37	27	190.08
Others	20	190.29	42	268.37
World Total	35	338.66	69	458.45

Source: World Bank 2003, UN-HABITAT 2001

Urbanization has been closely linked with the growth of manufacturing industry. Japan's rapid industrialization started in the 1960s. Twenty years later, South Korea initiated a range of policies aimed at accelerating industrialization. China's Open Door policy was initiated in the late 1970s. It was followed by increasing economic openness and export-led growth models in Malaysia, Philippines, Indonesia, India, and Thailand. Average annual rates of economic growth of 10 % and above were

achieved and sustained by some of these countries.

1.3 Process of Urban Environment Management

The process of urbanization has strong impacts on the elements of the atmosphere, the geo sphere, the hydrosphere and the biosphere shown in the below figure (Bridgman et al., 1995).

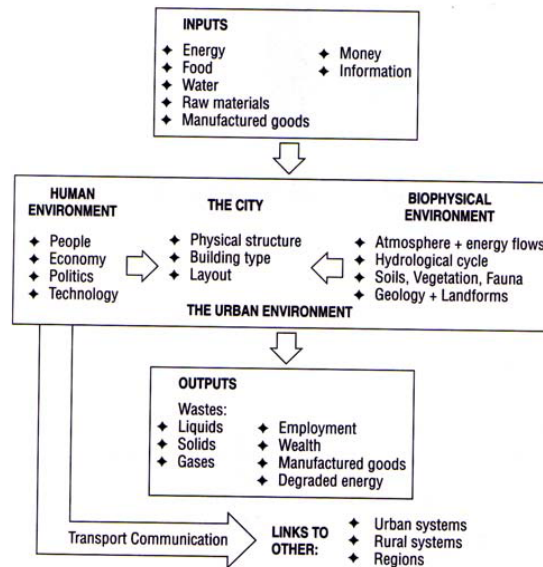


Fig. 1. The Urban System, Illustrating the interactions between the city, the human environment, and the biophysical environment (Bridgman et al., 1995)

2. Need and Approach

Agenda 21, one of the five official documents brought before the United Nations Conference on Environment and Development (UNCED, Rio, 1992), has two chapters dealing with urban problems; and urban environmental problems are mentioned throughout. Chapter 28 is devoted totally to the role of local authorities in implementing the document's action plans. One of the main programmes of Agenda 21 is concerned with the strengthening of institutional capacities in order to have the localities develop their own environmental action plans. UNCED has put urban environmental problems on the front stage and it has identified the local authorities as a major partner of national governments and international agencies in developing and implementing sustainable urban environmental action plans.

Are these expressed needs for professional expertise new? Are they specific enough to request new academic programmes? Can we respond in a systematic fashion to both needs for skills in planning and management, and for skills in technology development and design?

Urban planners and environmental engineers already know that new expertise is expected from them, at least in the industrialized countries. Many have specialized, on their own, in environmental impact assessment, in risk assessment, in environmental auditing, ecological planning and so on. In a few west European countries, the profession of "environmental advisors" is widely recognized and subsidized through national programmes.

2.1 Objectives of the Paper

This paper basically aims at bringing Spatial approach to Urban Environmental Management in such way to promote Spatial institutions in preparing professionals handling challenges in urban environmental management. To fulfill the above motivation of the paper, and this study is outlined with the following objectives:

1. to educate the concept of urban environmental management amongst the students, academicians, administrators and policy makers.
2. to create a common platform for academicians and administrative policy makers to design new approach for urban environmental management.

3. to recommend design of new curricula in higher education for effective and efficient urban environmental management.

4. to provide scientific guidelines for efficient urban environmental management in developing countries.

3. Spatial Approach

Keeping in view the urgency of urban environmental management, this paper has outlined and highlighted the need for Spatial approach. This study began with the emphasizing the need for new professional expertise to overcome the existing curricula in such way to inculcate new skills that require to face the challenges of urban environmental management.

3.1 A New Professional Expertise

Let us first look at the needs. We will not be mentioning needs arising from the serious degradation of urban environments, but we will be keeping in mind the needs so many times expressed by scholars and decision makers.

Since We want to address this question in a global perspective, we have tried to find out what are the needs arising out of urban environmental practices defined by international experts. From now on, we will be referring to the Berlin Declaration which has

been submitted to the UNCED in Rio in 1992 for the promotion of environmental protection at municipal level.

According to this, we almost have an agenda for the urban environmental manager (Figure 1) and we can consider specific tasks: implementation of strategies, new innovative planning practices, designing of organizational and technical solutions, new forms of co-operation, continuous education and awareness development programmes, institutional building. These tasks can be supported by techniques and methods that the Berlin Declaration has tried to identify as follows:

Introducing costs of ecological consequences and costs of use of the environment in all decision making and pricing accordingly.

- Taking decisions on the basis of environmental impact assessments.

- Not relying on competitively low environmental standards.

Organizing periodical environmental audits and publishing their results in regular environmental status reports.

Offering services of local environmental counseling to private and corporate citizens.

Pursuing innovative procurement policy in order to play a pioneering role in environmental protection.

Implementing a set of instruments of local environmental management.



Figure 2. *The Urban Environmental Manager*



Figure 3. Local Self-government Political/Administrative Structure: A Model

These actions should lead to a restructuring of the local urban management system on the basis of the following principles (Figure 2): Co-ordination of the functions of environmental protection with responsibility to the highest body of local government; organization of environmental protection tasks on a cross-sectoral basis.

Main Features of a New Curriculum

It is to be understood that these features are not arbitrary choices, if we refer to the general context we just gave. These features look more like basic requirements, fundamentals not mainly drawn from existing needs in the field of urban environmental management, but from optimal expectations; the role of higher education being to work with anticipations and have scholars help change the existing situations in order to build support systems for facing them.

First Set of Requirements

Students and researchers will meet and will have to face the components of the new paradigm. They will not find any support in reading official international documents, which are mainly based on voluntary motives. They will obtain minimal results with heavy costs related to learning in the old paradigm. They need mentoring and guidance in the

hazardous field of planning and management, accounting for the “environment” holistic concept and for the loosely delimited eco-systemic approach.

The first part of a curriculum will build on planning: from rational comprehensive planning to incremental strategic planning. It will continue with the sciences and practices of management: from the perspectives of good administration to the practices of governance and empowerment. It should then grip the city and the environment when they meet on the field of the carrying capacity limits, taking into account the history and the positive trends of man building the habitat of mankind.

Needless to say, this first set of requirements will have to be piloted and monitored according to the understanding and local representations of environmental ethics.

Second Set of Requirements

Except for the principles carried by the new paradigm and the motives in political documents, the body of knowledge in the urban environmental management field is more than limited. It is mostly made up of locally successful tricks, practical knowledge on ongoing experiments and a few operational principles. Developing a body of knowledge can rely on this but we have to keep

in mind that strong interests are just behind, pushing, these experiments, and that, quite often, they are less than sound approaches to global, universal problems.

The second part of the curriculum will have to introduce students and researchers to innovative and sound experiments, processes and tools. Innovative and sound are subjective concepts, of course. But, if we merge main severe problems and valued experiments in the international community of scholars, we can come up with a limited number of concepts, methods and tools that are leading the field of environmental management for the time being. The body of knowledge is building with leading planning and management practices: protected areas planning and management; ecological planning; coastal and river basin management; and so on. This second part of the curriculum is opening a learning process in the field of environmental planning and management.

Third Set of Requirements

For the time being (see Agenda 21) the field of urban environmental management is driven by the awareness of severe problems (waste, air, water...), and by procedural principles drawn from the new paradigm. Two different approaches are developing; one more concerned with planning, management and policy making; the other with technology and design. If we can come to the two first sets of requirements, why not recognize that professional expertise can build on one or the other of these two approaches? The third part of a curriculum would, thus, support students and researchers in one or the other approach.

The first one would deal with policy making and implementation. It would stress the conditions and knowledge we know in self-development, conflict resolution, local development, control and recovering standards and techniques. The second one would support assessment and development of alternative (may be small scale) technologies and designing of new operational concepts.

4. Conclusion & Practical Implication

The concept of urban environmental management requires complete understating of environmental issues concerning urbanization. Currently, however

the knowledge is incomplete amongst the new professionals and capacity to meet the challenge of urban environmental management is lacking amongst the professionals in most the developing countries and Universities efforts in inculcating professional skills are still at infant stage.

The concept of urban environmental management is a new approach in India. Considering its urgency, this study has compared a table of existing paradigm and with new paradigm for better introduction and implementation of new curricula centered at urban environmental management which will be of guidelines for academicians and administrative authorities.

This paper shows the away for further research in this regard and has outlined the guidelines for Spatial institutions for designing curricula and train the young professional to meet the unprecedented challenges of Urban Environmental management in the region.

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Analyze of the Components of Social Capital among Agriculture Students

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Abstract—The aim of this study was to analyze the components of social capital among agricultural students with emphasis on entrepreneurship. This survey was descriptive and correlational study. Statistical population consisted of agricultural students in Tarbiat Modares University (n=468) which 181 student was selected as samples by Bartlett table. Samples were studied via using simple stratified random sampling method. Content validity of the questionnaire was confirmed by a panel of experts. The reliability of the questionnaire was determined by pilot test and Cronbach's alpha was calculated 91 percent. Results of exploratory factor analysis showed that in this research social capital consisted of six components: social cohesion, social cultural values, social participation, social interaction and trust, social recognition and awareness and job security. These components explained 60 percent variance of social capital.

Keywords— Social Capital, Students of Agriculture, Tarbiat Modares University, Factor Analysis.

I. Introduction

Achieving to the sustainable development requires critical strategies. Various resources in underdeveloped countries are the main factors for development [1] that the human role is totally important in this value. The concept of human capital means human beings invest in their own capital. Human capital represents that qualitative characteristics of human is a type of capital [2]. In the theory of human capital, education and higher education are identified as a capital good. In this theory, education and training skills make appropriate capabilities in every body that this value can make more income in future, so it is determined as a valuable capital [3]. Today, social capital is presented like human and financial capital. The concept of social capital is the interaction between members of a network as a valuable source that with making the norms and mutual trust leads to achieve the goals. Social capital is a suitable way to use human and physical capital and also is a way to get successes [4]. Common feature of both human capital and social capital is that they are

simultaneously a capital and consumed good [5], and the difference between them is that social capital is not a subset of human capital, because the capital is belonged to groups not individuals. Norms constituting social capital are meaningful subjected to more than one person is involved in it [6]. Today, mistrust is the most important factor in a large number of organizations, so open interaction; personal and organizational flexibility can help to make suitable trust among all members. Subsequently, universities can have a significant role for obtaining this issue by training students, making new methods, creating popular skills, etc. [6].

II. The concept of social capital

Social capital is a sociological concept that increasingly has been used by social scientists [7]. The meaning of social capital which today is used is derived from Lyda j. Hanifan's records of 80 years ago. The concept of social capital has been raised since the 1920s, but it strongly has been considered during the last two decades [8]. Social capital is derived from a significant social relationship [9], and the concept of social capital generally focuses on human relationships. Relationships that are in all time of life and have a significant effects on their behavior and attitude [10]. This term was defined as the value of social structure that as a resource help the society members to achieve their goals and interests [11].

III. The importance of social capital and the role of high education in agriculture

Currently about 80-85 % of the population food and 90 % of the food industry needs are provided by agriculture and also 16 % of the GDP, 22 % of employment and about 25 % of non-oil exports are provided by the agricultural products. Agriculture has the most important role on national economy, and it can strongly affect the main parts of economy and production [12]. While social capital is the main value in agriculture, studies conducted about social capital on agriculture have considered the structure of social capital especially social networks [5]. Social capital is a gregarious

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ISSN (Online): 2305-0225

Issue 12(4), July 2014, pp. 390-395

concept that its principles are based on personal attitudes and behaviors. Various organizations such as social and voluntary organizations (schools and universities), family, religion and cultural patterns have an efficient role in creating habits and values of social capital [13]. Social capital of each society is due to the social and cultural values of the related society. Education and training organization is the most important institute that has strong effects on people especially for children and teenagers [14]. University is another main component that has an effective impact on society. It is clear that universities are places with high level of education and culture that is known as main organization for making and developing social capital. Because university acts as an agent of socialization, internalize of norms, academic and professional values, social self [15, 16]

IV. Literature review

Ganadan and Andishmand (2009) [6] conducted a research on the role of universities in building social capital in order to provide a model for improving the higher education system, seven main components of social capital including organizational identity, empowerment, collaboration and public interest, sharing the knowledge and creating the intellectual capital, trust and solidarity, participatory management and knowledge were identified. The results showed that trust and solidarity reached highest level and participatory management got the lowest. Marjaee (2004) [17] studied social capital among university students. In this study, the components of social capital were spited into five components including knowledge, cultural and social values, socio-economic risks and membership in organizations and

groups. In the research conducted by Hudson and Chapman (2002) [18], aimed to measure social capital in United State America, eleven components of social capital were classified into five levels of trust, informal networks, formal networks, political participation, civic participation. There are different views of researchers about the effective factors on creating social capital that some of them are presented in the following table [19].

According to what has been explained in this text, social capital plays an important role in the social, cultural, political and economic development of the related country. Since to promote this value is subject to develop higher education efficiency and effectiveness, and on the other hand students are

the certain capital. Therefore, developing scientific and socio-cultural levels among student is the main goal of universities that if there are weakness in social capital, reaching this value will be difficult. Hence, this issue certainly will reduce student's incentive and most of them may quit the universities and finally this subject get the related society more weaker than past, so identify effective factors contributing to the strengthening and weakening of social capital and also awareness of student's social and cultural capital are necessary for every programming [23]. Therefore, according to the importance of this issue, this research was aimed to determine the social capital among the students of Tarbiat Modares University that contains following purposes:

1. Describing the personal and professional characteristics of the respondents (students).
2. Identifying the social capital aspects using student's approaches
3. Classifying social capital aspects by responders.

V. Materials and Methods

The present research is descriptive-correlative and survey method was used for collecting the data. The statistical population is consisted of students of agriculture colleges in Tarbiat Modares University, Tehran, Iran (N=468). Bartlett et al. (2001) [24] table was used for the number of samples (n=182). Simple stratified random sampling method was applied to select the samples from the population. Questionnaire forms consisted of two parts that the one of them was related to social capital with 29 items that are based on a 5-point Likert-type scale (1:very low, 2:low, 3:medium, 4:high, 5:very high). Results obtained by Mohammadi *et al.* (2010) [25] were used to reach the goals of this paper. In another part of the questionnaire, the individual and personal characteristics of students were analyzed based on five open and close questions. Content validity was approved by a panel of University Professors after revising completely. Pilot test was conducted to determine the reliability of the questionnaire and the value of Cronbach's alpha was 0.91 indicating the suitability of the research tool. Descriptive statistics (Mean, Standard Deviation, Minimum and Maximum) and

Viewpoint	Factors affecting to forming social capital	The concept of social capital
Brehm and wendy, 1997[13]	Supporting and political support, training, household real income, opportunity cost of the time (watching TV, the number of children not attending school), reading newspapers, length of the staying in City from age 16 age, length life experiences	Civil Partnership General interpersonal trust
Offe and Fuchs, 2002[20]	Household income, employment status, including job security, level of income and overtime, religion (religious belief and commitment), education, age, city against suburb, household size, gender	Social Capital
Krishna and Uphoff, 2002[21]	Households that to solve social problems, have mass decision making clear mind and a guarantee of legislation enforcement, intelligence and modernization	Social Capital
Putnam, 2000[22]	Time and economic pressures, to appear households both employed, suburban or urban slums and distribution (spending time alone in the car and reduce the motivations of participation), electronic entertainment and television, changes generation (war, recession, declining marriage rates, increase divorces rate, decrease of births, loss of wages, supermarkets replacement, marketing)	Social Capital

ISSN (Online): 2305-0225

Issue 12(4), July 2014, pp. 390-395

exploratory factor analysis using the method of principal component analysis by SPSS (version 18) was applied in order to process statistical data.

VI. Results

A. Describing personal and educational characteristics of students

Results showed that respondent's average age was about 26 years old, the youngest and the oldest 22 and 38 years, respectively. More than half of the students (n = 110) were 25 years or younger and only 6 students aged 31 years or older. In terms of gender, more than 3/4 of respondents (n=137) were male and the rest were female. In terms of frequency of respondents in educational groups, Departments of Horticulture and Agronomy sciences (n=37) and the Science of Soil and Water (n=35) had the highest number of responders, but departments of Food Science, Agricultural Machinery (n=26), Agricultural Economics and Extension (n=26), Animal and Poultry Sciences (n=27) had the lowest number of responders. More than 3/4 of respondents (n=162) were M.Sc. And 19 students were Ph.D.

Table. 1 Educational and Personal Characteristics of Students

Variable	Variable levels	Frequency	Percentage
Age *(years)	25 years or less	110	60.8
	26-30	65	35.9
	31 and above	6	3.4
	Total	181	100
Gender	Male	137	75.7
	Female	44	24.3
	Total	181	100
Academic categories	Horticultural and Agronomy sciences	37	20.6
	Water and Soil Sciences	35	19.4
	Animal and Poultry	27	15
	Food Industry and Agricultural Machinery	26	14.4
	Agricultural Economic and Extension	26	14.4
	Disease and Pest	29	16
	Total	181	100
	Education level	M.Sc.	162
Ph.D.		19	10.5
Total		181	100

* Mean: 25.58, SD: 2.54, Min: 22 and Max: 38

B. Component analysis of social capital

In the present research, Exploratory Factor Analysis (EFA) using Principle Components Analysis (PCA) was used to explain the measuring tool of social capital. The trend of this technique is conducted by following steps:

Step one: Determining the factor analysis on data

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was used in order to determine the data proportion to perform factor analysis. The results indicated that data applied in this research were suitable for the factor analysis

technique, because KMO was more than 0.70 and was acceptable. In addition, Bartlett test was significant at 1% level indicating the correlation matrix was not same among items; i.e. there was a strong correlation among items of a factor, but there was not any correlation between items of a factor and items of another factor. So, exploring the new structure of data can be obtained (table 2).

Table. 2 KMO and Bartlett's Coefficients with P value

KMO	Bartlett	P value
0.902	2261.514	P<0.001

Step two: Determining the portion of factor set in explaining the variance of items

Communalities were elected in order to this value. Results showed the variance for each variable was more than 0.5, so the extracted factors were able to explain the changes in acceptable level. The maximum and minimum of this value were 0.74 and 0.52, respectively.

Step three: Determining the portion of factors in explaining cumulative variances of items

Varimax rotation was used to enhance the interpretation of factors and also Kaiser (eigenvalue) and Scree Plot criteria were applied to the number of factors (figure 1). Therefore, six factors with eigenvalue more than one were extracted that these factors explained 59.46% of cumulative variance that the portion of each factor was determined before and after rotations. Results showed the social capital consisted of six components. In other words, 29 items for evaluating social capital with six components were classified that the Social cohesion and Job security with the explanation of 13. % and 4.33%, respectively, had the maximum and minimum role in determine g the variance of social capital (table 3).

Table. 3 Extracted Factors with variance and Eigen values after loading

Factors	Eigen value	Extracted variance (%)	Cumulative Extracted variance (%)
1	3.89	13.41	13.41
2	3.79	13.07	26.48
3	3.31	11.41	37.89
4	3.05	10.52	48.41
5	1.95	6.73	55.14
6	1.25	4.32	59.47

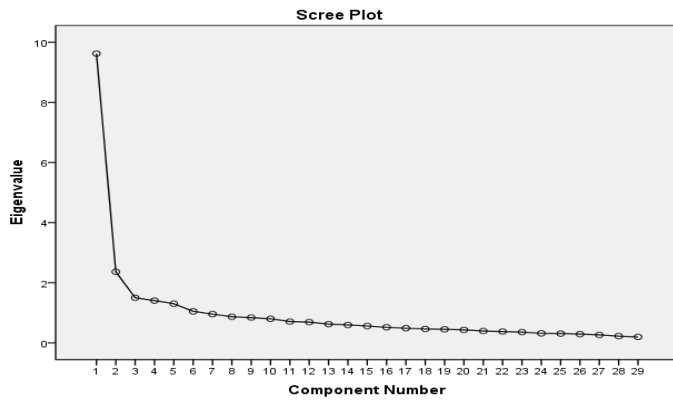


Figure.1 Scree Plot

Step four: Classifying the items among factors based on the correlation matrix after rotation

To classify items regarding to six factors, the Rotated Component Matrix was used, so every item according to factor value (more than 0.5) as they were classified based on the correlation of each other. Results of Rotated Component Matrix indicated that the factor value of all items was more than 0.5 and items belonged to each factor were classified as the related factor according to their correlation and factor value (table 4). First factors consisted of five items regarding the essence and content of these factors was named *Social Cohesion*. This factor with 13.41% had the highest effect on explaining the variance of social capital. Second factor had five items that this factor is strongly related to values, so it was named *Social-Cultural Values*. In addition, the variance for this value was 13.07%. The third factor, consisted of five factors, having items with participation values was determined as *Social Participation* and it is able to explain 11.41% of the variance of social capital. The fourth factor was named *Social interaction and Trust*, because items of this factor were associated with issues of interaction and trust. This factor determined 10.52 % of the variance of social capital. The fifth factor consisted of four items that mostly related to the student's recognition and awareness, so it is named *Social Recognition and awareness* that was able to explain 6.73% of the variance. The sixth factor was identified as *Job-Social Security*. This factor had five items that were associated with employment and skills. In addition, this factor with 4.33% had the lowest effect on explaining the variance of social capital. Finally, the components of social capital resulted from factor analysis were presented in the following figure 2.

Table. 4 Classifying Social Capital Components

Factors	Items	Fact or Loading
Social Cohesion	Attention of the University to present general agriculture seminars and congresses	0.60
	Academic staff attention to improve the sense of responsibility and assistance to client groups after graduation	0.51
	Students participation in technologies transfer and new events to producers	0.70
	Attention to the establishment of cooperation office between farmers and University	0.77
	University attention to developing of relations of agricultural students in national and international level (exchange student)	0.73
	Attention of teachers to regard rural and farmers subcultures reinforcement among students	0.72
	Teachers attention to increasing awareness of the culture of rural and tribal communities	0.66
	Teachers attention to strength social and cultural values among students in relation to agricultural issues	0.59
	Teachers attention to creating exchange of social-cultural values among students (class discussion, meetings, professional web blogging)	0.53
	Teachers attention to strength of context of cultural negotiation among students	0.51
Social cultural values	Students participation in the designing and implementation of agricultural research projects	0.75
	Participation and membership of students in agricultural producer cooperation's	0.78
	Interest to use of Participatory teaching methods by teachers	0.73
	participation amount in research projects out of university	0.64
	Amount of trends to participation in aid projects for farmers in the necessary times such as: floods, crop blight etc.	0.57
Social participation	Teachers attention to improve communication skills of students	0.53
	The number of student projects that doing in and farms and rural area	0.71
	Number of students that give consulate services to farmers	0.71
	Number of projects that give to students commonly and grouping	0.55
	Number of students that are passing operational or research projects in rural and farm area	0.58
Social interaction and trust	Amount of teachers attention to strength analytic vie point of students in agricultural problems	0.51
	Amount of students collaboration in publishing papers	0.81
	offering practical sections for theoretical issues in agricultural farms, greenhouses, agricultural production units	0.55
	Number of specialized scientific seminars and congresses holding by University	0.82
	Number of practical training and workshops holding by University	0.67
Social recognition and awareness	Number of educational programs offered by agricultural entrepreneurs	0.71
	Teachers attention to determine practical issues for students research project	0.52
	Financial support for students projects who are innovators and entrepreneur	0.75
Job-social security		

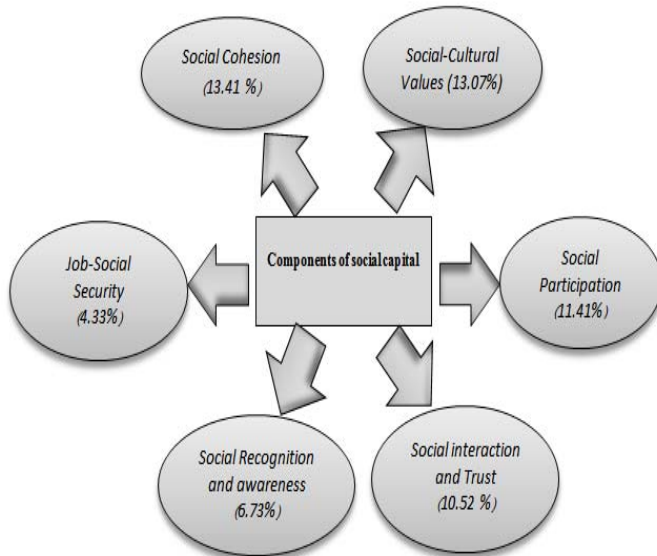


Figure. 2 Components of social capital

VII. Discussion and Conclusions

The results of this study led to identifying the components of social capital that were classified into six main components and 29 subcomponents. The results were similar to those obtained by Mohammadi *et al.* (2010) [25] and Rostami *et al.* (2009) [26] and also the presented results were consistent to the results obtained by Ahmadi Firozjaee *et al.* (2006) [27] in social participation and trust, Ghafori and Azkia (2001) [28] in trust and interaction components, Taheri, (2003) [29] in social interaction and cohesion, Sharepour and Khoshfar (2002) [30] in social cohesion and cultural capital. As it is seen from table3, factor value of social capital in aspect of social cohesion was more than other components and other components followed it in order from social and cultural values, social participation, social interaction and trust, social recognition and awareness to job-social security. Increasing social cohesion among students leads to develop their interaction, responsibility and help. Hence, social cohesion is one the main components that severely can have effects on social processes. The component of social and cultural values is the certain factor that has a significant role on transporting the culture, knowledge and skills, so it is necessary that the components will be completely riche by social-cultural activities such as free discussions in classes, making special weblogs and increasing cultural conversation and responsibility to all cultures among students in universities. The third component, social participation, is one the most important criteria in development. As educational system has a strongly correlation with participation, increasing the participating attitude enhances the incentive of help, responsibility, mental challenge. Therefore, to increase the participation among students some activities are needed such

as the methods of participating teaching, training in groups, having the appropriate plans for discussion, incentive and interest. The fourth component is social interaction and trust. Trust is the most important aspect of social capital also affects other aspects. Whatever students more rely on their interaction shows that they have high level of social capital. Going up the level of trust, social participation also will be increased. The lack of social participation changes the relationship among students and makes it amenable to the idea that everyone is just severely think about their self-interest and the interests of others are not important. Therefore, improving interaction skills and assigned gregarious projects to students, enhancing the incentive of counseling services and developing training programs to enhance the trust and interaction are suggested. Social recognition and awareness and also job - social security are the two components that had the minimum variance of social capital. Social recognition and awareness among students is a mental, emotional and mental need and covers some activities such as thinking, perception, awareness, reasoning, visualization, attention, problem solving, decision making, creativity and intelligence. People with lower levels of need for social knowledge are willing to rely on others and not much control over the information acquired from their environment and is relatively passive. Naturally, when people are not aware of the social problems of their society, they will have less ability to trust and interaction. As (Dwyer, 2008) [31] says, graduate students due to repeated education and research, learning, information seeking and thinking about the issues become more interesting. Hence, to improve the quality of academic education, especially issues that engaged students to search in various information resources are the main plans that can help social awareness and recognition. Job - social security is also had the minimum variance in the present research. It is clear that this value is an important factor that enables people to making appropriate decision for their future. Therefore, job - social security will be attention to increase the motivations of students in different fields like social and cultural aspects. Hence, applying consulting services, financial support and the connection between market and universities are the recommended programs for getting the appropriate goals in the society. Finally, by explaining six components of social capital, it is be found that developing the components of social capital, as certain part of student's skills and agriculture systems, is an essential value for societies.

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ISSN (Online): 2305-0225

Issue 12(4), July 2014, pp. 390-395

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Assessing the Influence of Development of Virtual Spaces on Economic, Social and Physical Processes of Tehran City from the Viewpoint of Citizens (Case Study: District 6 of Tehran Municipality)

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Abstract: This study was performed using the descriptive-analytic research method to assess various relationships among the physical form of urban places and development of electronic places in the context of social, economic and physical processes. By providing a valid and reliable theoretical basis, the conceptual framework of the study was examined in a case study (District 6 of Tehran Municipality was selected because of its existing virtual potentials) by going through scientific steps. In expanding different viewpoints, the highest level of advantage was taken from the theoretical approach to the social and political constructs of technology. The primary objectives of the research were also determined based on the results of assessment of the viewpoint of citizens on the influence of development of virtual spaces on economic, social and physical processes. Results indicated that the rate of usage of some virtual services (such as the Internet, banks and institutes electronic network, spending leisure time, city electronic portal, etc.) is high among citizens. In addition, results of the assessment of the viewpoints of citizens on the positive effects of development of the cyber technology on economic, sociocultural and physical processes showed that development of the cyber technology has a positive effect on these processes. Therefore, development of virtual spaces and transition from conventional processes provides for overcoming temporal and physical obstacles and limitations in the district. It also will drastically reduce the frequency of physical visits paid by citizens to receive services.

Keywords: economic, social and physical processes; virtual and electronic city; district 6 of Tehran municipality.

1. Introduction, Problem Statement, and Research Hypotheses

Recently, rapid evolutions have taken place in industrial developed cities. Apparently, these evolutions have basically led to drastic increases in the capacity and significance of the electronic and cyber spaces that encompass most of the modern urban changes. Moreover, a large part of the increases is caused by the use of electronic infrastructure and services,

which have provided for telecommunications and going beyond the spatial limits (Toffler, 1996). Modern cities, including the Tehran metropolis, not only host a large concentration of buildings, road networks, and transportation, but also are considered the core of economic, social and cultural lives of people. Today, there is a high level of interest in strong synergetic communications between cities and the new infrastructure network of the Tehran metropolis. Accordingly, the main focus of this study was on the degree of preparedness and available electronic features and cyber capacities in Tehran. Moreover, considering the considerable growth of the use of communication and information technologies (regardless of their quantity and quality), the present research aimed to determine the influence of city life on the spread of electronic networks over all life aspects and geographical scales. The research hypotheses were also formulated based on these fundamental questions. Research expectations were as follows:

Primary hypothesis: Tehran metropolis is ready and willing to become virtualized, but it seems that it is faced with obstacles in this regard.

Secondary hypothesis: In its way to virtualization, social, economic and physical processes are substantially influenced by the increasing growth of the use of electronic technologies and are seemingly reconstructed and redefined.

2. Research Objective

The objective of this study was to analyze the relations between new electronic technologies and virtualization in Tehran metropolis. It was tried to become the audience familiar and equipped with an approach based on theoretical bases of conceptual approaches and new theories. The proposed approach is capable of explaining the reality of the relations between the city and electronic-cyber communications by providing for a social-spatial analysis. The primary objective was, therefore, to present more precise discussions and to study the relations between the city and cyberspace. It was also tried to determine the influence of virtualization and development of

electronic spaces over the reconstruction of the spatial structure of the Tehran metropolis.

3. Research Method

This documentary-survey study was performed by using scientific research methods. That is to say, first a valid and reliable theoretical basis was explained and then the theoretical framework was tested in a case study (District 6 of Tehran Municipality) by using qualitative and quantitative methods. In the analytic method, the causal relationships between the mutual effects of electronic space and urban places was examined and analyzed based on theoretical approaches, fundamental concepts, previous research findings, expert opinions, and available information and statistics. In order to examine research questions and hypotheses, first the related dimensions and indicators were defined using global models of virtual city. Next, based on the common models, the viewpoints of participants were studied. Moreover, by analyzing indicators, available information and statistics, questionnaires (close questionnaire) and remarks of the participants, the attitude of the members of the sample population was assessed (based on the Likert scale). Considering the research hypotheses, questions were classified into the following categories: use of virtual services, interactions among citizens in virtual spaces, and the influence of economic, social and physical processes. In order to select the target population, 384 individuals were selected from the population of Tehran (7975679 people according to 2006 census statistics). However, in order to add to the reliability of the questionnaire, the sample size was assumed to be 400. It is also worth mentioning that 400 questionnaires were distributed across district 6 of Tehran Municipality. This district was selected because it demonstrate better modern urban indicators compared to other districts it is considered the pilot region in the Electronic Master Plan of Tehran. In order to assess the reliability of the data, the Cronbach's alpha method was used while research variables and components were assessed and classified using the TOPSIS model. Questionnaires for citizens were distributed based on the share of residents of each region. The number of apartments in each region was the primary and systematic criterion for distribution. Next, questionnaires were distributed randomly in each region with a relatively normal distribution. In order to determine the validity of the research, the visual validity of the research was measured. To this end, the final questionnaire was presented to the informed stakeholders and modifications were made to it to increase the validity of the research. Following the distribution and collection of questionnaires and performing interviews, the resulting data and information were classified and analyzed. Initial data processing was performed using SPSS and several tables were obtained at three levels. The tables are reported in a descriptive form. Afterwards, the TOPSIS model was used to rank the criteria for each component and measures its value from the viewpoint of the audience.

4. Research Background

Several studies have been conducted so far on the influence of virtual city, some of which are as follows:

- 1- *Spatial Analysis of the Potentials of Isfahan City for Actualization of the Notion of Electronic City* (Ahmad Shahivand, Hamidreza Varethi, & Mahmoud Mohammadi): The research conceptual model reflected the direct and indirect effects of factors contributing to the creation of the electronic city of Isfahan.
- 2- *The Effect of Development of Information and Communications Technology (ICT) on Planning for Urban Land Uses (Case Study: Cultural and Recreational Land Uses in District 5 of Isfahan City)* (Asqar Zarrabi, Masoud Taqvayi, & Reza Mokhtari Malek Abadi): This research was performed by assessing the attitude of its audience toward the effects of development of information and communications technology on the land use system of Isfahan City. The research was approved by the group of experts and concluded that the severe lack of cultural and recreational spaces, as necessities of cities, can be addressed in the cyberspace.
- 3- *Analysis of the Effects of Electronic City on the Physical Structure of City (Case Study of Fardis District of Karaj)* (Reza Farzin Mehr and Seyyed Muhammad Reza Khatibi): This study examined the status of Fardis District (Kara) and asked for the opinions of urban planning experts. The authors analyzed expert opinions and achieved thoughtful results. They also described the services of master plans of electronic cities (Farzin Mehr, 2009).

5. Definitions and Notions

- 1- Space: In the context of this study, space refers to a special and new form of socioeconomic and physical issues governing the major spatial structure of Tehran City. This is gradually leading to a special formation of processes and structures.
- 2- Spatial processes: A large set of economic, social and physical dimensions and facets of Tehran metropolis which are being reconstructed and modified under the influence of virtual and electronic spaces as well as the transition from traditional management.
- 3- Virtual city: A combination of spatial and concrete aspects of city life of Tehran metropolis which is being shaped and changed under the influence of abstract and electronic aspects of city life. In this regard, electronic places can create "places" for proper growth of city life and under their influence the old city needs to reconstruct its spatial and physical structures to meet its needs.

6. Conceptual and Theoretical Space

Concern for the relationships between city and cyberspace is a part of the wider process of analyzing the relationship between technology and society. In this regard, there is not only one "real" way of studying new spaces in cities. Rather, there is a

wide range of different contrasting viewpoints (Lefebvre, 1984). In general, there are four main approaches to the relationship between city and virtual spaces: 1) Determinism and technology, 2) Futurism and utopian idealism, 3) Critical and anti-utopian approach resulted from urban political economy, 4) Social construction of technology (SCOT) (Steven Graham, 2013: 77). The point is that existence of such approaches indicates that the casual relationships between cities and virtual spaces are very varying. In addition, this framework includes four types of reading resulting from the approaches. That is to say, the focus of these approaches is specifically on city economic development, city social and cultural life, city environment, and city physical form. The comprehensible and conceptual aspect of new theoretical and conceptual approaches suggests that the increase in the level of virtual communications and informed city life is a key factor to the emergence of urban issues challenging urban scientists and geographers. Moreover, policy makers, managers and urban planners also have to gain a comprehensive understanding of processes and dynamics of contemporary urban development (Beckovch, 1988). Analysis of theoretical approaches associated with relations between city and development of virtual and electronic spaces helped the authors obtain a basic theoretical framework composed of knowledge of social economy and social construction of technology (SCOT). The framework was also useful for gaining a better understanding of the spatial structure of new cities and parallel structures between urban places and electronic spaces. Evidently, without an understanding of the aforementioned points and many other relationships between city and virtual space, it will never be possible to understand all of the evolutions that have occurred in advanced modern city, especially Tehran metropolis. Hence, it was concluded that all relations have to be considered social and technical issues. In other words, groups and organizations are present in places on the basis of a combination of social and technical notions (Giddens, 1979). Accordingly, based on our understanding of conceptual space and new theoretical approaches it was concluded that relations that shape cities and their development are the result of social notions and electronic/virtual spaces as well as interactions and spatial communications. This conceptual space was the origin of two major questions stressed in this research. The first question dealt with the technical and technological state of Tehran metropolis in its transition to virtualization (preparedness of its technological infrastructure) while the second dealt with the possible effects of the technical and technological state of this city on social, economic and physical processes.

Concerning the first part, i.e. technological and electronic infrastructure, analyses of different opinions and viewpoints indicated that understanding the notion of contemporary city requires awareness and knowledge of complicated relationships between urban places (as stable places accommodating social, economic and cultural lives of citizens) and electronic spaces (with diverse flows of information, capital, services, work force, and media flowing through urban places in their immediate way in the geographical space) (Harvey, 1989).

In an effort to expand different viewpoints (the four theoretical approaches), the present study was mainly focused on the

fourth approach, which is the social and political construct of technology. The reason was that this approach functions more logical in dealing with relationships between urban processes and development of communication and electronic technologies. According to this conceptual framework, it was assumed that development of electronic spaces does not lead to collapse and degradation of cities. In contrast to the arguments by futurists and idealists, urban functions are not fully replaced with abstract activities taking place only in electronic spaces (Herpworth, 1989). Therefore, we are basically living in an urban civilization and cities still act like places. Many events occurring in cities cannot be simulated using telecommunication technologies. Urban places and electronic spaces can be considered correlated factors affecting each other. These relationships and correlations determine the future of cities. Hence, the notion of urban city is a combination of urban places and electronic spaces.

The increase in the number of electronic spaces is strongly related to the transition from the standardized, rigid, hierarchical, and harmonic world of the industrial era to the highly flexible social processes. Telecommunications and cyberspace have created deep new relationships between cities and the space-time-power matrix that are demonstrated as globalization of capitalism (Gillespie, 1991). In fact, it is the context of social structures that technical achievements of electronic spaces are used to discover new space control and organization methods, time, and social processes in cities (Giddens). In sum, the effects of electronic communications and growth of cyberspace in cities can be classified into the following groups: increased potential (capacity) of urban transport systems and infrastructure; omission of obstacles and limitations facing urban growth and decentralization processes; decreased transportation flows and efforts to create more sustainable cities; reinforcing the process of globalization of economic processes of cities; providing new political instruments for urban management, reinforcement of local economies, and support for social correlation at local levels; overcoming isolationism, disadvantage and inability and reducing informational poverty in deprived urban groups; and construction of urban spatial organization in terms of its infrastructure and social, economic, physical and administrative aspects. The last class is the basis for the primary objective of this research (Steven Graham, 2013).

As mentioned, the aforementioned theoretical basics are completely dichotomous. On one hand there is the geographical space with spatial and physical relations and coordinates and on the other hand there is the cyberspace based on electronic communications and interactions. Cyberspace tries to make a change in spatial relations by prioritizing the technical aspect (i.e. electronic technologies and infrastructure). Evolution of spatial processes in this transition leads to the reconstruction of economic, social, environmental, and infrastructural processes as well as transportation and land use.

7. Case Study

This study was generally focused on Tehran metropolis and specifically its District 6, which was selected because it is

located approximately at the geographical center of Tehran City. Another reason was that this district has been home to gradual physical, spatial and political changes at the national and even international levels in the last decades of urban development of Tehran. Currently, a large part of this district acts as the framework of Tehran city and the new center of administrative, governmental, and commercial affairs. In addition, some of the most significant reasons for selecting this district are as follows: the emphasis on electronic activities and virtualization in the Tehran Master Plan of 2007; the higher concentration of virtual participants in District 6 compared to other districts; satisfactory cultural and social conditions; presence of effective physical spaces influenced by newly emerging events such as universities, ministries, etc.;

availability of required potentials for accepting innovation and new developmental changes; and presence of serious participants in virtual spaces (including professors and students) of the region.

8. Target Population Status and Survey Analysis

The population under study included 400 citizens. Viewpoints of this population on the cyber technology, virtual management, and their effects on the spatial processes of the district under study formed the basis for assessments performed in this research. General characteristics of the target population (e.g. gender, age, education, ...) were as follows:

Table (1): Age, gender, marital and education status of participants

Option	Gender			Marital Status			Education				Age Structure				
	Male	Female	Total	Single	Married	Total	Diploma and	Associate Degree and Bachelor	Higher than M.A	Total	Below 25 years	25-35 years	35-45 years	45-65 years	Total
Frequency	280	120	400	240	160	400	100	204	96	400	85	129	135	51	400
Percentage	69.8	29.9	100	60.0	39.9	100	25.0	51.0	24.0	100	21.25	32.25	33.75	12.75	100

Since there was no significant relationship between the personal information of the participants (such as age, gender, education) and their share of use of virtual service, this concern is a negative factor. Therefore, personal information of participants was only presented to introduce the target population and the information was not used in the analyses.

9. Assessment of the District's Share of Electronic Infrastructure

In this section, the access of participants to cyberspace to benefit from telecommunications and Internet services was assessed. According to the research findings, citizens demonstrate high levels of indicators and satisfactory access to these indicators. Results showed that older telecommunication tools such as telephone are gradually replaced with newer technologies such as the Internet, cell phone, and computers. Moreover, it is true that Tehran metropolis is in its way to transition into a virtual city because of having necessary infrastructure.

Table (2): Assessment of the share and use of communication and virtual infrastructure by the target population

Indicators	Very low	Low	Moderate	High	Very high
Use of mobile phones and handsets	2	6	34	37	21
Use of computers	11	7	23	35	24
Use of the Internet	11	5	29	33	22

On the other hand, findings about assessment of criteria for the quantitative and qualitative levels of infrastructure indicated that the use of these telecommunication tools is not adequate yet and is below the average (especially in the case of Internet). When asked about the reasons for this situation both groups of

participants referred to low network speed as the main reason. In sum, the majority of participants referred to infrastructural problems and issues as the main cause of the low level of use of cyberspace.

Table (3): Reasons for the low level of use of Internet from the viewpoint of the target population

Option Level	Lack of familiarity	Low network speed	Expensive connection	Lack of equipment	Being busy	Sum
Percentage	۱۴	۵۰	۱۰	۱۲	۱۴	100

Use of old and new communication tools to receive news and information was another criterion for measuring the capacity and potential of the region for virtualization. This criterion was formulated in the form of several indicators. Use of radio for news and information had the lowest share while the Internet and television had the highest share among news sources.

Satellite and newspaper also followed TV and the Internet. Results of these analyses also showed the higher interest in new technologies. One of the reasons the audience and participants are attracted to these sources is that they provide online news and information.

Table (4): Status of the use of virtual and non-virtual media by the target population

Option Level	Newspaper	Internet	TV	Radio	Satellite	Sum
Percentage	۸	۳۷	۴۱	۳	۱۱	100

After the status technical infrastructure, the status of virtual networks and telecommunications was another important criterion for assessment of the preparedness of Tehran metropolis. The city was assessed against the criterion at the "LAN" (virtual networks) level. The criteria and indicators used in this section cover a wide range of the services required

by the citizens and provided by Tehran metropolis. The range of these criteria was extended by considering factors such as the use of electronic mail, public and specified trainings, and meeting scientific needs. The findings gave an interesting picture of the target population (Table 5).

Table (5): Activities by the target population in virtual spaces

Indicators	Very low	Low	Moderate	High	Very high
Use of e-mail and chat	۲۲	۱۵	۲۶	۲۴	۱۳
Use of credit cards	۴	۶	۱۹	۴۲	۲۹
Use of the electronic networks of banks and institutions	۱۱	۱۷	۳۲	۲۷	۱۳
Electronic purchase	۱۷	۱۷	۲۶	۲۹	۱۱
Spending leisure time in the cyberspace	۱۹	۱۹	۳۰	۲۳	۹
Meeting scientific needs through the cyberspace	۱۳	۱۰	۳۰	۳۰	۱۷
Use of electronic services provided by public and private organizations	۲۲	۲۸	۳۱	۱۴	۵
Use of electronic portals	۲۲	۲۶	۳۰	۱۶	۶
Public and specified trainings on the Internet	۱۵	۱۷	۳۴	۲۵	۹
Use of electronic offices	۲۴	۳۲	۳۱	۱۰	۳
Use of virtual spaces	۲۶	۳۲	۲۵	۱۱	۶
Use of the Internet for reviewing local news	۱۶	۱۶	۲۴	۳۰	۱۴

Results suggested that most indicators are equally valuable. Regardless of the "moderate" option, it is evident that in the case of most indicators, half of the target population shows a very low to low level of tendency to use the cyber space (virtual space) to do their activities and tasks. However, the other half shows a high to very high level of interest in using this space. If the "moderate" option is distributed equally and randomly between these two ranges, a moderate target population faced with electronic-based spaces is pictured.

Reception of virtual spaces by citizens has always been a key international indicator for measuring the preparedness of cities

(as Internet Penetration Rate) (Khawrazmi, 2002). These findings primarily imply that Tehran metropolis has a moderate level of preparedness for virtual interactions and communications as well as electronic networks in its transition into a virtual city. This state is somewhat satisfactory for the transition phase and is considered the first substantial step. However, this city is still in the beginning of its path to virtualization. TOPSIS analysis of the level indicated that the use of credit cards had the highest share of the use of virtual services by citizens (TOPSIS number of 0.72). This was followed by cell phone, handsets, and computers. In general,

the TOPSIS number of a few questions about citizens' use of virtual services was below 0.5, which indicated that the citizens' use of this group of services was satisfactory. The minimum TOPSIS number for level one questions, which dealt with the use of virtual services, belonged to the use of electronic government offices (0.34). In addition, the highest number (0.72) belonged to the use of credit cards. Assessment of the opinions of the target group indicated that the district is satisfactorily equipped with the required infrastructure. On the other hand, analysis of the status of some indicators also confirmed this finding. However, this does not apply to the level of networks which refers to a lack of a comprehensive telecommunications environment in the district. This has its roots in several social, cultural, economic, administrative and technical factors. Some of these factors are as follows: lack of information and awareness of citizens about the existing virtual spaces and services; partial coverage of servicing processes by the cyberspace and lack of full coverage; necessity of physical presence for some non-virtual actions which has led to a decrease in the motivation of citizens for using the virtual services; lack of formation of interagency interactions between inter- and intra-organization communications; lack of integrated management and therefore a lack of comprehensive service provider electronic portals. The environment hosting the trends, acts as the material support for processes and functions governing the information community. The foremost and first tier of this environment is its physical part, which is known as electronic infrastructure and virtual network. This tier (layer) is formed a circle of electronic motivation that together form the material basis for processes. These motives lead the social network. In fact, this layer is the physical support for simultaneous social functions. Therefore, this layer or tier is also a form of space in the service, commercial, or industrial structure of society, similar to "city" or "district". The spatial links between functions governing District 6 are established in a network of interactions formed based on information technology and virtual infrastructure. In such a network, there is no place because places are defined by trends (Castles, 2003, 128). Hence, the existing infrastructure in the study area as well as communication networks and interactions in the virtual space,

determine the main spatial configuration of District 6 of Tehran metropolis. Reinforcement of this underlying infrastructure, not only provides for physical presence of function and service places, but also integrates them into the networks. Technological infrastructure forming the basis of networks and are moderately governing the district, will create/define new spaces in the future. This infrastructure is a manifestation of a network of trends that considerably influence the economic, social, and physical processes of the study area. These effects are discussed in the next section. Findings of the present research suggest that the Tehran metropolis has made numerous efforts to prepare the infrastructure and virtual networks, but it is still in the beginning of its path to virtualization. Hence, authorities shall consider the need for taking actions to reinforce associated processes and thus fully prepare the city for this purpose.

10. Assessment of the Level and Dimensions of Influence of Virtual Spaces on Spatial Processes

A. Analysis and Assessment of the Effects of Virtual Spaces on Economic Processes

Processes associated with this component were assessed at the general level by some general questions. According to the findings, it can be said that about 50% of citizens believe that virtual technologies and virtualization of economic processes leads to the economic growth and development of the region. Concerning the role of cyberspace in creating economic stability as well as the contribution of technologies to the emergence of sustainable, suitable and permanently-paid jobs in the region, it can be said that most participants expressed their agreement by choosing options "highly agreed" and "agreed". On the other hand, 32% of citizens believed that development of virtual spaces will lead to permanent employment and creation of suitable permanently paid jobs in other regions of the city. 47% of the citizens had no opinion on this forecast. A high portion of citizens believe that development of cyber technologies and virtual spaces will lead to an increase in the capitals of the city and the district as it will also help save urban management costs (Table 6).

Table (6): Assessment of the effects of cyberspace on economic processes

Indicators	Fully disagreed	Disagreed	No opinion	Agreed	Fully agreed	Sum	Average
Increased economic growth	۴	۱۳	۳۴	۲۸	۲۱	۱۰۰	+۳
Creation of sustainable, suitable and permanently-paid jobs in the region	۷	۱۳	۴۳	۲۹	۸	۱۰۰	+۳
Creation of sustainable, suitable and permanently-paid jobs in other regions of the city	۷	۱۴	۴۷	۲۴	۸	۱۰۰	+۳
Increased city and district capitals and saving urban management costs	۵	۸	۳۷	۳۵	۱۴	۱۰۰	+۳

Results of analyses of the effect of cyber technology on economic indices suggested that cyber technology can considerably influence the economic state of Tehran and its District 6. Results of the questionnaire indicated that according to urban participants in District 6 of Tehran, cyber technology leads to an increase in employment (new jobs) and maintains the balance between economic development in this region and other regions of the city. Concerning employment, the sample population believed that cyber technology reduces urban management costs because its general use and the subsequent jobs and workplace changes can add to economic development of the district and the city. Although the experts agreed that cyber technology leads to an increase in the efficiency and improvement of the urban management system, the whole administrative system and its hierarchical structure governing Iran have to move toward virtual management to be able to observe the changes in all urban regions. Results of the questionnaires indicated that target population confirms the effect of development of cyber technology on the economic processes of the region because the average score for all criteria was higher than 3.

B. Analysis and Assessment of the Effects of Virtual Spaces on Social-Cultural Processes

Table (7): Assessment of the Effects of Virtual Space on Social-Cultural Processes

Indicators	Fully disagreed	Disagreed	No opinion	Agreed	Fully agreed	Sum	Average
Reduced congestion	۶	۶	۳۸	۳۱	۲۰	۱۰۰	+۳
Increased security of citizens	۵	۱۳	۳۹	۳۱	۱۲	۱۰۰	+۳
Enhanced life quality	۸	۱۲	۳۲	۳۰	۱۸	۱۰۰	+۳
Increased freedom of action and confidence of citizens	۷	۱۰	۳۱	۳۳	۲۰	۱۰۰	+۳
Increased participation of citizens	۷	۱۲	۴۰	۳۱	۱۰	۱۰۰	+۳
Increased supervision of citizens over urban management	۶	۱۵	۳۹	۳۰	۱۰	۱۰۰	+۳
Ease of handling citizenship affairs and needs	۵	۹	۳۵	۳۵	۱۶	۱۰۰	+۳
Reduced waste of money and time	۴	۵	۲۶	۳۶	۲۹	۱۰۰	+۳
Increased public awareness and knowledge	۳	۷	۳۴	۴۰	۱۶	۱۰۰	+۳
Increase leisure time for citizens	۴	۱۱	۲۳	۳۹	۲۳	۱۰۰	+۳
Increased informed requirements by citizens	۵	۹	۲۳	۴۰	۲۲	۱۰۰	+۳

The TOPSIS analysis performed on this group of questions resulted in a sum of 0.623, which reflects the satisfactory status of these indicators. Of the eleven questions in the group, which deal with the consensus about development of cyber technology, all scored high scores. The scores were predictable due to the nature of questions. However, the indicators linking development of cyber technology to an increase in public awareness and knowledge as well as a reduction in congestion

gained the highest TOPSIS scores. This properly reflects the belief of citizens in the considerable effect left by virtual performance on social processes. Therefore, a reduction in the staggering congestion of cities results from a decrease in concentration, which is a positive result of development of virtual spaces. Since this district is located in the context of the central part of Tehran metropolis as well as the margins of main urban and national arteries and diverse land uses, it has

always been the home to urban congestion and concentration. Hence, the sample population believed that with the development of an urban city, the congestion/concentration is reduced and a more peaceful and desirable urban environment is probably created. Studies conducted in Singapore, Japan, and South Korea showed that a major strategy for actualization of the notion of virtual city is support for peace. In addition, mass media environments and virtualized urban spaces (existing or emerging) are increasingly privatized and thus will

probably bring about mental peace to citizens. The result was confirmed by the remarks of the study groups as well. However, all social theories focused on the pathology of new spaces are concerned with the loss of face-to-face social interactions which accounts for a high level of mental peace. Evidence also suggests that development of virtual spaces will increase social and mental security among citizens. This finding fully complies with the results obtained by previous researchers.

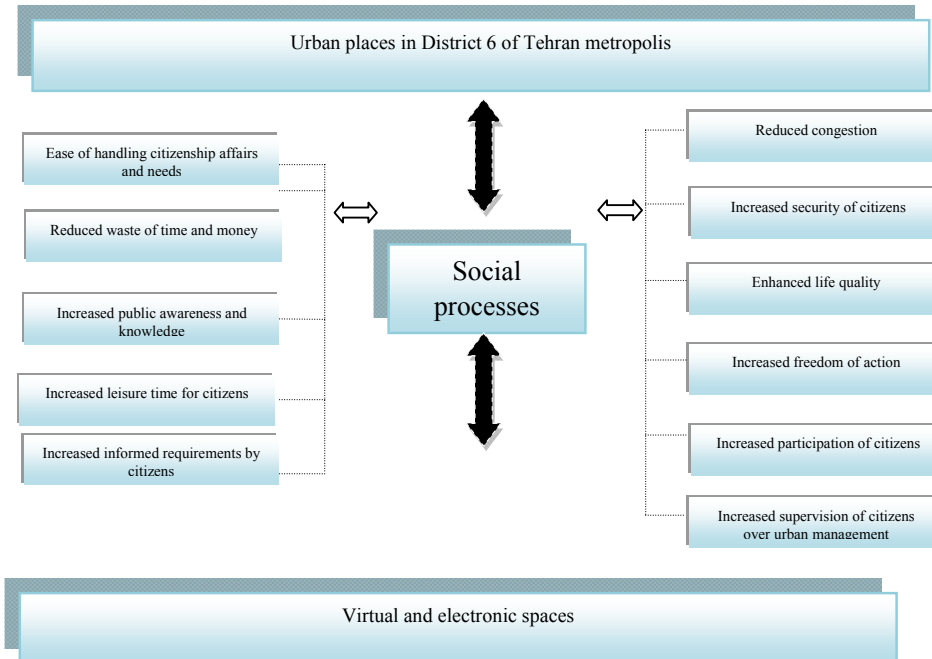


Figure (1): Social processes influenced by electronic communications and virtual spaces

Establishment of a virtual city in the district is considered by the citizens to be promising a desirable living, recreational, and working environment. According to these groups, people in electronic cities have more time to rest and relax and will demonstrate a higher level of productivity compared to the past. In the study area, with the existing urban infrastructure, which provides for most functions of electronic city through Internet-based facilities and electronic system, there is no need for physical presence to handle daily affairs such as payment of water, gas, electricity and phone bills and purchase of real states or goods. These affairs can now be handled through personal computers connected to the Internet. Hence, participants agreed that one of the social indicators influenced by virtualization is the reduction in time and money loss. Moreover, participation in urban activities (such as contacting authorities, enterprises, economic and social agencies, municipalities, and other municipal authorities) is facilitated and services are provided to the citizens more easily and satisfactorily. On the other hand, administrative and operation efficiency is increased so that citizens can be informed of events occurring in their residential area and express their opinions on the possible solutions. In such a condition, communications and interactions among agencies are increased

and residents are provided with access to the required services. Accordingly, the target population agrees on the increase in the rightful demands of citizens. Existence of multiple communication channels in the district providing services such as 137, 110, 135, etc. confirms the findings and results. Therefore, some of the definite effects of establishment of a virtual city in the region are as follows: improvement of the quality of the life of residents with an increase in their awareness of urban processes and facilities, ease of urban activities, and improvement of economic conditions as a result of enhanced commerce in the city; a reduction in all of the processes required for performing a task in a single activity, promotion of electronic activities, and omission of subsequent visits to offices and organizations; and an increase in the participation of people in city management and their right to express their opinion about the city and directly contact authorities.

C. Analysis and Assessment of the Effects of Virtual Spaces on Environmental-Physical Processes

In this section, the attitude of participants toward environmental and physical issues of the district and the city is

discussed. Results of analyses of questionnaires indicated that the sample population believes that development of cyber technology will lead to a reduction in the pressure put on service and infrastructural facilities, a reduction in noise and pollution, and an increase in environmental quality. The score associated with this belief was more than 3 or approximately 3. Research findings indicated that the study population care about environmental issues and confirms the influence of development of this technology on the environmental aspects of the region. A considerable number of citizens agree/fully agree that development of the cyber technology leads to a reduction in air pollution and noise across the district. That is to say, less than 20% of the citizens disagree with this assumption about the two indicators. About 60% of citizens believe that development of cyber technology highly influences noise and air pollution. They believe that development of cyber technology leaves a high/very high effect on the improvement of the quality of the environment of the region and the city. On the other hand, concerning “the use of smart systems result in soothing traffic and congestion in the region”, 15% chose the “no opinion” while 52.0% and 27% chose the “agreed” and “highly agreed” options. Concerning “the use of smart systems influences incident management and control”, 52% chose the “agreed” option while “25%” chose

the “highly agreed” option. Moreover, in the case of “the use of smart systems contributes to the support for emergency vehicles”, almost similar answers were provided. 55% and 31% of citizens also agreed and highly agreed that the use of smart systems facilitates reception of tolls, traffic plans implementation, and purchase and reservation of tickets, respectively. More than 80% of the citizens under study believed that the use of smart systems will positively affect the public transportation system. Moreover, about 60% also believed that cyber technology will gradually lead to omission of some physical and functional spaces in the spatial structure of the district. About 56% of the citizens believed that cyber technology will highly influence the productivity of functions in the spatial structure of the region while about 60% believed that cyber technology will lead to the emergence of new spaces. More than half the citizens believe that growth of virtual spaces such as schools, universities, and electronic offices will significantly reduce urban congestion. This is also the case with the reduction in concentration of activities on the spatial structure of the region. In addition, almost half the citizens also suggested that development of cyber technology will highly contribute to the reduction in the pressure put on service and infrastructural facilities of the district.

Table (8): Assessment of the effects of cyberspace on environmental-physical processes

Indicators	Fully disagreed	Disagreed	No opinion	Agreed	Fully agreed	Sum	Average
Reduction in air pollution	3	6	25	43	23	100	+3
Reduction in noise	4	11	28	36	21	100	+3
Increased traffic speed and movement	2	4	15	52	27	100	+3
Easier management of traffic and incidents	2	5	16	52	25	100	+3
Support for emergency vehicles	1	4	20	50	25	100	+3
Ease of receiving tolls, implementing traffic plans and purchasing and reserving tickets	1	2	11	55	31	100	+3
Enhancement of public transportation	1	3	15	53	28	100	+3
A reduction in physical visits by citizens	0	11	28	43	18	100	+3
Removal of some physical spaces	1	4	37	52	6	100	+3
Substitution and creation of some new places	1	3	38	43	15	100	+3
Increased productivity and efficiency of spaces	1	4	38	41	16	100	+3
Improved urban per capita parameters	2	15	54	21	8	100	+3
Reduced concentration on the urban spatial structure	3	8	34	34	21	100	+3
Reduced concentration of activities on the spatial structure	3	7	39	35	16	100	+3
Reduced pressure on facilities and infrastructure	4	11	40	31	14	100	+3

The final TOPSIS number obtained from rating the opinions of citizens on the spatial processes associated with environmental-physical components was 0.69. This indicated that the most important factor in the actualization of the notion of virtual city in the eyes of citizens was the impact of these

processes. The question about the opinion of the citizens about the effect of smart systems on reception of tolls, implementation of traffic plans, and purchase/reservation of tickets scored higher than other questions. Questions about issues such as the effect of smart systems on improvement of

public transportation, support for emergency vehicles and traffic soothing results also gained high scores. Research findings, especially the resulting priorities and assessments indicate that when physical procedures are replaced with electronic procedures, virtual spaces will have some effects and consequences, which in turn will lead to creation of new spaces, generation of new rapid trends, and increased power and capacity of infrastructural networks. With the increasing omission of the borders between physical and electronic environments at the district level, virtual spaces are playing significant roles in physical and environmental changes. A

considerable number of participants under study are focused on the effects of current advancements in cyber technologies on the region. According to the viewpoints of the target population, the inevitable development of cyber and virtual spaces will lead to a reduction in congestion and an increase in decentralization. Hence, these processes will transcend the limits of geographical differences and re-define the district. Emergence of elements and spaces with varying performance and speed levels are some of the concrete effects of this transition.

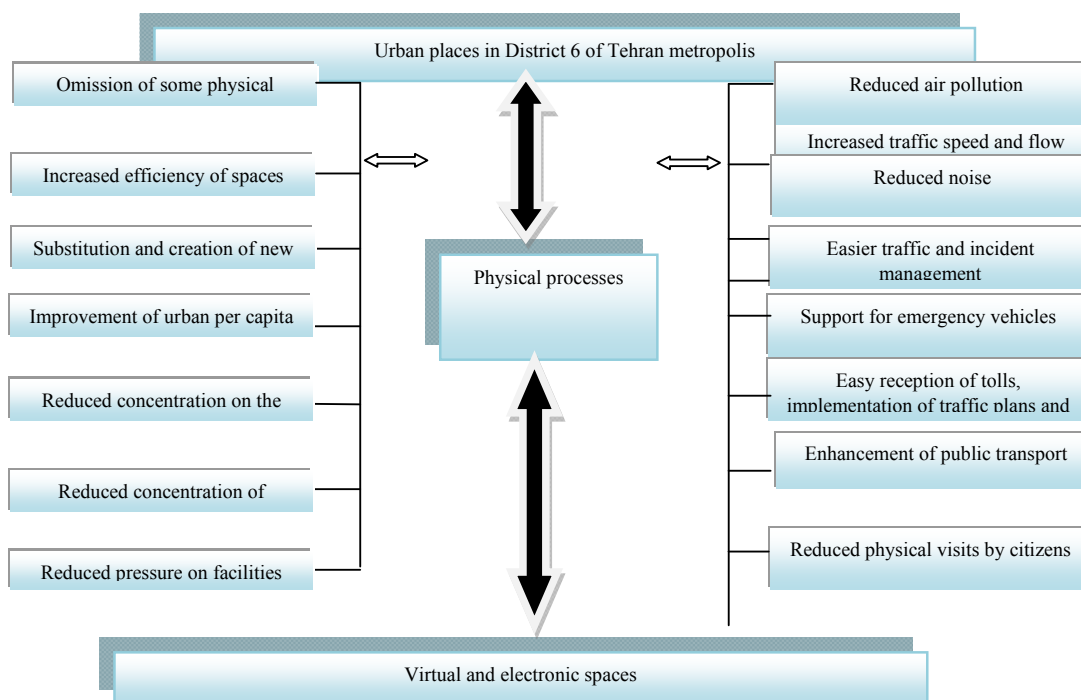


Figure (2): Physical processes influenced by electronic communications and virtual spaces

11. Conclusion and Examination of Research Hypotheses

Results revealed that use of many virtual services (such Internet, bands and institution electronic networks, leisure time features, municipal electronic portals, etc.) was high by citizens. This indicated that the first step of the move toward transition into a virtual city is taken and the first research hypothesis is confirmed. This hypothesis states that: "Tehran has relative preparedness for the transition into a virtual city". The reason is that the primary basis for the virtual city management network is a dominant management, implementation of principles of virtual city, informed citizens, and increased virtual users. However, there are numerous essential and general problems associated with these processes that still impede the full actualization of the transition. Results

of the analysis of the viewpoint of the sample population on the positive effects of cyber technology on social, economic, cultural and physical processes indicated that the population confirms the positive effects of cyber technology on these processes and the respondents obtained a score of higher than 3 and thus assessed the effects to be moderate. Hence, the second research hypothesis was also confirmed as well. Accordingly, development of virtual spaces and transition from convention processes provides for overcoming the existing temporal and physical limitations and obstacles in the region. It will also drastically reduce physical visits paid by citizens to receive services. The spatial and temporal compactness caused by virtual communication in the district will lead to a decrease in the costs of communications among different geographical areas. It will also significantly increase the potential and

capacity for exchange and use of services. It can be said that the time required to travel between places in District 6 is decreased and traffic flow is soothed. At some different levels, virtual communications at District 6 have overcome temporal and spatial limitations and thus the efficiency and productivity of spaces is increased in the eyes of citizens. Development of cyber technology adds to the control over urban places by selecting people that can access them in the selected geographical places. Therefore, citizens strongly believed that control and management of some special urban issues associated with traffic and incidents will add to the desirability of the district and regulation of traffic and control systems. On the other hand, these development communications will lead to the ease of access to services. Hence, participants believe that development of virtual spaces facilitate the reception of tolls, implementation of traffic plans and purchase and reservation of tickets. Accordingly, the physical-environmental component plays the most important role in future spatial processes and virtual urban management. All of the indicators discussed in this section were of great importance to the participants, but smart public services (tolls, traffic plans, ticket affairs), enhanced public transport, traffic flow and traffic soothing results, and support for emergency vehicles were among the most important factors in the eyes of citizens. The role and performance of virtual services in spatial processes is another factor important to the citizens. They stressed on the effect of cyber technology on the reduction in the loss of money and time of citizens in handling their affairs as the most important consequence.

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