



# The investigation of the relation between ergonomics level and the quality of giving services based on servqual Model

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## ABSTRACT

**Objective:** The present study was aimed to investigate the relation between ergonomics level and the quality of giving services to the users in water and waste water Co. **Methodology:** This research is applied in terms of objective and from the view of method is descriptive-survey research. The sample population is the staffs of water and waste water Co. (the subject of Ergonomics) and the users of the company (the subject of services quality). 171 samples were selected randomly for ergonomics subject and 384 samples for service quality. Data collection tool was questionnaire and Ergonomic questionnaire was divided into administrative and technical questionnaires. From the view of the staffs, services quality questionnaire of Servqual model was distributed. **Results:** To determine the correlation between the variables, Spearman correlation coefficient was used. The results of the research indicated the lack of relation between ergonomics level and the quality of giving services in water and water waste company. **Conclusion:** Theoretical inference of the research was that observing ergonomic principles increases services quality and theoretically, if an employee is not comfortable in this duties, it is possible not to do the work correctly or a person who is tired in work place, some problems such as low precision during work, less physical and mental performance speed and considerable mistakes in his reports are created.

## 1. Introduction

Today, only the organizations have good position in competition field that their main activity is fulfilling the requirements of the customers and satisfaction of their needs with the minimum price and the maximum quality, the successful and effective presence in regional and global competition market is an unavoidable necessity with the optimized use of facilities and good operation of new resources for manufacturing and presenting good services with good quality based on customer satisfaction (Kazazi, 2004).

The lack of physical fitness causes physical problems including Musculo-Skeletal pains that are the most common side effects of working in current societies. According to the existing statistics, about 48% of all the diseases related to working are cumulative injuries created due to physical or mechanical problems that are Musculo-Skeletal Disorders.

The lack of mental consistency creates special problems. Physical- mental problems are one of these problems appearing due to more thinking and mental pressure during working. When a person has not the capacity of the responsibility given to him due to thinking power, mental pressures are increased for him and it causes some problems such as irritation, psychosis, the lack of mental balance, etc. if such problems continue, they lead into physical problems such as blood circulation system, gastrointestinal tract problems, reaction of Endocrine glands, etc. On the other hand, when the work or responsibility requires little mental ability, thinking power and IQ, using a person with high mental abilities can be problematic. Such a person in his duty, never find the opportunity to use natural talent and creation and always complains about the monotonous regularity of the work and despite his high ability is not inclined to strive more for better performance of the work. The outcome of this condition is mental pressure and less productivity.

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To avoid these issues and providing the health of labor force “Ergonomics” helps human being as an efficient strategy. As Rajers and Cavank explains: Ergonomics aims to adapt the work with human being not making human being consistent with the work (Kalbasi, 2005).

Pre-requirement of quality is ergonomics and quality is one of the productivity components. To achieve productivity and quality we require the improvement of work place that ergonomics help us to achieve it. Ergonomics and quality management are interrelated to each other as we can not say where one of the starts or the other finishes.

In the present industrial world, many workers and staffs are obliged to adapt with unsuitable conditions that the environment and applied tools impose on them and they can cope with the created limitations. The outcomes of such compromise are very bad and have adverse effects on a person life, health, safety and his productivity. In such a condition, the human being can not adapt with the type of work or the equipments being used or in the living or working environment.

The term ergonomics is derived from Greek *Έργον*, meaning "work", and *Νόμος*, meaning "natural laws". In applied term, Ergonomics is a set of knowledge being created of the combination of biological sciences, physiology of work place and it attempts to design the tools and work place based on physical, thinking capabilities and limitations and interests of people.

Ergonomics is a science that studies human being and his interaction with products, productions, equipments, facilities, methods and work and life environment and despite technical and engineering sciences that mostly deal with the techniques, emphasize on human being and design of equipments for people.

Ergonomics is the science of studying human being during work, to understand the complex relation between people and physical and psychological aspects of work place, occupational needs and procedures.

Ergonomics is the application of scientific information about human being (and scientific methods of such information) to solve designing problems (Chubineh, 1996).

Ergonomics is human-being science discussing about the effective and general relation between human being and technology and tries to create the maximum productivity by recognition of the interaction between human being factors and technology and environment characteristics (Vosuqi et al., 2009).

Ergonomics is the application of scientific information about human being to solve design problems (it investigates the ergonomics of capacities and capabilities of human being and then use the information in the design of jobs, products, work place (even living environment) and equipments) (Kalbasi, 2005).

The International Ergonomics Association defines ergonomics as follows:

Ergonomics is the scientific relating the knowledge of human sciences with the occupations, systems, products and environment considering physical, mental and human being limitations” (Habibi, 1998).

Ergonomics or human engineering is defined by International Labor Organization (I.L.O) as:

“Ergonomics is applying biology science and its consistency with technical and engineering sciences and achieving the required balance between the work and worker leading into good activity and work.

Ergonomics is the science of optimized use of working tools in work place as the maximum productivity in the products is achieved, while the worker or user will have the maximum satisfaction of the application of the mentioned tool and work place and this is while the required safety is provided for the workers and users during work (Karzar Jedi, 2000).

Ergonomics investigates the relationship between human being and environment, as the maximum capabilities of human is used and occupational requirements don't exceed the capabilities of a person. Thus, there should be the required consistency between a person and his duties, capabilities and his occupational requirements (Ganjipour, 2005).

Considering the above definitions, ergonomics uses scientific fields such as medical, physiology, statistics, psychology, anthropology, anatomy, biomechanics and the evaluation of the dimensions of human body for designing machine and work place. Indeed, ergonomics is an interdisciplinary science relating technology, environment and mental and physical needs of human.

In USA, instead of the term “ergonomics” human factors engineering is used. Human factors and Ergonomics of America society emphasized on the design methods and defines human factors engineering as: “the discovery and application of the principles related to human behavior and the characteristics of design, evaluation, maintenance process of the products and systems with the aim of safety, effectiveness and satisfaction among the staffs”.

The main goals of ergonomics science is improving the procedure, working methods and working tools, their consistency with mental and physical characteristics of human.

It should be considered that by observing the principles of ergonomics, work pressure and unduly fatigues are reduced. Also, ergonomics attempts to find scientific consistency of job, conditions, tools and work environment with physical and body characteristics of human and determination of his physical ability; the job and work place should be designed in a way to be consistent with the physical properties of average people (by considering the related standard deviation) (Foruzanfar, 1999).

Other purposes of ergonomics include reduction of work pressure, fatigue and tiredness that are created in vain and it is attempted to change working with the machine for the benefit of a person and finally, its main aim is supporting and safety of human. In ergonomics, it is attempted to change boring works in to increase the convenience of an individual and any person can do it by a little skill. Thus, correct application of ergonomics improves productivity of labor force and increases production and efficiency ability of a person considerably (Qanian, 2002).

Perhaps, it is imagined that using ergonomics science increases production costs but despite as it is imagined, the statistical investigations had the following results:

Improving quality and increasing production

Increasing productivity

Optimized use of labor force

Increasing national income and economical benefits (Sadraabarqui, 2005).

The year 1994 is the beginning of ergonomic movement in its scientific discipline. The first ergonomic society was established in England in this year by organized formation of this science in different time periods, showed its role in different fields.

**Table 1. Ergonomics evolution steps**

Military Ergonomics	1950s
industrial Ergonomics	1960s
Ergonomic design of the product for consumption	1970s
Human and machine system	1980s
Cognitive and macro Ergonomics	1990s
Ergonomic communications (global)	2000s
Cultural Ergonomics	Next step

(Vosuqi et al, 2009)

Ergonomics or human factor engineering is a combinational science attempting to design the tools, devices, work place and occupations based on physical-thinking capabilities, limitations and interests of human.

This science with the aim of increasing productivity, well-being, safety and health of human being is formed.

Thus, when the staffs have good performance to make a balance between the physical, mental and work place, in operational model of human resources development to increase the efficiency and productivity, ergonomics is used and this is due to the fact that ergonomics saves energy and time and the staffs by the minimum physical and mental energy bring the maximum physical work and intellectual work for the organization (Karzar Jedivand, 2002). Oyewole et al (2010) in a research titled “The Ergonomic Design of Classroom Furniture/Computer Workstation for First Graders in an Elementary school presented the following results:

Incompliance of the size and dimensions of the school furniture with students’ body measurements is one of the effective factors on the change of spinal cord and back pain and it can cause mental disorders and academic failure. Thus, 20 elementary classes were considered and their anthropometric data including height, weight, popliteal length, knee height, the distance from buttock to popliteal and the sizes of school desks and chairs were measured to be compared.

Anthropometric data analysis of descriptive statistics (Mean, Range, Standard Deviation) was conducted in Microsoft company. The results of using this ergonomic design for class furniture were convenience and low skeletal disorders and back pain (Ertho and Irving, 1997).

Klatte et al (1997) in a research titled “Quality improvement through capable processes and ergonomic design had the following results:

Using ergonomics in design and work place is a basis to produce high-quality products continually and continuous improvement in the quality of the product is possible only via systematic analysis and optimization of all production process.

This article deals with the investigation of volkswagencompany that by process audition, quality audit, product audit proved that for quality improvement and analysis, suitable tools are required.

Quality audit was conducted for the analysis of the production processes quality capability by Volkswagen in Velfsburg to define that how much this systematic, independent and evident process is done to gain audition evidences and purposeful evaluation and its criteria are fulfilled. In product audition, the characteristics of the product are pointed from the view of customer (internal and external).

Strasser (1995) in a research titled “Ergonomic efforts aiming at compatibility in work design for realizing preventive occupational health and safety” proposed the following results:

By industrialization phenomenon development, the pattern of the diseases threatening the health of people was changed as from the mid 20 century, infectious diseases were decreased and the diseases related to the events of life such as cardio-vascular diseases and Musculo-Skeletal problems were decreased. Another phenomenon threatening the well-being of human in industrial world is occupational disease.

The optimized design of the equipments is not done without considering ergonomics. Some samples of this kind of design and its use reduced occupational diseases and stretching injuries and reduced physiological costs and increased efficiency.

Along with industrialization, using technologies, standards and rules are revealed more in ergonomics.

## 2. Materials and methods

### 2.1 Research method

This research is applied in terms of objective and descriptive-survey study in terms of method of field type. Descriptive method investigates the relation between the variables without any manipulation. It means that the researcher doesn't manipulate the studied variables personally and investigate them as they are occurred in the past or they will happen in future and observes and measures their relationship. Also, sample population of this research for the subject of ergonomics is the staffs of water and water waste company and for the subject of the quality of the services, clients-users.

## 2.2 Data collection instrument

For data collection and data analysis two questionnaires were used. The first questionnaire is composed of two administrative and technical questionnaires and to investigate the condition of ergonomics from the view of the staffs and the second questionnaire was presented to investigate the quality of giving services to the users and clients.

## 2.3 Validity and reliability of the questionnaire

Validity means true and valid. Validity is the measurement of the required property and characteristic. The importance of the validity is that wrong and inadequate measurements can make the scientific research invalid. Validity refers to the validity of the measurement of the researcher (Khaki, 2003).

Both questionnaires are standard.

Ergonomic questionnaire was presented by international labor organization and services quality questionnaire is used by many researchers and its validity is proved. But to determine content and face validity of the questionnaire, the questionnaire was distributed among expert people in this field and their comments were used to investigate the consistency of the questions with the measurement goals (services quality and ergonomics). Reliability for valid people is the ones whose behavior is reliable, consistent and predictable.

It means that what they do tomorrow or next week is consistent with what they do today or previous week. In this way we say they are reliable. Invalid people change their behavior considerably and their behavior is unpredictable and varied. A test is reliable when the observed and real scores have high correlation, it means that observed and real scores of each of the participants are available. The correlation square between these scores called "reliability coefficient of test" and is a significant number (Khaki, 2003).

Cronbach's alpha was used for the reliability of the questionnaire and the results of the analysis by SPSS software indicated reliability coefficient 0.88 for administrative ergonomics and 0.85 for technical ergonomics and 0.91 for services quality in the existing condition and 0.92 for the services quality in the expected condition (Joseph and etal, 2003).

## 2.4 Research hypotheses

### 2.4.1 Main hypothesis

There is a relationship between ergonomic level and the quality of giving services to the users.

### 2.4.2 Sub-hypotheses

There is a relationship between ergonomics level and tangible factors in the quality of giving services to the users.

There is a relationship between ergonomics level and reliability in the quality of giving services to the users.

There is a relationship between ergonomics level and empathy of the staffs with the client in the quality of giving services to the users.

There is a relationship between ergonomics level and responsiveness of the staffs in the quality of giving services to the users.

There is a relationship between ergonomics level and assurance of the client in the quality of giving services to the users.

### 2.4.3 Research variables

Variables help use to understand the relations between different issues well and make the investigation and hypotheses test possible. Generally, in the investigation and research hypotheses test and the identification of the relations between the variables we have two types of dependent and independent variables that should be considered. "Dependent variable" is being explained and "independent variable" is a variable that is expected to explain the change in dependent variable.

The variables are studied and are shown briefly in Table 2.

**Table 2. Independent and dependent variables**

Hypothesis No.	The type of relation in the hypotheses	Variable	
		Independent	Dependent
1	The relation between ergonomics level and tangible factors in the quality of giving services to the users	Ergonomics level	Tangible factors in the quality of presentation of services to the users
2	The relation between ergonomics level and reliability in giving services to the users	"	Reliability in the quality of giving services to the users
3	The relation between ergonomics level and empathy of the staffs with the client in the quality of giving services to the users	"	Empathy of the staffs with the client in the quality of giving services to the users

4	The relation between ergonomics level and responsiveness of the staffs in the quality of giving services to the users	"	Responsiveness of the staffs client in the quality of giving services to the users
5	The relation between ergonomics level and the client assurance in the quality of giving services to the users	"	The assurance of the client in the quality of giving services to the users

### 3. Discussion and results

The main hypothesis test is as follows:

There is no relationship between ergonomic level and the quality of giving services to the users: H0

There is a relationship between ergonomic level and the quality of giving services to the users: H1

**Table 3. Ergonomics correlation coefficient and services quality zones Nonparametric Correlations**

		Ergonomics	k_kh services quality
Spearman's rho	Correlation Coefficient	1.000	-.124
	Sig. (2-tailed)	.	.400
	N	58	58

As it is shown in Table 3 and numerical value of correlation coefficient in significance level (Sig. (2-tailed) ) = 0.4, we can say that as this number is more than error level  $\alpha=0.05$ , H0 is strongly supported and it means that there is no relationship between these two variables (Ergonomics, 1998).

Sub-hypotheses are as follows:

#### 3.1 First hypothesis test

There is no relationship between ergonomics level and tangible factors in the quality of giving services to the users: H0

There is a relationship between ergonomics level and tangible factors in the quality of giving services to the users: H1

**Table 4. numerical value of correlation coefficient of the hypothesis**

			Ergonomics	Tangible factors
Spearman's rho	Ergonomics	Correlation Coefficient	1.000	-.008
		Sig. (2-tailed)	.	.908
		N	171	384

As it is shown in Table 4, numerical value of correlation coefficient of the hypothesis is -0.008 and as significance level is 0.908, this number is bigger than  $\alpha=0.05$ . H0 hypothesis is strongly supported and it means that there is no significant relationship between two variables.

#### 3.2 Second hypothesis test

There is no relationship between ergonomics level and reliability in the quality of giving services to the users: H0

There is a relationship between ergonomics level and reliability in the quality of giving services to the users: H1

**Table 5. numerical value of correlation coefficient of the hypothesis**

			Ergonomics	Reliability
Spearman's rho	Ergonomics	Correlation Coefficient	1.000	-.018

	Sig. (2-tailed)	.	.782
	N	171	380

As it is shown in Table 5, numerical value of correlation coefficient of the hypothesis is -0.018 and as significance level is 0.782, this number is bigger than  $\alpha=0.05$ . H0 hypothesis is strongly supported and it means that there is no significant relationship between two variables.

### 3.3 Third hypothesis test

There is no relationship between ergonomics level and empathy of the staffs with the client in the quality of giving services to the users: H0

There is a relationship between ergonomics level and empathy of the staffs with the client in the quality of giving services to the users: H1

**Table 6. numerical value of correlation coefficient of the hypothesis**

			Ergonomics	Empathy
Spearman's rho	Ergonomics	Correlation Coefficient	1.000	.041
		Sig. (2-tailed)	.	.537
		N	171	384

As it is shown in Table 6 numerical value of correlation coefficient of the hypothesis is 0.041 and as significance level is 0.537, this number is bigger than  $\alpha=0.05$ . H0 hypothesis is strongly supported and it means that there is no significant relationship between two variables.

### 3.4 Fourth hypothesis test

There is no relationship between ergonomics level and responsiveness of the staffs in the quality of giving services to the users: H0

There is a relationship between ergonomics level and responsiveness of the staffs in the quality of giving services to the users: H1

**Table 7. numerical value of correlation coefficient of the hypothesis**

			Ergonomics	responsiveness factors
Spearman's rho	Ergonomics	Correlation Coefficient	1.000	.033
		Sig. (2-tailed)	.	.624
		N	171	377

As it is shown in Table 7 numerical value of correlation coefficient of the hypothesis is 0.033 and as significance level is 0.624, this number is bigger than  $\alpha=0.05$ . H0 hypothesis is strongly supported and it means that there is no significant relationship between two variables (Habibi, 2004).

### 3.5 Fifth hypothesis test

There is no relationship between ergonomics level and assurance of the client in the quality of giving services to the users: H0

There is a relationship between ergonomics level and assurance of the client in the quality of giving services to the users: H1

**Table 8. numerical value of correlation coefficient of the hypothesis**

			Ergonomics	Assurance factors
Spearman's rho	Ergonomics	Correlation Coefficient	1.000	.021
		Sig. (2-tailed)	.	.755
		N	171	381

As it is shown in Table 8 numerical value of correlation coefficient of the hypothesis is 0.021 and as significance level is 0.755, this number is bigger than  $\alpha=0.05$ . H0 hypothesis is strongly supported and it means that there is no significant relationship between two variables.

The results showed that all the research hypotheses are rejected and from theoretical view means weak ergonomic level and average ergonomic level of the company and it was not effective on the quality of the services to the users.

It should be considered that the investigation of Ergonomic research and services quality was done by Servqual Model; it is possible that other models change the conclusion of the study (Helander, 1996).

**Table 9. The summary of the rejection or support of the research hypotheses**

Hypothesis	Rejection or supporting	Correlation coefficient	Sig. (2-tailed)	$\alpha$ =Significance level
There is a relationship between ergonomics level and tangible factors in the quality of giving services to the users.	Rejected	-0.008	0.908	0.05
There is a relationship between ergonomics level and reliability in the quality of giving services to the users.	"	-0.018	0.782	"
There is a relationship between ergonomics level and empathy of the staffs with the client in the quality of giving services to the users.	"	0.041	0.537	"
There is a relationship between ergonomics level and responsiveness of the staffs in the quality of giving services to the users.	"	0.033	0.624	"
There is a relationship between ergonomics level and assurance of the client in the quality of giving services to the users.	"	0.021	0.755	"

Therefore, the organization should attempt to increase ergonomic level in the offices to reduce the absence of the staffs due to the diseases and extra costs on the staffs and the organization and create a good working place for collaboration and participation that high working morale reduces the probability of human mistakes to have good services with the support of health, safety and motivation.

#### 4. Conclusion

Theoretical inference of the research was that observing ergonomic principles (mechanical, biological, perception, technical and psychological) increases services quality and theoretically, if an employee is not comfortable in this duties, it is possible not to do the work correctly or a person who is tired in work place, some problems such as low precision during work, less physical and mental performance speed and considerable mistakes in his reports are created. But if a work place is designed well ( from the design of the rooms, color, decoration,etc), fatigue of the staff and his pressures are reduced and he can respond better to the clients and if an organization thinks only about profit and productivity and ignores sanitary and mental issues of the staffs, human resources of the organization will be dissatisfied, angry and pessimistic people that finally leads into less working and absence, etc and in these conditions, the staffs are not motivated to have personal consideration to the customers and understand their needs.

But considering all the above issues in this company, there was no relationship between ergonomics and services quality to the users and it is due to conscience and moral commitment of the staffs to the people, outsourcing and giving most of the parts of the contractors, exclusiveness of the company, satisfaction of the users with this condition and finally a capable management and as the ergonomics of the company is finally average, but services quality was relatively good from the view of customers but it should be considered that the low ergonomic level in each company doesn't show its effects at present but the organization will observed the results over the time. All the researchers believe that observing ergonomic standards is not effective for increasing services quality, productivity and health.

The results showed that all the research hypotheses are rejected and from theoretical view means weak ergonomic level and average ergonomic level of the company and it was not effective on the quality of the services to the users. It should be considered that the investigation of Ergonomic research and services quality was done by Servqual Model.

Therefore, the organization should attempt to increase ergonomic level in the offices to reduce the absence of the staffs due to the diseases and extra costs on the staffs and the organization and create a good working place for collaboration and participation that high working morale reduces the probability of human mistakes to have good services with the support of health, safety and motivation.

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