# USERS' OVERALL SATISFACTION FOR ARC WELDING ROBOT: A CASE STUDY OF UNI ARC CO.,LTD.

By

THITI WONGTHANASAK

A Thesis submitted in partial fulfillment
of the requirement for the degree of

Master of Business Administration

Graduate School of Business
Assumption University
Bangkok, Thailand

March
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# ABSTRACT

Nowadays, arc welding robot sales situation of each distributor not only in Thailand but around the world is in the midst of the fear that the equipment investment is curbed down due to the global recession. To survive in this difficult period, the important factors in environmental changes that would promote purchasing demand of arc welding robots are improvement the right products and also improvement the right sales activity to meet the highest levels of customer satisfaction to the right person. Therefore, this study is focused on the difference of users' satisfaction for arc welding robots when classified by various users' characteristic profiles. In this study, Uni Arc Co., Ltd. [UNAC] as a reliable arc welding robots distributor in Thailand was selected to be the case study. The research objectives encompass 1) To study the levels of users' satisfaction toward the product factors of arc welding robots which are Performance in operation, Reliability, Technical sophisticate, Flexibility and Adaptability in use, Size, Weight, Speed, Warranty, and Durability. 2) To study the differences of satisfaction toward the arc welding robots of UNAC among users when classified by users' characteristic profiles (Gender, Age level, Income level, Education level, and Department).

Research methodology encompasses sampling survey. Data collection tools involve structured questionnaires, in which 400 sets of closed-form questionnaires were used. Probability sampling technique is chosen. Sampling element is users who have ever experienced in using, received the service at any period of product life or involved in purchasing the arc welding robots of UNAC before. There are totally 45 hypotheses conjectured for testing.

Descriptive statistics is used to explain the users' satisfaction through product factors of arc welding robots can be concluded that the users have the greatest satisfaction on the "Performance in Operation" of arc welding robots; following with; Durability, Speed, Warranty, Flexibility and adaptability in use, Size, Reliability, Weight, and the least satisfaction of users toward product factors of arc welding robot is "Technical Sophisticate" respectively. Also, Independent Sample T-test is used for testing the hypotheses which want to find out the difference between male and female's satisfaction toward the arc welding robots of UNAC. Results from the test of 9 hypotheses by T-test can be concluded that there is significant difference between male and female on satisfaction toward the arc welding robots of UNAC by Male users have the greater satisfaction than Female users on the arc welding robots toward Performance in operation, followed by Durability, Speed, Warranty, Flexibility and adaptability in use, Reliability, and Weight, respectively. However, only Technical sophisticate and Size of arc welding robot factors that both Male and Female users have the same level on satisfactions. Moreover, Analysis of variance (ANOVA) technique is used for hypotheses testing in analyzing the difference among the other respondents' characteristic profiles which are Age level, Income level, Education level, and Department with the level of satisfaction toward the arc welding robots of UNAC. Results from the test of the rest 36 hypotheses by One-way ANOVA can be concluded that there is significant difference among the respondents regarding their satisfaction toward the arc welding robots of UNAC when classified by Age level, Education level, Income level and Department. However, there are no difference among the respondents regarding their satisfaction for Reliability and Speed of the arc welding robots of UNAC when classified by department.

Finally, the findings have implications for arc welding robots supply businesses which will recommend about the right product factors of arc welding robots that should be developed on the new generation of arc welding robots and also should be emphasized or improved when arc welding robots distributors directly make their sales activities to the right users.

## ACKNOWLEDGEMENTS

I would like to thank all the people who have contributed to the successful completion of this work. I would like to express my sincere appreciation to Dr. Charnchai Athichitskul, my advisor, who provided a detailed review and suggested good guidance and excellent advice throughout the study.

I am greatly indebted and would like to convey my gratitude to Dr. Thongdee Kijbonnchoo, Dr. Chittipa Ngamkroeckjoti, and Dr. Ioan Voicu, who are the members of thesis committee for their recommendations for the improvement of my thesis. Their valuable suggestions make my research more complete.

Finally, I wish to thank you all the members of my family for their love, encouragement, support, and understanding during the period of MBA study.

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March, 2009

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# CHAPTER 1

# GENERALITIES OF THE STUDY

This chapter introduces the general information related to arc welding robots and the profile of Uni Arc Co., Ltd., Statement of the Problem, Research Objectives, Scope of the Research, Limitations of the Study, Significance of the Study and Definitions of Terms.

## 1.1 Introduction of the Study

The word “Robot” is derived from the Czech word “Robonik” means working like a slave (Western Abenaki Dictionary, 1994). The world’s first industrial robot was “Unimates” jointly developed by George Devol and Josef (Joe) Engelberger in the 1950s decade and led to the formation of Unimation Inc. producing industrial robots. The first generation Unimation was installed at General Motors in 1962. Two decades later Japanese technology has taken over industrial robots development (Reed Tradex, 2008).

Generally, robots are appropriate for individuals who have a deficiency in manipulation ability. In industry, a robot replaces human when the task is dangerous or monotonous, and sufficiently simple (Mahoney, 2006).

### 1.1.1 Industrial Robot

Industrial robots are programmable, multifunctional, mechanical devices through variable programmed motions to perform a variety of tasks. An industrial robot system includes not only industrial robots but also any devices and/or sensors required for the robot to perform its tasks as well as sequencing or monitoring communication interfaces. Robots are generally used to perform unsafe, hazardous, highly repetitive, and unpleasant tasks. Most robots are set up for an operation by the teach-and-repeat technique. In this mode, a trained operator (programmer) typically uses a portable control device (a teach pendant) to teach a robot its task manually. They have many different functions such as material handling, assembly, arc welding, resistance welding, machine tool load and unload functions, painting, spraying, etc. (US Department of Labor, 2005).

Industrial robots and their application systems were put into full-fledged practical use in 1980s, and demand for such robots and systems has increased steadily ever since. Nowadays an industrial robot is classified by many applications (Figure 1.1).

**Figure 1.1: Robot Application**

**Current Robot Application**

| | |
|---|---|
| Die Casting | Machine Loading |
| Spot Welding | Stamping |
| Arc Welding | Plastic Molding |
| Glass Handling | Investment Casting |
| Heat Treatment | Conveyer Transfer |
| Forging | Palletizing |
| Paint Spraying | Inspection |

Source: Shimon Y. Nof (1999). *Handbook of Industrial Robotics*. 2nd ed. p. 8.

### 1.1.2 Arc Welding Robot

Arc welding robots are classified according to articulated robots on the basis of rotation of wrist in space. They work on the principle of industrial robot controlled by robot controller through teach pendant and used together with a welding power source. They are used in industrial welding processes to facilitate automatic welding.

Figure 1.2 indicates the three main components of arc welding robot: manipulator, robot controller, and welding power source (Uni Arc's service division, 2008).

**Figure 1.2: Main Components of Arc Welding Robots**

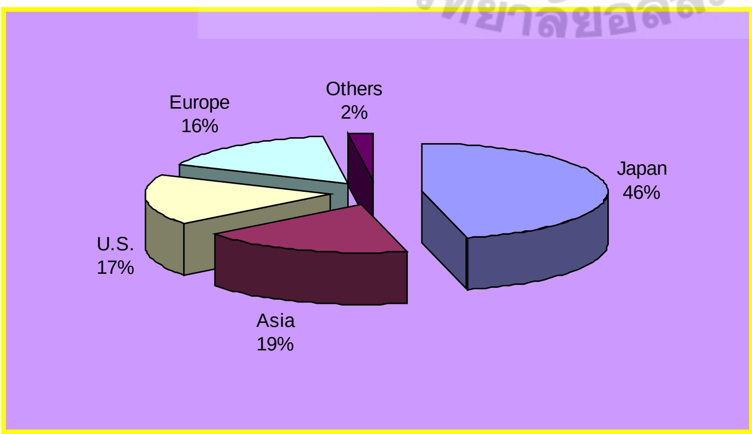

Source: Uni Arc's service division (2008). *Introduction of Arc Welding Robots*. p.21.

Arc welding robots perform their tasks more repeatedly than a manual welder under various conditions at high duty cycles because they are designed for the repetitive program and monotony of the task with consistent positional accuracy. They provide a better quality product than manual production and, moreover, helping in reduction of labor cost. In Summary, arc welding robots offer many benefits to users, including consistency, quality of welding, reduction of production costs, fewer scrapped parts, and increment of users' returns on investment. However, arc welding robots also require appropriate maintenance for continuous performance. They may require regular recalibration or reprogramming. Proper robotic system design also helps in minimizing interruptions in the continuous production line. Precisely programmed welding robots provide the same quality every time on pieces of the same dimensions and specifications. Generally, there are four methods of robot's arc welding processes which are most popular used in the industry: Co2 arc welding process, MAG arc welding process, MIG arc welding process, and TIG arc welding process (Uni Arc's service division, 2008).

### 1.1.3 Global Arc Welding Robot Supply Industry

Industrial robots are driving many worldwide manufactured industries. Japan is the most important supplier of robotic software, hardware and peripheral equipment; Japan is the largest market. Figure 1.3 shows demand for industrial robots in each area.

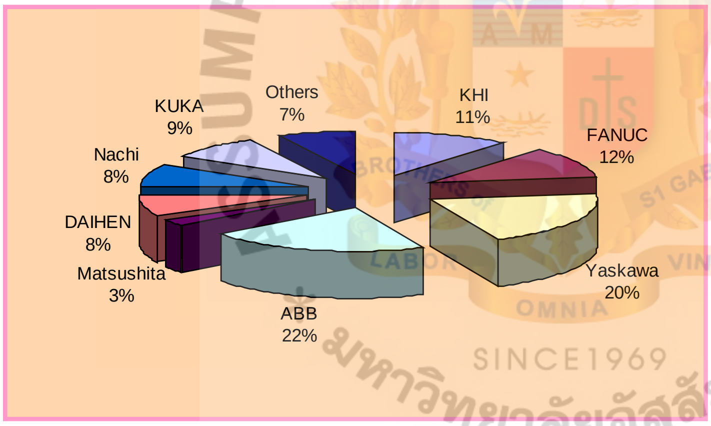
**Figure 1.3: Worldwide Demand for Industrial Robots**




Source: JETRO (March 2006). Trends in the Japanese Robotics Industry. *Industrial Reports*. Retrieved May 06, 2008, from The Japan External Trade Organization (JETRO) website

Nowadays, there are several leading industrial robot manufacturers who are countable as global robot suppliers such as ABB, Yaskawa, DAIHEN (collaborated with Nachi), FANUC, Kawasaki [KHI], KUKA and Panasonic. Up to 2007, ABB has top share in spot-welding and painting and is quite successful in export sales and earning the firm the largest share in terms of volume. Yaskawa, the second market share, supplies to Toyota's plant in the Czech Republic and is getting more orders from other Japanese manufacturers building plants overseas such as Thailand. FANUC and KHI are supplying western customers (Figure 1.4).

**Figure 1.4: Global Shares of Welding and Painting Robots (Robots: arc welding, spot welding, painting, shearing, de-burring & grinding)**




Source: JETRO (March 2006). Trends in the Japanese Robotics Industry. *Industrial Reports*. Retrieved May 06, 2008, from The Japan External Trade Organization (JETRO) website

Today, Nachi has made inroads in the American welder robot market, which is formerly a base of ABB. Nachi has taken market share away from ABB by concluding a contract with Chrysler plant. While the manufacturer robot like Yaskawa aims to increase its contracts with other related manufacturers in an effort to sell more robots in USA and other markets (JETRO, March 2006).

Focus on arc welding robots, we can count that there are only two suppliers who manufacture all completed components (manipulator, robot controller, and welding power source). Those are OTC-Daihen and Panasonic-Matsushita while the others such as ABB, Yaskawa, FANUC, KUKA, Nachi, Kawasaki, and so on attach their arc welding robots and robot controllers with welding power sources from other welding power sources manufacturers (Uni Arc's service division, 2008).

Because of manufacturing welding power sources by themselves, now, Both OTC- Daihen and Panasonic-Matsushita are competing to get the biggest share in Japan and throughout the world in the category of arc welding robots (Uni Arc's service division, 2008).

To support a huge global demand of industrial robot including arc welding robots, all leading industrial robot manufacturers are strengthening sales and maintenance overseas to attract customers. Most of them are also initiating overseas production of robots especially for foreign auto industries. Moreover, they also set up their subsidiary companies as sales and services center for supporting their distributors in each country with a significant demand of this product such as USA, Germany, China, and also Thailand (Uni Arc's service division, 2008).

**1.1.4 Arc Welding Robot Supply Industry in Thailand**

In Thailand, the demand of arc welding robots comes from many various manufacturing industries. The automotive part and motor vehicle industries are the biggest users of arc welding robots. A half number of arc welding robot is purchased by Japanese automotive manufacturers who have moved to Thailand and by local automakers since Thailand has become automobile production base with the continuity of support policy from every Thai government (Uni Arc's service division, 2008).

There are several local and joint venture companies who set up to be the distributors of global industrial robot manufacturers. Previously, the distributors are just responsible for sales and stock. Now intense competition has made them change. They have to provide full-line sales and services of their represented products. Moreover, the arc welding robot distributors have to offer a warranty, robot training, and prototype tooling for various robot integration packages. They also have to offer the users care service with trained engineers and technicians who can solve customers' inquiries ranging from programming issues to robot system failures (Uni Arc's service division, 2008).

Uni Arc Co., Ltd. is one of the leading arc welding robot distributors in Thailand. It roles as OTC Daihen representative who provides the arc welding robot to the users that employ the welding robot in their manufacture (e.g. automobile/ motorcycle manufacturers, local auto-parts makers, steel products maker, electric/electronic companies) (CMP Media, 2008). The next topic will discuss on the Uni Arc Co., Ltd. company profile.

**1.1.5 Uni Arc Co., Ltd. [UNAC] Company Profile**

Uni Arc Co., Ltd. [UNAC] was founded in 2003 as a distributor of OTC DAIHEN Asia Co., Ltd. [OTC] and a sales and services base of DAIHEN Corp

(Japan) for Asia and Australia region, to market OTC arc welding equipment especially arc welding robots in Thailand. When UNAC differentiated itself from the other players in the arc welding supply industry by providing full line of sales and services activities, the others are still rolling themselves as a commission agent or trading firm with no after-sales services. UNAC set up its own strongest robotic engineering team who can support all after sales activities with no support from other manufacturers. They have set up their own necessary and relevant facilities such as products showroom, welding lab, conference and training and repair shop. Also, they have set up OTC Suvarnbhumi Technical Center joint with DAIHEN Corp to provide education of arc welding principle and know-how, latest welding technology for all interest people.

Just three years later, UNAC has become the leading full line supplier of arc welding equipment especially arc welding robots, by responsible for more than 1,000 units population of OTC arc welding robot in Thailand. Most of their customers are in the automotive industry such as Toyota, Hino, Isuzu, Kawasaki, and so on. UNAC has doubled growth their revenue for three years continuously since 2003 to 2006 and become the second top sales volume of OTC arc welding robot in Thailand since then (CMP Media, 2008).

Currently, UNAC positions themselves as the leading full line supplier of arc welding equipments especially arc welding robot category. They have become the expert in robotized welding environments, which is capable of providing a full range of arc welding robots and control systems from compact standardized robot cells for simple tasks to large scale customized systems. Besides arc welding robots, the product line of UNAC includes a complete range of products to improve welding quality and quantity of output such as Co2/ MAG/ MIG/ TIG power sources, Air plasma cutting machines, welding wire, torches, accessories, and consumable and spare parts (Uni Arc's service division, 2008).

The summary of UNAC profile is shown in Figure 1.5.

**Figure1.5: Summary of UNAC Profile**

| | |
|---|---|
| **Company Name:** | Uni Arc Co., Ltd. |
| **Industry:** | Arc Welding Supply Industry |
| **Establishment:** | June 2003 |
| **Head Office:** | 99/222 Moo16 Bangpleeyai, Bangplee, Samutprakarn 10540 |
| **Warehouse:** | 12/23 Moo5 Rachatewa, Bangplee, Samutprakarn 10540 |
| **Alliances:** | DAIHEN Corp. (Japan)<br>OTC DAIHEN Asia Co., Ltd.<br>Shanghai Atlantic Welding Consumables Inc. (China)<br>Keenweld (Thailand) Co., Ltd. |
| **Major Products:** | Full Robotic/ Automatic Welding System, Stand-Alone Arc Welding, Cutting, and handling Robot, Co2/ MAG/ MIG/ TIG/ SPOT Arc Welding Machine, Air Plasma Cutting Machine, Welding Wire, Welding Torch, Welding Consumable and Spare Parts, Welding Chemicals |

Source: CMP Media (2008). Summary of Uni Arc Co., Ltd. *Intermach Times 2008, Vol.26, No.2, February*, p.10.

### 1.2 Statement of the Problem

Currently, arc welding robots sales situation of each distributor, not only in Thailand but around the world, is in the midst of the fear that the equipment investment is curbed down due to the global recession.

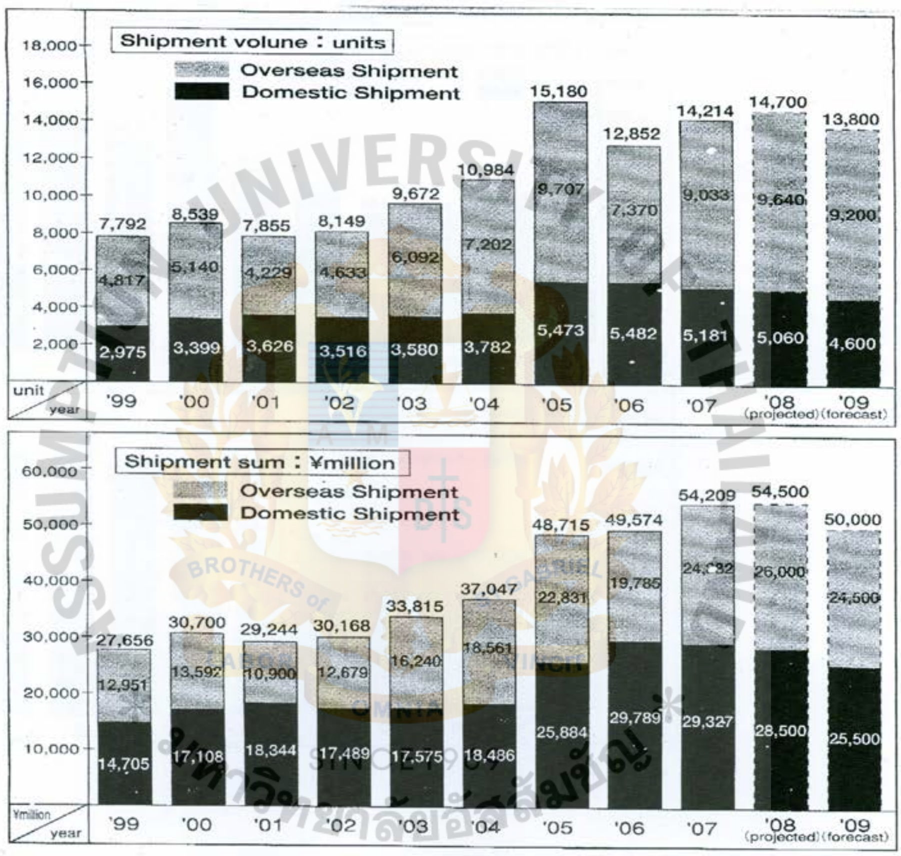
The global sales data from Daihen Corp. (Japan) [OTC], role as the arc welding robot manufacturer of UNAC, reported that the sales circumstances were roughly transiting favourably until September 2008 on the whole, but in the after month of the financial crisis from October to November, the sales circumstances are sharply deteriorating. Looking at the sales circumstances by areas, first of all, in China, the sales of welding machine and welding robots were transiting in two-digit growth form a year earlier until around September, but the market conditions are deteriorating in such case as the large-scale capital investment centering on the automobile related industry becomes delayed (Kawahara, 2008)

In fiscal year 2008 (April 2008-March 2009), the sales are expected to show a plus increase over the previous year's since there were deposits in the first half. In ASEAN area, the motorbikes related industry was buoyant so far, but things take a sharp turn for a minus from the previous year, expecting to fall below the previous year results. In Korea, the sales of welding robots for small compact cars are steadily transiting, expecting a small increase from the previous year. Also in Europe, in the half of fiscal year, mainly welding robots for the automobile related industry were transiting favourably, but the sales are largely on the decline receiving the influence of the financial crisis. The sales volume in North America are falling below the previous results due to a sluggish sales in automobiles business, but since the sales portion in North America of OTC's overseas business are not high, thus the influence exerting on the whole sales is small. As to the North America's marker, although the time cannot be estimated, we see that the automobile industry will come back some time. At present, in store for that period, OTC has a policy to perform what should be done, namely, cost down, quality improvements, reorganization of research and development division such as a new product development and foundation reinforcement. Although the growth rate in China and India is said to be sluggish, the demand will be over 2008 results. In North American market, it depends on the situation of the automobile industry, but we estimate that the sales level off in 2009 and recover from 2010. The market in ASEAN and Europe is the severest, and it will be unavoidable in two-digit down. The year 2009 is under very severe environment, but our company would like to maintain the 2008 results in anyway, and to seek the share-up (Kawahara, 2008).

Now then, as for the prospects in the arc welding robot market in 2009, it seems that the global financial crisis will largely affect also on the equipment investment of the robots. In the case of year 2008, that influence was only given several months in the latter periods, but in the case of the year 2009, the crisis will affect the demand trends throughout the year. It is feared that, especially Japanese domestic, North America and Europe are dropped down. As to the whole Asian market, there are many factories, where still robotization is needed, thus expecting a few percentages up (Shimpo Corporation, 2009).

Forecasted by Japan Robot Industrial Association estimated that in the arc welding robots shipment for 2009 (January – December), the Japan domestic shipment will be 4,600 units (down by 9.1%) amounting to 25.5 billion yen (down by 10.5%). On the other hand, the overseas export will be 9,200 units (down by 4.6%) amounting to 24.5 billion yen (down by 5.8%), totaling 13,800 units (down by 6.1%) amounting 50 billion yen (down by 8.3%) (Shimpo Corporation, 2009).

**Figure 1.6: Shipment Volume and Shipment Sum**




Source: Shimpo Corporation (2009). Arc Welding Robots: Forecast for 2009. *The Japan Welding News for the World, Vol.13, No.46, Winter Issue.*

The number one factor in environmental changes that would promote demand of robots in 10 years to come was "Necessity of improving manufacturing processes will become higher as the average age of operators get higher", followed by, in order, "Since manufacturing is moving in the direction of multi-variety, small quantity production, the need for production facilities capable of coping with versatile products will increase," "Improved working ratio of facilities will become important in terms of lower manufacturing cost," "Need for improved product quality and yield become higher," "The sum of investment in plant and equipment will become higher because of higher labor cost," "Responding to the requirement of shorter working hours will become more necessary." and "Reduced price and improved performance of robots will create room for greatly increasing the demand of robots" (Shimon, 1999).

For reduced price, in the position of arc welding distributor, at the end, it will be limited by their product buying cost from manufacturers. For improving the performance of robots, the distributors should know what they should do or their manufacturers should produce by best understanding their various users' satisfaction, more necessary (Uni Arc's service division, 2008).

Focus on UNAC, one important problem lies in the sales ratio of cable built-in robot (standard and current model) is low compared with other companies. The company would like to aim at sales-up to high value-added peripheral devices to new type arc welding robot by providing feedback information of improvement of product to their manufacturer. Another problem is among many related users of arc welding robot; the level of satisfaction through product is doubt to hit their needs (Uni Arc's service division, 2008).

Judging from the above situation while UNAC, the leading arc welding robot distributor in Thailand, has a great number of users who has already bought and related to arc welding robot, to find the users' satisfactions in each area of product aspects among various users is very interesting for more understanding their needs and finally improving the capacity of UNAC arc welding robot supply industry as a whole (Uni Arc's service division, 2008).

Based on the background stated above, the author aims to conduct the research about the users' satisfaction for arc welding robots: A case study of Uni Arc Co., Ltd. on the following questions:

1. Which product factors of arc welding robots satisfy the users of Uni Arc Co., Ltd. [UNAC]?
2. Is the users' satisfaction toward the arc welding robots of UNAC different among the users' characteristic profiles (Gender, Age, Income, Education, and Department)?

**1.3 Research Objectives**

This research has two main objectives:

1. To study the levels of users' satisfaction toward the arc welding robots of UNAC.
2. To study the differences of satisfaction toward the arc welding robots of UNAC among users when classified by users' characteristic profiles (Gender, Age, Income, Education, and Department).

**1.4 Scope and Limitations of the Research**

- There are several arc welding robot distributors in Thailand but only users of UNAC will be focused in this research. Depending on the time constraint and the budget, the data will be collected for a period of 22 days scheduled during February 1st – 10th, 2009 for the reliability test and during February 16th – 27th, 2009 for the actual primary data for the purpose of interpretation.

- This research will not study to all types of welding processes which can be welded by robots. It will be conducted to the users or respondents who are using arc welding robots in the processes of Co2/ MAG/ MIG/ TIG only.
- This study will valid only in the area of end user's satisfaction, not including the area of other arc welding robot distributors, sub-dealers, or any other robot commission agent.
- This study is a case study of Thailand, so the investigation result will be valid only in Thailand.

**1.5 Significance of the Study**

This study provides the critical improvement for UNAC to understand their users' satisfaction among different users' characteristic profiles through their product. Also this study is beneficial for the arc welding robot manufacturer of UNAC, Daihen Corp (Japan), to understand the users' satisfaction in product aspects of arc welding robots in Thailand.

Moreover, the research findings would be beneficial for general study in arc welding robots; especially for the companies in the arc welding robot supply industry in Thailand. The result of this study will also help other global robotics supply companies more understand and recognize the difference between the users' characteristic profiles and the satisfaction toward arc welding robots in Thailand.

In highly competitive circumstance among arc welding robot manufacturers, the author intends to generate and inspire new ideas for robotic manufactures that need to improve or develop their products by understanding of their users' needs as well.

### 1.6 Definitions of Terms

**Accuracy:**

1. It refers to the quality, state, or degree of conformance to a recognized standard or specification
2. It also refers to the ability of a robot to position its end-effectors at a programmed location in space. Accuracy is characterized by difference between the position to which the robot tool-point automatically goes and the originally taught position, particularly at nominal load and normal operating temperature (Shimon, 1999).

**Arc Welding:**

Arc welding uses a welding power source to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is sometimes protected by some type of inert or semi-inert gas, known as a shielding gas, and/or an evaporating filler material. The process of arc welding is widely used because of its low capital and running costs (Lincoln, 1994).

**Arc Welding Robot:**

An arc welding robot is comprised of: a robot main body including a welding torch and a wire feeder for feeding the welding wire to said welding torch, said wire feeder including a sensor and a driving motor; a robot controller for controlling said robot main body; and a welding power supply arranged inside said robot controller, said welding power supply controlling said wire feeder and a welding power, wherein a robot main body driving power cable and a robot control cable are connected between said robot controller and said robot main body and wherein a sensor cable of said wire feeder, a gas valve control cable for shield gas supplied to said welding torch and a welding voltage feedback cable to be accommodated in said robot main body driving power cable (Hayashi, 2003).

**Articulated Robot:**

It refers to a robot with rotary joints (e.g. a legged robot or industrial robot). The articulated robots can be ranged from simple two-jointed structures with 10 or more interacting joints. They are powered by a variety of means, including electric motors (US Department of Labor, 2005).

**Axis:**

1. It refers to the rotation line of manipulator.
2. It refers to the degree of freedom against a mechanical limit stop (Daihen Corp, 1991).

**Co2 Arc Welding Process:**

In this welding, fine coiled welding wire [0.8 -1.6mmø (1/32-1/16 inø)] is used in place of manual welding rod. The welding wire is fed to the welding torch through the wire feed roll. This wire is electrified through the torch tip, due to which arc is struck between the base metal and the wire, and both the base metal and the wire are continuously molten by arc heat. Since $CO_2$ gas is used to protect the arc part from air, this welding method is named (Daihen Corp, 1991).

**Industrial Robot:**

A reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks (US Department of Labor, 2005).

**Off-line teaching:**

The simulation software designed for controlling robots by simulation through a personal computer without teach pendant (Uni Arc's service division, 2008).

**MAG Arc Welding Process:**

The welding process using mixed gas of Argon and CO2 is called MAG (Metal Active Gas) arc welding. MAG arc welding is similar to CO2 gas shielded arc welding in that the same basic power supply. Difference between MAG and CO2 gas shielded arc welding is only using gas and wire. By MAG arc welding, beautiful beads, free from spatter, can be formed not only in small current range but over the full working range of the welding machine (Daihen Corp, 1991).

**Manipulator**:

A device used under human control to manipulate materials without direct contact (US Department of Labor, 2008).

**MIG Arc Welding Process:**

MIG (Metal Inert Gas) welding process is similar to CO2 gas shielded arc welding and MAG arc welding in the principle. Usually Aluminum and Stainless steel welding is popular as MIG arc welding although various metal, copper, high-tension steel, and so on can be welded by this method (Daihen Corp, 1991).

**Peripheral:**

A peripheral is a device attached to manipulator or robot controller which is countable as additional axis for supporting the work of arc welding robot (Uni Arc's service division, 2008).

**Positioner:**

Also know as positioning table, the positioner is fixture devices for locating the parts to be processed in the required position and orientation. The positioner can be implemented as hard tooling devices or reprogrammable robotic devices which reduce the set-up time and part change over times. For instance, the positioner is used in robotic arc welding to hold and positioning pieces to be welded. The moveable axes of the positioner are sometimes considered additional robot axes. The robot controller controls all axes in order to present the seam to be welded to the robot's torch in the location and orientation taught or modified by adaptive feedback, or changes inserted by operator, dynamically during execution (Shimon, 1999).

**Repair:**

To restore robots and robot systems to operating condition after damage, malfunction, or wear (US Department of Labor, 2005).

**Robot:**

A robot is programmable automation to augment human manipulation (Mahoney, 1995).

**Robot Controller:**

The unit attached to control one or more robot through teach pendant (Uni Arc's service division, 2008).

**Robot Manufacturer:**

A company or business involved in the design, fabrication, or sale of robots, robot tooling, robotic peripheral equipment or controls, and associated process ancillary equipment (US Department of Labor, 2005).

**Robotic Cell:**

A robot-served cluster of workstations which contains no internal buffers for work-in-process and in which only a single family of parts is produced (Shimon, 1999).

**Robotics:**

Robotics in this study means the science of designing, building, and applying robots (Shimon, 1999).

**Sensors:**

Extracting relevant information from sensor signals and subsequent interpretation will be the function of inexpensive, high-performance computer processors. With these advance sensors, a robot will in time have a capability to detect, measure, and analyze data about its environment considerably beyond unaided human capabilities (Uni Arc's service division, 2008).

**Slider:**

Slider is a peripheral of robot that has a mode of locomotion by moving body parts smoothly along a surface while remaining in contact with robot (Daihen Corp, 2008).

**Teach Pendant:**

Teach Pendant in this study means a movable mechanism allowing the user to guide the robot's operation in the restricted envelope (Shimon, 1999).

**TIG Arc Welding Process:**

The gas tungsten arc welding (GTAW) process is sometimes called "TIG" (tungsten inert gas) welding and the inert gasses, argon and helium are chiefly used for gas tungsten arc welding. Since argon gas is extensively used as shielding gas, this welding method is generally called Argon arc (TIG) welding. In his welding tungsten electrode (non-consumable) is used and filler wire may or may not be added. The electric arc is produced by passage go current through the ionized inert shielding (Daihen Corp, 1991).

**UNAC:**

Uni Arc Co., Ltd.

**User:**

A company, business, or person who uses robots and who contracts, hires, or is responsible for the personnel associated with robot operation (US Department of Labor, 2008).

**User-Friendly:**

A common term implying eases of learning and operating a complex system by human users, especially via a computer interface (Shimon, 1999).

**Welding Power Source:**

A welding power source is a device that provides an electric current to perform welding (Uni Arc's service division, 2008).

# CHAPTER 2

# LITERATURE REVIEW

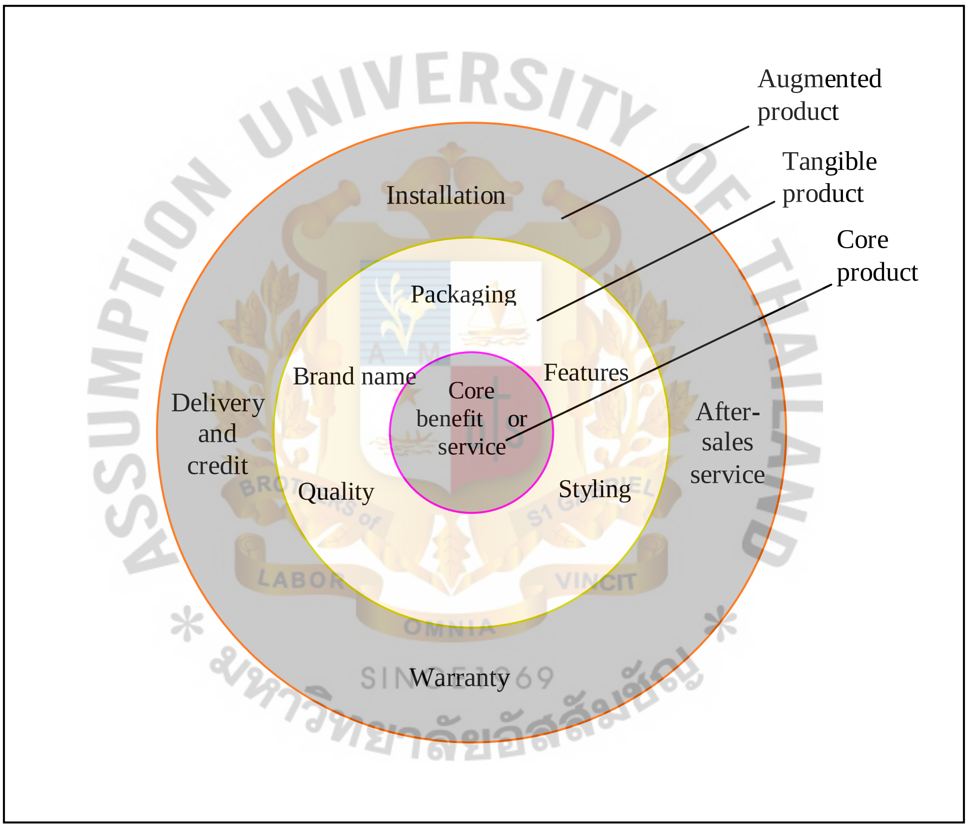
In this chapter, the researcher will explain related theories on studying the user's satisfaction for arc welding robots, a case study of Uni Arc Co., Ltd. In this literature review, the first section presents the theories related to product factors of arc welding robots. The second section will cover the independent variables, users' characteristic profiles, in order to use for measuring the difference between the respondents' variables and the satisfaction toward arc welding robots of UNAC. Finally, the last section presents review of previous studies that related to this research.

## 2.1 Definition on Users' Satisfaction for Robotic Factors (Dependent Variables)

### 2.1.1 Product

Kotler (2003) mentioned that "*product is anything that can be offered to a market to satisfy a want or need*". Also, he stated that, "*product is also mean to any physical goods, services, experiences, events, persons, places, properties, organizations, information and ideas*". Hawkins et al. (2001) stated that the product is anything a consumer acquires or might acquire to meet a perceived need. Moreover, Mandell and Rosenberg (1981) also stated that product is the element of marketing mix that represents the basic offering being made to consumers. In 1989, Walters and Bergiel stated that product is a bundle of physical goods, service, ideas, and symbolic attributes designed to enhance consumer want and satisfaction. Then, Willaim and Slama (1989) mentioned that consumer's criteria are generally grounded in the attributes and benefit buyer seeks from the products they buy. Kotler and Armstrong (1997) also mentioned each product item offered to customers can be viewed on three levels and each level adds more customer value (Figure 2.1).

**Figure 2.1: Three levels of Products**




Source: Kotler P. (2000). *Marketing Management.* 10th ed. London UK: Prentice-Hall International.

## <u>Core product</u>

*Core product* means core benefits that customers seek when they buy a product. Thus, when designing products, the marketers must first define the core benefit of the product to be perceived to consumers (Kotler and Armstrong, 1997).

**Tangible product**

*Tangible product* may have as many as five characteristics: a quality level, feature, design, brand name and packaging (Kotler, 1989).

**Augmented product**

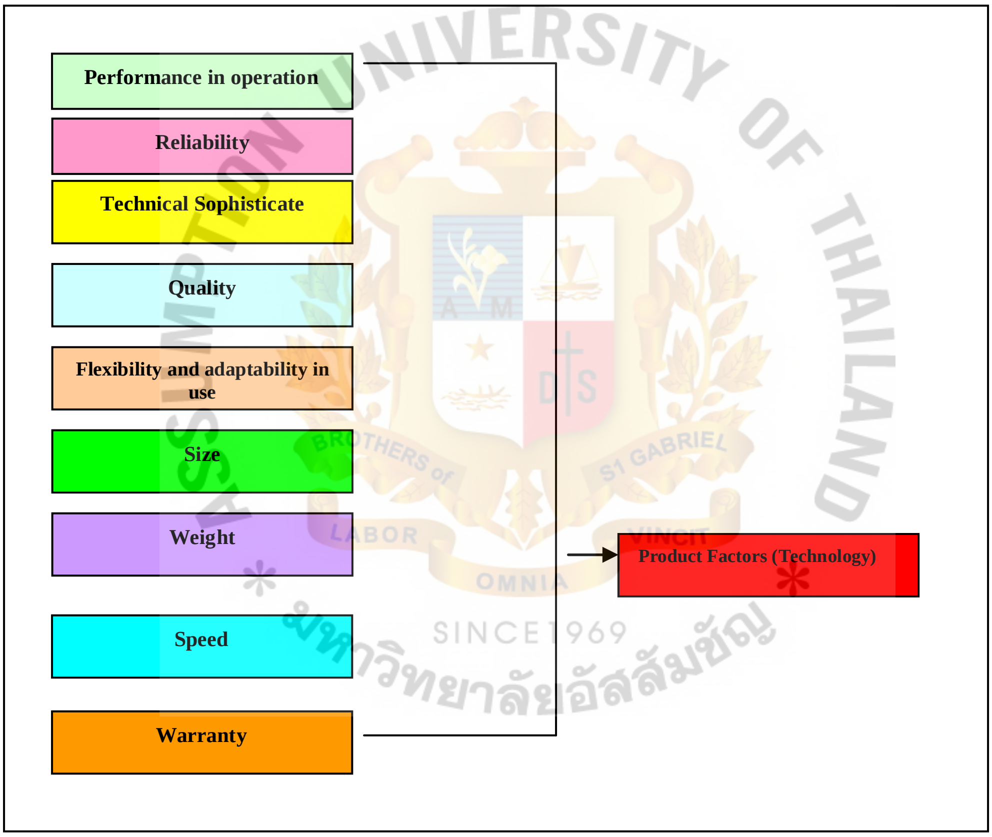
The last one is *augmented product*. It offered additional consumer service and benefits such as after sale service, warrantee, delivery, credit, etc. All of them become the important parts of the total product (Kotler, 2000).

Gross et al. (1987) mentioned that consumers evaluate the product by deciding if acquiring the attributes of product will enable them to accomplish their intended life activities. And consumers will satisfy when they believe that an item's attributes suit their needs better than the attributes of other products. Schaffner et al. (1998) also mentioned that to be successful, product must meet the need of the target better than the competition does. The product benefit is identified by consumers as important to them in buying and using the product. Assael (1993) stated that product represents the product feature, the package, the brand name, and post sales service support. Zikmund and Amico (1996) quoted that the term product refers to what the business or non-profit organization offers to its prospective customers or clients. The offering may be a tangible good, a service, or an intangible idea. The product that customers receive in the exchange process is the result of a number of product strategy decisions. Developing and planning a product involve making sure that it has the characteristics and features customers want. Selecting a brand name, designing, a package, developing appropriate warranties and service plants, and other product decisions are also activities involved in developing the "right" product.

### 2.1.2 Product Factors (Technology)

There are many factors associated to customer satisfaction on high technology product like arc welding robots. Evans and Berman (1982) stated that there are nine product attributes that can influence customer satisfaction for the high technology products (cited in Baker and Hart 1999); each factor is shown in Figure 2.2.

**Figure 2.2: Model of Product Factors (Technology)**




Source: Evans and Berman (1982) all cited in Baker and Hart (1999). *Product Strategy and Management*. London: Prentice Hall.

#### 2.1.2.1 Performance in Operation

Baker and Hart (1999) mentioned that *performance factor* means performance specification on capability of the products. They also quoted that *performance factor for some technical products* means performance on some work in the processes of the manufacturer; which is considered as belonging to the product process under a consideration of the manufacturer. Generally, arc welding robots' performance in operation will be classified by following three main components of arc welding robots: manipulator, robot controller, and welding power supply. For the manipulator, its most important performance is enough working area. For the robot controller, its most important performance is memory capacity. And for the welding power source, its most important performance is stable welding capability (Uni Arc's service division, 2008).

#### 2.1.2.2 Quality

Quality means the "*totality of features and characteristics of a product or service that bear on its ability to satisfy stated or imply need*" (Kotler, 2000). Therefore, the researcher concludes that the seller has delivered quality whenever the seller's product or service meets or exceeds the customer's expectation and quality is also a key to value customers' satisfaction.

#### 2.1.2.3 Reliability

According to Lovelock (2001), reliability means least probability of malfunction or failure while Kotler (2000) defined reliability as "*The ability to perform the promised service dependably and accurately*". DeLone and McLean (1992) stated that reliability for robotic products means the promise from a robotic company that its robot can operate accurately, dependably and consistently, according to its specifications. In practical use, the reliability of arc welding robots means the repeatability of manipulator and the accuracy of robot controller and welding power supply, which are also agreed and used in this study.

#### 2.1.2.4 Technical Sophisticate

According to Handscombe (1989), sophisticate means material objects of use to humanity, such as machine, hardware or utensils, and also system, the method of organization and techniques. *Technical Sophisticate* in this study means peripheral equipments that is the technology that comes along with the arc welding robots to support more complicated tasks, for example, simulation software, positioner, slider, and sensor.

#### 2.1.2.5 Flexibility and Adaptability in Use

According to Baker and Hart (1999), flexibility is "*the popular term for the ability to easily bend an object or the ability to adapt to different circumstances*" and adaptability means "*an anatomical structure, physiological process or behavioral* *trait of an organism that has evolved over a short or long period of time by the process of natural selection*". Therefore, flexibility and adaptability in use in this study means the capability of arc welding robots to be adjusted or handled in case of short-term or suddenly changes in production requirements occurred.

**2.1.2.6 Weight**

Slawsby (2006) mentioned that light weight can increase freedom to mobility. Light-weight arc welding robots are gaining popularity and could get up to 70 percent of the market in 2010, increasing from 20 percent in 2007 (Ranch, 2007). However, in this study *weight* means the weight of arc welding robots.

**2.1.2.7 Size**

According to Ranch (2007), *size* may refer to "*how big something is*". The dimension of size is consisting of length, width, height, diameter, perimeter, area and volume. In this study, size means the size of arc welding robot.

**2.1.2.8 Warranty**

*Product warranty* means an explicit or implicit promise by sellers that the product will perform as specified or the seller will fix it or refund the customer's money during a specified period (Kotler, 2000). Besides, Jobber (2001) also stated that the company should offer technical assistance to customer when the product is needed to repair.

However, Berkowitz et al. (2000) defined product warranty as "*a statement indicating the liability of the manufacturer for product deficiencies*". Moreover, there are various degrees of product warranty with different implications for manufacturers and customers; which are express warranty, limited-coverage warranty, full warranty and implied warranty (Berkowitz et al. 2000).

#### 2.1.2.9 Speed

Several factors are influencing sales volume of arc welding robot; *Speed* variable is one of them.

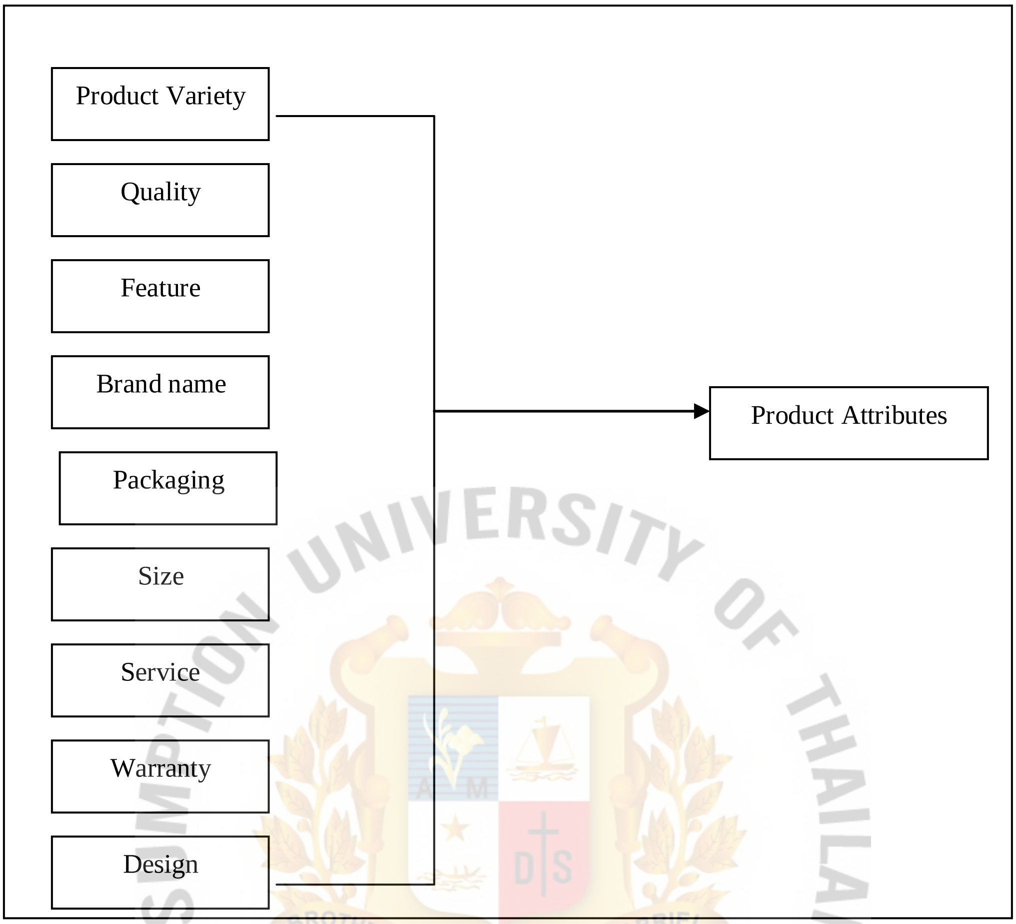
The higher speed arc welding robot can reduce welding cycle time, and enhance productivity. Cycle time is faster because the motion speed of the robot axes is increased as a result of cutting-edge motor control technology and new ARM (Advanced Robot Motion) control. Other enhancements, such as minimized ARC ON/OFF time and reduce air-cut time, can also reduce welding cycle time (Yaskawa Electric Corporation, 2007).

## 2.2 Theories of Product Attributes Model

### 2.2.1 Product Model 1: Product Attributes Model

Kotler (2000) mentioned that there are 9 product attributes that can affect customer satisfaction as shown in Figure 2.3 and Table 2.1.

**Figure 2.3: Product Attributes Model**




Source: Kotler P. (2000). *Marketing Management*. 10th ed. London UK: Prentice-Hall International.

**Table 2.1: The Meanings of Product Attribute**

| No. | Product Attributes | Meaning |
|---|---|---|
| 1 | Product Variety | Have many product assortment to select |
| 2 | Quality | Characteristics of a product that perform high standard |
| 3 | Features | Characteristics that supplement the product's basic functions. |
| 4 | Brand name | Sign or symbol to differentiate the sellers from their competitors |
| 5 | Packaging | Designing and producing the container for a product |
| 6 | Sizes | Size of the product |
| 7 | Service | Provide additional service to the customers |
| 8 | Warranty | Implicit promise by sellers to buyers |
| 9 | Design | Shape and design of product |

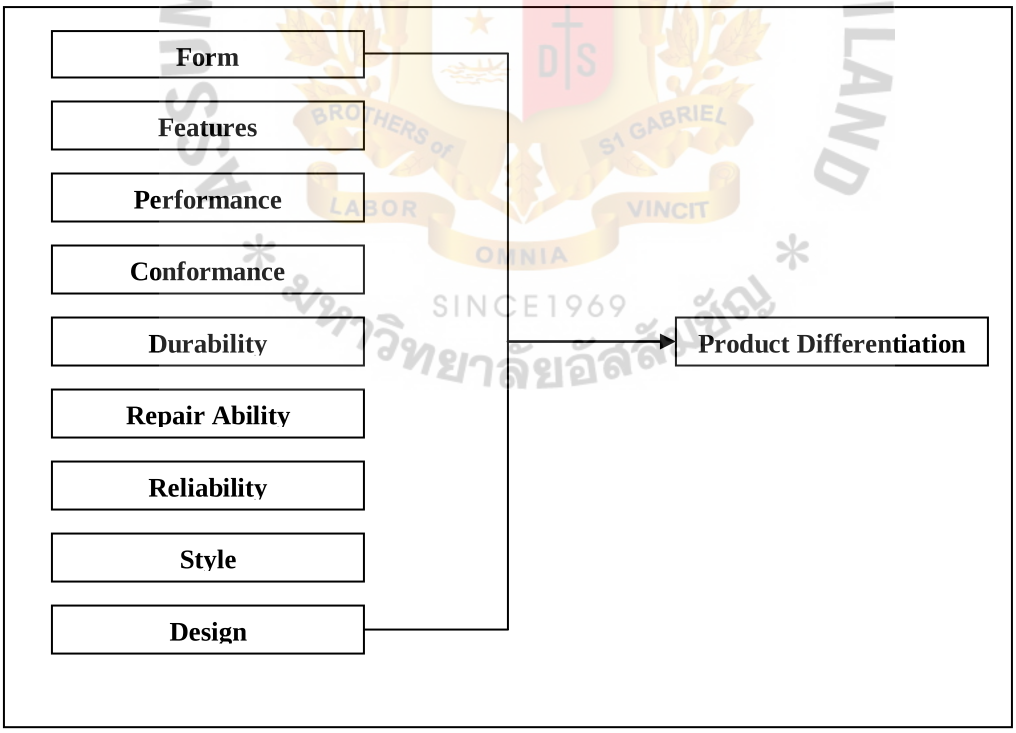
Source: Kotler P. (2000). *Marketing Management*. 10th ed. London UK: Prentice-Hall International.

These nine product attributes also corresponds to the characteristics of technology product of Evans and Berman (1982) on performance in operation, quality, design, size, and warranty. From the study of Ratsameeuthai (2002), product attributes can influence consumer's satisfaction on performance in operation, reliability, size, weight, speed, and warranty as well.

### 2.2.2 Product Model 2: Product Differentiation Model

Kotler (2000) stated that physical products are varying in their potential for differentiation. The product differentiation is shown in Figure 2.4.

**Figure 2.4: Product Differentiation Model**




Source: Kotler P. (2000). *Marketing Management.* 10th ed. London UK: Prentice-Hall International.

**Form**

According to Kotler (2000), there are many products that can be different in form, size, shape, or physical structure of product. By considering arc welding robots, there are various forms by their size, shape, and so on. Berkowitz et al. (2000) also stated that product forms can pertain to variations within the class of entire product category.

**Features**

Most of the products can be offered with varying features or characteristics that could supplement the product basic function. Therefore, being the first to introduce new valuable features is one of the effective ways to compete with other competitors (Kotler, 2000). Features are competitive tools to differentiate the company's products. Some companies are emphasizing on innovation by adding new features to their products. Moreover, most products can be offered with varying features. The point is a stripped-down, or bare-bones, version of the product. Therefore, the company can also create additional versions to its product by adding extra features (Ang H. et al. 1996).

**Performance**

Performance was defined by Kotler (2000) as "*the level at which the product's primary characteristics operate*"; by performance of product, usually have four levels: low, average, high or superior. Besides, from the study of Strategic Planning Institute (cited in Kotler, 2000), the study found that high performance of the product is resulted in more customer satisfaction, customer loyalty, return on investment (ROI), and positive word of mouth. Accordingly to Jobber (2001) stated that product performance can be enhanced by such devices as raising speed, comfort, safety levels, capability, ease of use, etc.

**Conformance**

Kotler (2000) stated that conformance is defined as "*the degree to which all the produced units are identical and meet the promised specification*". According to Ang H. et al. (1996), conformance is the degree to which a product's design and operating characteristics come close to the target standard; it will reflect whether the various produced units are identically made and meet the specification. Many buyers expect that conformance of product should be high; while low conformance of the product will disappoint customers.

**Durability**

Durability is a measure of the product's expected operating life under natural or stressful conditions and is a valued attribute for certain products (Kotler, 2000). Moreover, Kotler (2000) mentioned that customers will generally pay more attention for the products that have long lasting reputation. However, Kotler (2000) also stated that this rule is not subject to some products, for example, the product that has rapid technology obsolescence. According to Jobber (2001), durability of product will provide longer life to the product and could generate low cost to the customer. In economics' sight, a durable good mean the good that does not quickly wear out; or more specifically, it yields services or utility over time rather than being completely used up when used one. For example, normally, arc welding robots' life cycle is around five years (Uni Arc's service division, 2008). So if they are easily broken down by manufacturer's fault within that period, it would be concluded that the products' durability is not good.

**Repair Ability**

Normally, customers prefer product that is easy to repair. Kotler (2000) stated that repair ability means "*a measure of the ease of fixing a product when it malfunctions or fails*". According to Ang H. et al. (1996), repair ability means the products that can be easily repaired when they are damaged. For example, arc welding robots distributors should have a high repair ability of their products. Quick response and enough reserved spare parts would result in more users' satisfaction.

**Reliability**

In practical, reliability of arc welding robots means repeatability of manipulator and accuracy of robot controller and welding power supply. This meaning is as same as explained in the previous content of Figure 2.2 – Model of Product Factors (Technology).

**Style**

Jobber (2001) mentioned that product style can also give customer satisfaction through the improved looks that good style brings.

**Design**

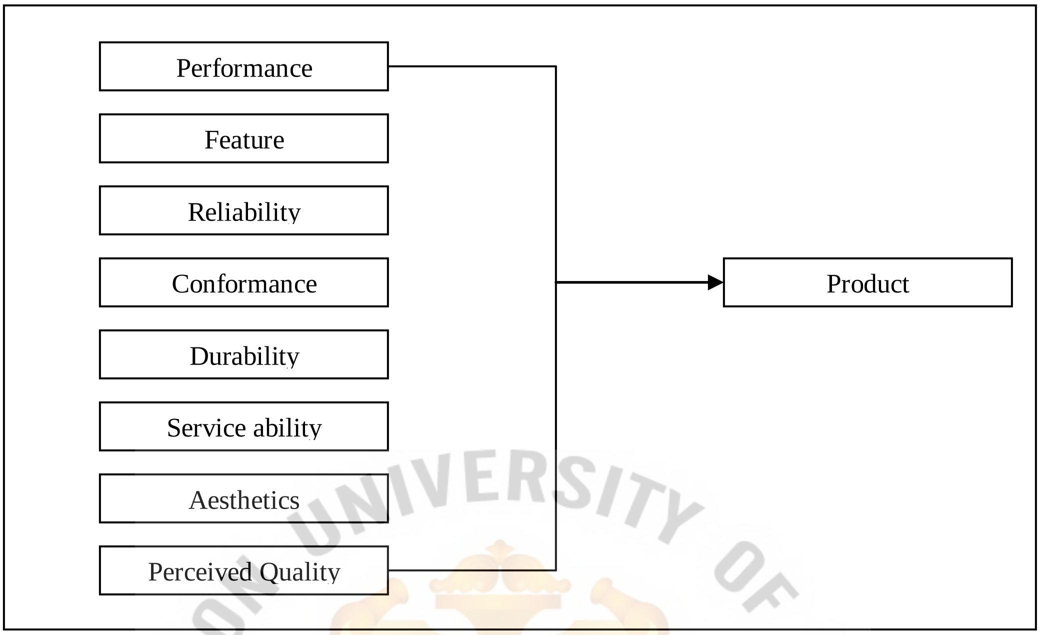
In highly competitive market, design is one important factor that helps differentiate and position a company's products. Kotler (2000) stated that design is the totality of features that affect how a product looks and functions in terms of customer's requirements. A good design should be attractive to look, easy to open, install, use, repair and dispose of. According to Ang H. et al. (1996), a well designed product would be pleasant to look at, and also easy to open and learn how to use. Besides, Ang H. et al. (1996) also stated that a good design should be innovative, unobtrusive and enduring and enhances the usefulness of a product. Currently, the design of arc welding robots must be designed to respond the “user-friendly design”, which is a common term implying eases of learning and operating a complex system by human users, especially via a computer interface (Shimon, 1999).

### 2.2.3 Product Model 3: Product Dimensions Model

Normally, products can reflect the intended function and the circumstances of product use. Consequently, as these circumstances change, it is sometimes necessary to adjust products ability according to that situation. Moreover, some technology products are also sometime defined as “meeting the requirement of the customers”.

Besides, there is a widespread agreement that a product is multidimensional construction. Many scholars in the quality field have developed lists of dimensions of high technology products. One of them is from David A. Garvin. Garvin (1987) developed the list of eight dimensions of product; which are widely accepted as being applicable to most high technology products and the following table is the model of Garvin’s eight dimensions of quality as shown in Figure 2.5 and Table 2.2.

**Figure 2.5: Product Dimensions Model (High Technology)**




Source: Garvin, D. (1987). Product technology: Competing on the Eight Dimensions of Quality. *Harvard Business Review, November 1987.*

**Table 2.2: Model of Garvin's Eight Dimensions of Quality**

| Dimensions | Descriptions |
|---|---|
| Performance | A product's primary operating characteristics |
| Features | Characteristics that supplement basic functioning |
| Reliability | Probability of a product malfunctioning within a specific time period |
| Conformance | The degree to which a product's design and operating characteristics meet established standards |
| Durability | Expected product life |
| Service ability | Speed, courtesy, competence, and ease of repair |
| Aesthetics | How a product looks, feels, sounds, and etc |
| Perceived Quality | Reputation and other indirect measures of quality |

Source: Garvin, D. (1987). Product technology: Competing on the Eight Dimensions of Quality. *Harvard Business Review, November 1987.*

**Performance**

Garvin (1987) stated that performance refers to the primary operating characteristics of a product. In addition, whether performance differences are perceived as quality differences or not depends on individual preferences. The words that describe product performance include terms frequently associated with quality, along with the term that fails to carry the association (Garvin, 1987). Generally, arc welding robots' performance will be classified by three main components of arc welding robots: manipulator, robot controller, and welding power supply. For the manipulator, its most important performance is enough working area. For the robot controller, its most important performance is memory capacity. And for the welding power source, its most important performance is stable welding capability (Uni Arc's service division, 2008).

**Features**

Garvin (1987) stated that features are bells and whistles of the product; these are the secondary characteristics that supplement the product's basic function. Most of the products can be offered with various features or characteristics that could supplement the product's basic function. Therefore, being the first to introduce valued new features is one of the effective ways to increase the customer satisfaction (Kotler, 2000). Adding more features is also a competitive tool to differentiate the company's products. Some companies are extremely innovative in adding new feature into their products. Moreover, most products can be offered with many features. Besides, the company can also create additional versions to its product by adding extra features (Ang H. et al. 1996).

**Reliability**

Garvin (1987) stated that reliability reflects the probability of a product's malfunction or failure within a specified period of time. The most common measures of reliability are the mean times to first failure (MTFF), the mean time between failures (MTBF) and the failure rate per unit time. Because these measures require a product to be in use for some period; they are more subject to durable goods than to products and services that are consumed instantly. Reliability normally becomes more important to consumers when the maintenance cost is expensive (Garvin, 1987). Therefore, many arc welding robotic companies add more advertisement on their reliability. In other theory, a *reliable* product is also meant to totally free of technical errors; in practice, however, vendors frequently express a product's reliability quotient as a percentage. In this study, reliability is subject to attributes of arc welding robot-related components such as software or systems that need consistently performance according to its specifications.

**Conformance**

According to Garvin (1987), conformance is the degree to which a product's design and operating characteristics meet pre-established standards. In the field, data on conformance are more difficult to obtain and measure. However, there are two common measures that are frequently used: the measure of the incidence of service calls for a product and the frequency of repairs under warranty. In service business, measures of conformance are normally focus on the accuracy, timeliness, counts for processing errors, unanticipated delays, and other frequency mistakes. According to Kotler (2000), conformance was defined as "*the degree to which all the produced units are identical and meet the promised specification*". Accordingly to Ang H. et al. (1996), conformance is the degree of how much a product's design and operating characteristics come close to the target standard. It will reflect whether the various produced units are identically made and meet the specification. Many customers expected that conformance of product should be high. The problem with low conformance is that the product will disappoint some customers.



**Durability**

According to Garvin (1987), durability is a measure of product life on both technology and economic dimensions, for example, time to technical obsolescence and rated life of monitor. Technically, durability can be defined as the amount of use one gets from a product before it physically deteriorates; this means that durability becomes the amount of use one gets from a product before it breaks down and replacement is regarded as preferable to continued repair.

**Service Ability**

According to Garvin (1987), service ability means the courtesy, competence, and ease to repair. For example, in this study, warranty of arc welding robot includes after sales support for customers to call for service and spare part replacement. Customers are concerned not only about product's breakdown but also about the elapsed time before service can be restored, the timeliness with which service appointment are kept, the nature of dealing with service personnel, the frequency of service calls, and failure to correct an outstanding problem.

**Aesthetics**

According to Garvin (1987), aesthetics is how a product looks, feels, and sounds; which is clearly a matter of personal judgment and a reflection of individual preferences. However, Kotler (2000) mentioned that color is often the determining factor in a customer's acceptance or rejection of a product. However, the impact on customer satisfaction of the color should not be overlooked. For example, Red is often successful because it evokes feeling of warmth, passion and sensuality; while black, white and gold color can denote quality and class of the products.

**Perceived Quality**

According to Garvin (1987), perceived quality is a measure of various attributes of the product and service; the frequency indirect measures are the only basis for comparing brands. For example, we can compare perceived quality via brand name and advertising. Kotler (2000) stated that brand is a name, term, sign, symbol or design or a combination of them, which is intended to identify the goods and services of one seller to differentiate them from their competitors.

The consistency of these eight dimensions of product is significant and should be considered. Garvin (1987) mentioned that the product design sometimes cannot simultaneously maximize each of these eight dimensions because there are always tradeoffs among them.

### 2.3 Identify the Dependent Variables

In this study, the researcher applied all models, as mentioned in the literature reviewed above, to be the model of product factors of arc welding robot as shown in Figure 2.6.

**Figure 2.6 Product Factors (Dependent Variables)**

**Product Factors (Arc Welding Robot)**

**Performance in operation of arc welding robots**

**Reliability of arc welding robots**

**Technical sophisticate of arc welding robots**

**Flexibility and adaptability in use of arc welding robots**

**Size of arc welding robots**

**Weight of arc welding robots**

**Speed of arc welding robots**

**Warranty of arc welding robots**

**Durability of arc welding robots**

Source: Adapted from Evans and Berman (1982), Garvin (1987), and Kotler (2000).

## 2.4 Respondents’ Characteristic Profiles (Independent Variables)

### 2.4.1 Personal Factors

Schiffman and Kanuk (2007) stated that personal factors are demographic characteristics of the customer and demography refers to the vital and statistic measurement of a population; they include age, sex, marital status, income, occupation and education and most often used as the basis for marketing segmentation. Besides, the information of demographics is easier for the company to classify the customer than other type of segmentation variables, such as psychology or socio-cultural studies. From Kotler (2003), personal characteristics include the buyer’s age and stage in the life cycle, job position, economic circumstances, lifestyle, personality, and self-concept.

In this study the researcher applied personal factors to be users’ characteristic profiles which are gender, age level, income level, education level, and department (job positions) as Independent Variables. The following topics are the description of each user’s characteristic profile.

**Gender**

Gender is always a distinguishing segmentation variable. Gender affects consumer’s thinking, attitude, behaviour, want, purchasing decision and levels of satisfaction. According to Kotler (2004), a marketer notices an opportunities for gender segmentation; males and females have different thinking value, attitude, need and want. Dholakia et al., (1990) stated that women and men seem to differ in their satisfaction areas. Although sex roles have been blurred, satisfaction is still a gendered emotion, particularly in married households. Schiffman and Kanuk (1997) supported that women place more importance on personal gratification exemplified by such things as a comfortable life, pleasure, and happiness; while men, on the other hand, do not find fulfillment of such value as a comfortable life, pleasure, and happiness. Therefore, in this study, the researcher used gender to measure the level of satisfaction toward arc welding robots of UNAC.

**Age**

Many age levels can be defined, such as infants and toddlers, young children, teenagers, adults, and senior citizens which are typical age-based market segments. Classifying consumers into age groups like this is useful when people in different ages have different purchasing behaviours and levels of satisfaction (Zikmund and Amico, 2001). Kotler (2000) also stated since consumers' wants and needs are changed by age, people buy different goods and service over their lifetime. Schiffman and Kanuk(1997) mentioned that product's need is often varied by consumer age; marketers have found age particularly useful demographic variables to distinguish segments. Many marketers have concentrated on a specific age segment. Therefore, in this study, the researcher uses age level to measure their level of satisfaction toward arc welding robots of UNAC.

**Income**

Income has been an important variable for distinguishing market segments for a long time. Product choice is greatly affected by one's economic circumstance. People's economic situation is comprised of their spendable income (its level, stability, and time pattern), savings and assets (including the percentage that is liquid), debt, borrowing power and attitude of saving versus spending (Kotler, 2004). Therefore, in this study, the researcher used the income level to measure the level of customer satisfaction toward arc welding robots of UNAC.

**Education**

Education is relatively simple to measure. Education level is correlated with both occupation and income. In addition, it influences lifestyle and therefore consumption patterns of individual directly (Hawkins, Best and Coney 2001). Skinner (1994) also stated that different educational levels can influence how decisions are made. And different educated consumers will seek different information and demand better-quality products in different ways. Therefore, in this study, the researcher uses the education level to measure the level of customer satisfaction toward arc welding robots of UNAC.

**Department (Job positions)**

According to Kotler (2004), variety in occupations or job positions can influence the purchasing decision and levels of satisfaction toward products. Besides, Hanna and Wozniak (2001) also defined occupation or job position as an activity that serves as one's regular sources of livelihood. Hanna and Wozniak (2001) also stated that occupation or job position tends to be closely related to the education level, and the income level; most of these factors are frequently used together as a composite index to evaluate the level of purchase intention and level of satisfaction. According to Hawkins et al.(1998) who mentioned that occupations can be broken down into large categories of job positions ranging from professionals in each department, technical workers, administrative officers, to maintenance workers position. Therefore, in this study, the researcher uses Department to measures the levels of customer satisfaction toward arc welding robots of UNAC.

**2.5 The Importance of Customer Satisfaction**

In the early 1970s, there has been a plenty of research on consumer satisfaction. Various theoretical structures have been presented to examine the antecedents of satisfaction and to develop meaningful measures of the construct. Kristensen et al. (1999) indicated that customer satisfaction is a key issue for every company wishing to create better business performance and increase the value of customer assets.

Fornell (1996) mentioned that companies that have high degree of satisfaction from customers were going much well in terms of economic performance, also in terms of profits, stock prices or some other measurement of shareholder values. Therefore, the companies that consider the level of customer satisfaction as a criterion to diagnose products or service performance and that tie customer satisfaction rating to both executive and employee's compensation will result in high return on revenues and business performances (Anderson and Sullivan, 1993).

Jones and Sasser (1995) indicated that customer satisfaction information can be a critical barometer of how well a company is serving its customers. Also, this information can be an indicator for a company to indicate what it needs to do to increase its customer satisfaction level until the majority of its customers are totally satisfied. Additionally, Anderson and Fornell (2000) stated that customer satisfaction has generally been regarded as a complement to traditional measures. It is a leading indicator of future profits, because it is derived from consumption data. Besides, it can contribute to greater customer's loyalty. With the increasing loyalty, customer satisfaction could ensure future revenues, decrease price elasticities, and reduce the cost of future transactions.

In addition, Anderson and Fornell (2000) mentioned that increasing the level of customer satisfaction can enhance the company's overall reputation and lower the cost of attracting new customers. Satisfied customers can be considered as an asset to the company and should be acknowledged as such on the balance sheet.

Therefore, customer satisfaction has a strong positive linkage with profitability and the business results of a company. Customer satisfaction has a vital impact as the primary source of future revenue for many companies; it is an important complement to traditional measures of economic performance, providing useful information not only to the companies themselves, but also to shareholders, investors, buyers, governments and regulators (Fornell, 1992). Therefore, it is not surprising that numbers of companies are endeavoring to measure customer satisfaction increasingly.

### 2.5.1 Customer Satisfaction Theory

According to Boulding (1990), the concept of customer satisfaction can be separated into transaction-specific and cumulative. From the transaction-specific perspective, customer satisfaction is regarded as a post-choice evaluative judgment of a specific purchase occasion (Oliver, 1977). In contrast, cumulative customer satisfaction is an overall evaluation based on the total experience with a product or service over time (Fornell, 1992). Although transaction-specific satisfaction may specifically refer to a particular product or service, cumulative satisfaction is a more basic indicator of the company's past, current, and future performance (Anderson, Fornell, and Rust, 1997). Therefore, cumulative satisfaction approach has been applied in a variety of theoretical models.

### 2.5.2 Customer Satisfaction Definitions

Customer satisfaction is referred to an individual’s subjectively derived favorable evaluation of any outcome and/or experience associated with consuming a product. Conceptually, satisfaction is a purchase outcome, whereby consumers compare rewards and costs with anticipated consequences (Huang and Lin, 2005). Howard and Sheth (1969) stated that customer satisfaction can be defined by customer comparison and estimation. Also, customer satisfaction is one kind of cognition that evaluates feedback about suitability after a purchase.

Churchill et al. (1982) stated that customer satisfaction is the result of using a product, and it is generated by the buyer’s anticipated result, reward and the investment cost. Oliver (1997) defined satisfaction as the consumer’s fulfillment response. It is a judgment that a product or service feature, or the product or service itself, provided or is providing a pleasurable level of consumption-related fulfillment, including level of under/or over fulfillment. Therefore, satisfaction is the consumer's sense that consumption provides outcomes against a standard of pleasure and displeasure.

Anderson, Fornell, and Rust (1997) mentioned that there are differences between specific transactions and cumulative transactions as two viewpoints to explain customer satisfaction. For a specific transaction, customer satisfaction comes from customer evaluation after the buying behavior about some specific purchase place or timing, and it may provide diagnostic information about the specific commodity or service performance. However, cumulative transactions arise from the customer evaluating all commodities or services purchased, and it may provide the company with important operational performance indicators for the future.

## 2.6 Previous Studies

Based on the previous studies, there are no any previous studies that exactly studied about the users' characteristic profiles and arc welding robot factors. Thus, the researcher reviewed the results of the relevant research that is suitable to explain or to support this research which study about customer satisfaction among various users and product factors of arc welding robots.

**Determinants of Customer Satisfaction in Personal Computer (PC) Purchase: A Selected Survey on Pantip Plaza Area**

According to the study of Phomnart (2000), "Determinants of Customer Satisfaction in Personal Computer (PC) Purchase: A Selected Survey on Pantip Plaza

Area", the objective of this study are to study the factors contributing to customer expectation of PC purchase in Pantip Plaza and to contrast relevant factors indication customer satisfaction in PC purchase in Pantip Plaza.

The results from analytical portion of the study concluded that customers are satisfied with capability of PC, the appearance of PC, the durability of PC, and the reasonable price of PC while the 3 first positions of customer expectation are the efficiency of PC, the product warranty of PC, and the reasonable price respectively.

**Determinants of Customer Satisfaction: The Windmill Park Country Club Case**

According to the study of Tanphaibul (2001), "Determinants of Customer Satisfaction: The Windmill Park Country Club Case", the objective of this study are to study the factors contributing to expectation of customers of Windmill Park Country Club and to compare the factors indicating satisfaction of Windmill Park Country Club's customers.

The results from analytical portion of the study concluded that customers are satisfied with modern look and attractive physical facilities including service, product and facilities, promised service, dependability of performance, accuracy in term of service performance, good service of employees, readiness to serve attitude and being able to handle urgent requests effectively, whereas, other factors customers are dissatisfied with. The degree of satisfaction and dissatisfaction is high.

**Customer Satisfaction, Productivity, and Profitability: Differences Between Goods and Services**

According to the study of Anderson (2008), "Customer Satisfaction, Productivity, and Profitability: Differences between Goods and Services", the objective of this paper is to investigate whether there are conditions under which there are tradeoffs between customer satisfaction and productivity. A conceptual framework useful in resolving these contradictory viewpoints is developed.

The model predicts that customer satisfaction and productivity are less likely to be compatible when: 1) customer satisfaction is relatively company's offering is customization – the degree to which the company's offering is customized to meet heterogeneous customers' needs – as opposed to standardization – the degree to which the company's offering is reliable, standardized, and free from deficiencies; and 2) when it is difficult (costly) to provide high levels of both customization and standardization simultaneously.

Although there is widespread belief that companies should be superior on both customer satisfaction and productivity, it may be more difficult to pursue both simultaneously when it is important to customize market offerings to better meet customers' needs. The findings presented here suggest that this may be particularly true for industries in which services have come to dominate the world's developed economies; such tradeoffs require greater understanding – especially as the trend toward services shows no signs of abating.

The analytical portion of the study suggests that customer satisfaction and productivity are less likely to be compatible when: (1) customer satisfaction is relatively more dependent on customization as opposed to standardization; and (2) when it is difficult (costly) to provide high levels of both customization and standardization simultaneously.

Finally, it is worth emphasizing that while the issue of tradeoffs between customer satisfaction and productivity is important today, it is expected to continue. The implication is that more business transactions involve long-term relationships that depend on satisfying customers, often by customizing the company's market offering, in order to retain them. In most developed countries, companies face slowing growth, mature markets, and increasing foreign competition. This makes customers an increasingly scarce resource pursued by an increasingly large number of aggressive suppliers. As cost structures make price competition difficult for many firms, pursuing customer satisfaction – reducing price elasticity and retaining current customer – is becoming an increasingly attractive alternative.

**Robot for Rehabilitation: Status and Strategy**

According to the study of Mahoney (2008) on "Robot for Rehabilitation: Status and Strategy"; the current status of commercially available robotic manipulation aids is reviewed. A perspective is discussed on why rehabilitation robot – The Handy 1 – has not achieved a level of success merited by their potential. Several strategies are introduced for expanding commercial development based on an evolutionary approach. The results of the study are shown that the Handy 1 was actually lease preferred by the subjects for many of the evaluated criteria. The Handy 1, however, is the only device that was able to be programmed so that the presentation position of the food to the person could be changed to accommodate someone with a high-level spinal cord injury or other severe posture constraint.

While the result of vocational robotic accommodations project at ASEL has been attempting to identify new jobs for which robotic accommodations may be appropriate. A study which was carried out was begun by creating a profile of an individual with a severe manipulation disability. This profile defined a fictitious applicant as having sedentary strength and fingering. This profile was then matched to the job database and it was found that forty job descriptions existed were accessible to a person with no manipulation ability. These jobs were primarily in the professional, technical, and managerial category. This approach demonstrates that it is not necessary to provide an individual with a complex robotic system in order to increase vocational opportunities. Even a modest increase in manipulation skill may open up many opportunities. These results support the vocational robotic accommodation appropriate for the implementation of robotics in the existing vocational accommodation process.

In conclusion, the number of readily available assistive robot products does not reflect the effort and funding that has been applied in this field. This state is a result of an imbalance in the effort applied to the development of simple and useful robotic aids, as compared to the fundamental research.

**Speed Control of Permanent Magnet Brushless DC Motor Drive**

According to the study of Paothong (2002), “Speed Control of Permanent Magnet Brushless DC Motor Drive”, the results from analytical portion of the study concluded that the drive performance obtained from simulation and experimental work are compared and found to be in closed agreement. It was demonstrated that the closed loop control of the drive using current control strategy can provide precise speed regulation under various operating conditions.

# CHAPTER 3

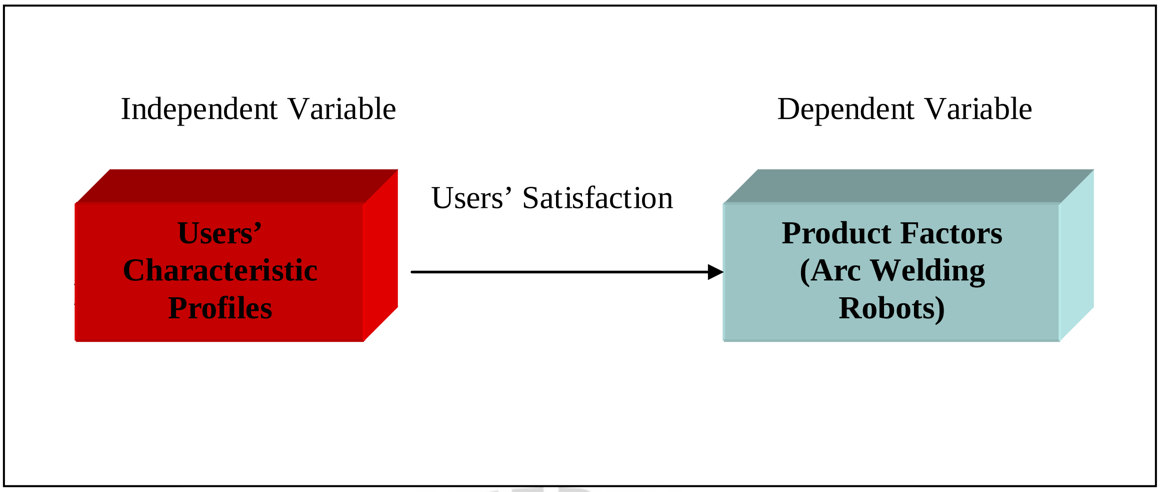
# THEORETICAL AND CONCEPTUAL FRAMEWORK

This chapter presents the research framework of this study. The theoretical framework is based on theories and concepts drawn from the literature review. The conceptual framework is then developed by the researcher. Finally, after developing the conceptual framework, the researcher generated the research hypotheses relevant to the study.

## 3.1 Theoretical Framework

A theoretical framework is related to several theories among several factors relevant to this study. After the researcher reviews many theories and concepts in the previous chapter, the researcher can identify the relationship between independent and dependent variables. In this study, the dimensions of product factors for arc welding robot are Performance in Operation, Reliability, Technology Sophisticate, Flexibility and Adaptation in Use, Size, Weight, Speed, Warranty and Durability; they were used as the dependent variables. Meanwhile, the personal factors of the customers are used as the independent variables as shown in Figure 3.1.

**Figure 3.1: Theoretical Framework**




Source: Adapted from Evans and Berman (1982), Garvin (1987), Kotler (2000), Schiffman and Kanuk (2007), and Anderson and Fornell (2000).

The above figure shows that the independent variables, users' characteristic profiles of UNAC customers including Gender, Age level, Income level, Education level and Department, have a significant impact on level of users' satisfaction on arc welding robot's factors including Performance in Operation, Reliability, Technology Sophisticate, Flexibility and Adaptation in Use, Size, Weight, Speed, Warranty, and Durability, respectively.

## 3.2 Conceptual Framework

Sekaran (1992) stated that conceptual framework is the researcher's own model that can explain the relationship between independent and dependent variables. In this study, the researcher developed a conceptual framework to examine the difference between the users' characteristic profiles and the satisfaction level toward arc welding robots of UNAC. According to the literature review in chapter two and also comments received from on site interviewed with 30 users at customers' places which conducted between November and December 2008 confirmed that, the personal factors or users' characteristic profiles of UNAC in this study, which are Gender, Age level, Income level, Education level and Department, can be used as the independent variables, while the dimensions of product factors of arc welding robots including Performance in Operation, Reliability, Technology Sophisticate, Flexibility and Adaptability in Use, Size, Weight, Speed, Warranty, and Durability can be used as the dependent variables as shown in Figure 3.2.

**Figure 3.2: Conceptual Framework**

**Independent Variables**

**<u>Users' characteristic profiles</u>**

- **Gender**
- **Age Level**
- **Income Level**
- **Education Level**
- **Department**

→

**Dependent Variables**

**<u>Product Factors</u>**
**<u>(Arc Welding Robot)</u>**

- **Satisfaction on Performance in Operation of arc welding robot**
- **Satisfaction on Reliability of arc welding robot**
- **Satisfaction on Technical Sophisticate of arc welding robot**
- **Satisfaction on Flexibility and Adaptability in Use of arc welding robot**
- **Satisfaction on Size of arc welding robot**
- **Satisfaction on Weight of arc welding robot**
- **Satisfaction on Speed of arc welding robot**
- **Satisfaction on Warranty of arc welding robot**
- **Satisfaction on Durability of arc welding robot**

Source: Adapted from Evans and Berman (1982), Garvin (1987), Kotler (2000), Schiffman and Kanuk (2007), and Anderson and Fornell (2000).

### 3.3 Research Hypotheses

The main objective of this study is to investigate the difference between the users' characteristic profiles and the satisfaction toward the product factors (arc welding robots) of UNAC.

According to conceptual framework, the hypotheses for this research are constructed as shown in Table 3.1.

**Table 3.1: Hypotheses Testing**

| | |
|---|---|
| H1o:<br><br>H1a: | There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$).<br>There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |
| H2o:<br><br>H2a: | There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$).<br>There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |

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| H3o:<br><br><br>H3a: | There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$).<br>There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |
| H4o:<br><br><br>H4a: | There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$).<br>There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |
| H5o:<br><br><br>H5a: | There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$).<br>There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |
| H6o:<br><br><br>H6a: | There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$).<br>There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |

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| H7o: | There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$). |
| H7a: | There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |
| H8o: | There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$). |
| H8a: | There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |
| H9o: | There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Gender ($\mu_1 = \mu_2$). |
| H9a: | There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Gender ($\mu_1 \neq \mu_2$). |
| H10o: | There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. |
| H10a: | There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |

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| H11o: <br><br><br> H11a: | There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. <br> There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |
| H12o: <br><br><br> H12a: | There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. <br> There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |
| H13o: <br><br><br> H13a: | There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. <br> There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |
| H14o: <br><br><br> H14a: | There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. <br> There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC, when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |

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| H15o: | There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. |
| H15a: | There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |
| H16o: | There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. |
| H16a: | There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |
| H17o: | There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. |
| H17a: | There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |
| H18o: | There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$. |
| H18a: | There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. |

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| H19o: | There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H19a: | There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H20o: | There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H20a: | There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H21o: | There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H21a: | There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H22o: | There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H22a: | There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |

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| H23o: <br><br><br> H23a: | There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. <br> There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H24o: <br><br><br> H24a: | There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. <br> There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H25o: <br><br><br> H25a: | There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. <br> There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H26o: <br><br><br> H26a: | There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. <br> There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |

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| H27o: | There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Income level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H27a: | There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H28o: | There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H28a: | There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |
| H29o: | There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H29a: | There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |
| H30o: | There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H30a: | There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |

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| H31o: | There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H31a: | There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |
| H32o: | There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H32a: | There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |
| H33o: | There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H33a: | There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |
| H34o: | There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC, when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H34a: | There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |

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| H35o: | There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H35a: | There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |
| H36o: | There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Education level $\rightarrow \mu_1 = \mu_2 = \mu_3$. |
| H36a: | There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. |
| H37o: | There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H37a: | There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H38o: | There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H38a: | There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |

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| H39o:<br><br><br>H39a: | There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.<br>There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H40o:<br><br><br>H40a: | There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.<br>There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H41o:<br><br><br>H41a: | There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.<br>There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H42o:<br><br><br>H42a: | There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.<br>There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |

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| H43o: | There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H43a: | There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H44o: | There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H44a: | There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |
| H45o: | There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$. |
| H45a: | There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by Department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. |

### 3.4 Operational Definitions of the Independent and Dependent Variables

According to Zikmund (2000), operational definitions help the researcher specify the rules for assigning numbers. The value can also be assigned in the measuring process which can be manipulated according to a certain mathematical rule. Besides, a specific type of scale must also be selected. Table 3.2 will help the researcher explain and clarify the operational definitions of independent and dependent variables.

**Table 3.2: Operational Definitions of Independent and Dependent Variables**

| **Concept** | **Conceptual Definition** | **Operational Component** | **Level of Measurement** | **Question Number** |
|---|---|---|---|---|
| **Dependent Variables** | | | | |
| Performance in Operation | The performance in operation factor is conformed with some works in the processes of customers and considered as the belonging to the product process under a consideration of customers. | Satisfaction on the standard manipulator's working area of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the long arm manipulator type designed for increasing the working area of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the new manipulator (AX-V4) designed for moving into narrow space of arc welding robot from Uni Arc Co., Ltd. [UNAC] | Interval Scale | Q. 6-15 |

| | | | | |
|---|---|---|---|---|
| | | Satisfaction on robot motion performance of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on number of axis controlled by the robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the memory capacity of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on stable arc provided by the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on low spatter provided by the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the arc stability at very low current ranges by the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the arc stability at very high welding speeds by the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | | |

| | | | | |
|---|---|---|---|---|
| Reliability | The reliability in this study means the promising from the company that can provide accurately, dependably and reliably arc welding robot for their customers. | Satisfaction on the positional repeatability of the manipulator of arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on Operational Software (OS) of the robot controller of arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on current and voltage precisely controlled and supplied by the welding power source of arc welding robot from Uni Arc Co. , Ltd. [UNAC] | Interval Scale | Q. 16-18 |
| Technical Sophisticate | Technical Sophisticate in this study means the technology that comes along with the arc welding robots, for example, software peripheral, equipments and etc. Therefore, the arc welding robots should offer new technologies that are sophisticated but still easy to work; in order to respond to the needs of the customers. | Satisfaction on Off-Line teaching software (AX-OT) for arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the positioner designed for synchronized with the arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the slider designed for synchronized with the arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the sensor designed for the arc welding robot from Uni Arc Co. , Ltd. [UNAC] | Interval Scale | Q. 19-22 |

| | | | | |
|---|---|---|---|---|
| Flexibility and Adaptability in Use | The flexibility and adaptability in use in this study means convenience to use arc welding robot; for example, the functions or commands of arc welding robot is easy to understand or the arc welding robot can be installed easily. | Satisfaction on the changeable arm (Arm side) of manipulator for the arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the hanging installation capability (Ceiling/Wall type) of Manipulator of the arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the manipulator designed for moving into narrow space of the arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the built-in coaxial power cable designed for avoiding welding obstacles of the arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the compatibility to abundant applications of the robot controller of arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the software PLC function of the robot controller of arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on Data Management with Ethernet of the robot controller of arc welding robot from Uni Arc Co. , Ltd. [UNAC] | Interval Scale | Q. 23-34 |

| | | | | |
|---|---|---|---|---|
| | | Satisfaction on Field network compatible and reduce cable runs provided by the robot controller of arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the manipulator and robot controller to connect with various welding processes power source (Co2/ MAG/ TIG/ MIG) of the arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on welding capability for various kinds of materials by the power supply of arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the welding capability for various thicknesses of materials by the power supply of arc welding robot from Uni Arc Co. , Ltd. [UNAC]<br><br>Satisfaction on the welding power source to meet various welding needs (provides 32 welding processes in pulse MAG/MIG, DC MIG, Co2/ MAG) of welding power source from Uni Arc Co., Ltd. [UNAC] | | |

| | | | | |
|---|---|---|---|---|
| Size | The dimension of size is consisted of length, width, height, diameter, perimeter, area and volume. In this study, size means the size of arc welding robots. | Satisfaction on the size of manipulator of the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the size of robot controller of the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the size of welding power source of the arc welding robot from Uni Arc Co., Ltd. [UNAC] | Interval Scale | Q. 35-37 |
| Weight | In this study *weight* means the weight of arc welding robots. Light weight arc welding robots are gaining popularity. | Satisfaction on the weight of manipulator of the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the weight of robot controller of the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the weight of welding power source of the arc welding robot from Uni Arc Co., Ltd. [UNAC] | Interval Scale | Q. 38-40 |

| | | | | |
|---|---|---|---|---|
| Speed | *Speed* variable is one of the arc welding robots rivals in the market. The higher speed means the higher production for the customer. However, such high speed should get along with low defection rate. | Satisfaction on the speed of manipulator (Air-cut time) of the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the speed of robot controller (Processing time) of the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the welding speed of the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | Interval Scale | Q. 41-43 |
| Warranty | Product warranty means an explicit or implicit promise by sellers that the product will perform as specified or that the seller will fix it or refunds the customer's money during a specified period. | Satisfaction on one-year warranty period for the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on customer technical assistance (in-warranty) of the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the on-site robot checking and repairing (in- warranty) of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the period of part's claim for the arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the reserved spare parts for broken arc welding robot from Uni Arc Co., Ltd. [UNAC] | Interval Scale | Q. 44-48 |

| | | | | |
|---|---|---|---|---|
| Durability | Durability will provide longer life to the product and could generate low cost for the customers. Economically, a durable good means a good that does not quickly wear out, or more specifically, it yields services or utility over time rather than being completely used up when used one. Perfectly durable goods never wear out. | Satisfaction on the manipulator's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the robot controller's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the welding power source's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the welding consumable parts of arc welding robot from Uni Arc Co., Ltd. [UNAC]<br><br>Satisfaction on the welding spare parts of arc welding robot from Uni Arc Co., Ltd. [UNAC] | Interval Scale | Q. 49-53 |

| | | | | |
|---|---|---|---|---|
| **Independent Variables** | Personal factors or Users' characteristic profiles in this study are demography of the customers. Demography refers to vital and measurable statistics of a population. While the characteristics of other demographics include age, sex, marital status, income, education, and occupation or job position. | - Gender<br>- Age<br>- Education<br>- Income<br>- Department | Nominal<br>Ordinal<br>Ordinal<br>Ordinal<br>Ordinal | Q. 1<br>Q. 2<br>Q. 3<br>Q. 4<br>Q. 5 |

# CHAPTER 4

# RESEARCH METHODOLOGY

This chapter is aimed to explain the research processing. The researcher wants to describe research methods used, respondents and sampling procedures, research instruments or questionnaires, collection of data and statistical treatment of data.

## 4.1 Research Methods

Zikmund (2003) stated that there are various methods that can be employed to collect primary data, ranging from interviews, questionnaires, observation and other motivational techniques. This research is conducted to clarify and define the nature of the problems. This research uses questionnaires for finding the information obtained from the respondents in the sampling unit.

In this study, descriptive research is used by employing the survey technique which is defined as a method of primary data collection. The reason why the researcher employed survey technique in this study because of it is mostly used in business research. It allows the researcher to study and describe large population on fairly and quickly (Malhotra, 1999). Besides, the survey technique provides relatively low cost, minimal time and accurate, and also represents the total population (Zikmund, 2003).

## 4.2 Respondents and Sampling Procedures

### 4.2.1 Target Population

According to Churchill and Brown (2007), target population means the complete group of specific population elements relevant to the research. Therefore, the target population of this study is the users who have experienced in using, received the service at any period of product life or involved in purchasing of the arc welding robots.

### 4.2.2 Sampling Element

Zikmund (2003) stated that a sampling element is an individual member of a specific population. Therefore, in this study, the sampling element is the users who have ever experienced in using, received the service at any period of product life or involved in purchasing the arc welding robots of UNAC before.

### 4.2.3 Sampling Unit

Zikmund (2003) stated that the sampling unit is the place where the researcher can find the sampling element. Therefore, in this study, the sampling unit is the UNAC customers' places or UNAC users' factories at which they have ever experienced in using, received the service at any period of product life or involved in purchasing the arc welding robots of UNAC before, especially in automotive manufacturers, local automakers, steel product makers, electrical and electronics manufacturers and etc.

### 4.2.4 Sample Size

The sample size must be taken into account for calculation in order to meet the requirements of the population. The researcher requires the most precision number of sample size in order to be the representatives of the total population. More often, the decision on sample size will require concessions with theoretically correct sample sizes and the sample sizes also depend on and allowed by available resources (Malhotra, 2004).

Therefore, in order to determine the sample size, Burns and Bush (2007) stated that the sample size can be calculated by mathematic formula below:

$$\frac{n = Z^2 pq}{E^2}$$

Where;

n = Sample Size

P = the population for the research calculated by the percentage of respondents. It assumed to be 0.5(50%) (Burns and Bush, 2005).

q = (1-p) estimated between the non-customers to overall population

$Z^2$= allowed errors between the trued and sample population

E = the allowance error (precision), 0.05

**Confidence Level** is the degree of accuracy desired by the researcher and stipulated as a level of confidence in the form of a percentage. Typically, marketing researchers rely on the 90%, 95%, or 99% level of confidence. The researcher has set this percentage to be **95% confidence level** because it is the most commonly used level of confidence in market research and also usually the default level is found in statistical analysis programs such as SPSS. Therefore, standard score of Z associated with the confidence level mentioned below is equal to 1.96 (Burns and Bush, 2005).

Those values are substituted into the following formula:

$$N = \frac{(1.96)^2(0.5)(1-0.5)}{(0.5)^2}$$

$$= 384.16 \text{ respondents}$$

$$\text{or} \sim 400 \text{ respondents}$$

Therefore, from the calculation above, the sample size of this study is equal to 400 respondents in order to collect the questionnaires in this study.

### 4.2.5 Sampling Procedures

There are two basic types of sampling techniques. The first one is non-probability (The researcher does not know the total elements in the target population.) and the second is probability sampling (The researcher knows the total elements in the target population.) (Churchill and Brown, 2007).

For this research, the method of **probability sampling** is selected because the researcher has the entire records and numbers of UNAC's users which can help the researcher create a sampling frame. Therefore, all of the target population has an equal chance to be selected as the sample in this study (Zikmund, 2003). In this study, the researcher decided to collect data from all UNAC's users by using the simple random sampling method to get 400 samples.

**4.3 Research Instrument**

The data collection which is applied in this research is referred to the quantitative research. This quantitative research relies on a sizable representative sample of the population and a formalized procedure for gathering data (Burns and Bush, 2005). In addition, the data is based on the numbers and variables which help interpretation of the result be easier (Winter, 2007). The questionnaire is the research instrument the researcher uses in this study. The researcher also selects a personal interview questionnaire which is suitable for eliciting the respondent's beliefs, opinions, attitudes, perceptions and so on.

A questionnaire is a structured sequence of questions designed to draw the factors, opinions and provide a vehicle for recording the data. According to Burns and Bush (2005), it is a list of questions that have pre-specified answer choices. There are four purposes for using the questionnaire. Firstly, it provides the accurate information from the respondents. Secondly, it offers the structured interviews. Thirdly, a standard on factors, comments and attitudes is provided. Finally, the questionnaire facilitates the data processing.

In this study, the questionnaire is distributed to both male and female respondents who have received the service or purchased the arc welding robots from UNAC before. The number of questions in the questionnaire is totally 53 questions together with the respondents' characteristic profiles. The questionnaire can be separated into two parts as follows:

**Part 1:** The questions are to find out the users' characteristic profiles of individual respondent, including their gender, age, income, education and department.

**Part 2:** This part is comprised of 48 questions to measure the respondent's satisfaction level toward the arc welding robots of UNAC. The questions in this part will ask about nine product factors of the arc welding robot including Performance in Operation, Reliability, Technology Sophisticate, Flexibility and Adaptation in use, Size, Weight, Speed, Warranty and Durability. A five-point Likert scale is applied in this research in order to make the respondents to indicate their degree of satisfaction or dissatisfaction for each question.

The researcher provides the Likert scale to capture the intensity of the respondent's answer for each question, as shown below.

| | |
|---|---|
| Very Low Satisfaction | = 1 |
| Low Satisfaction | = 2 |
| Neutral | = 3 |
| High Satisfaction | = 4 |
| Very High Satisfaction | = 5 |

### 4.3.1 Pre – Test of Questionnaires

A pre-test was conducted by distributing 30 sets of questionnaires, during February 1st-10th 2009. By using self-administered questionnaires (Mail survey), the researcher distributed them to 30 samples of customers in Bangkok and Rayong area who had used or purchased the arc welding robots from UNAC before. Based on Cronbach's Alpha reliability test, if the coefficient is at least 0.7, the questionnaire is considered to be reliable (Rattana, 2004). As shown in Table 4.1, the researcher found that all the coefficients or Cronbach's Alpha values are greater than 0.7; therefore, this questionnaire is considered reliable.

**Table 4.1: Cronbach's Alpha values of Pre-Testing**

| **Product Factors** | **Cronbach's Alpha** |
|---|---|
| Performance in Operation | .872 |
| Reliability | .892 |
| Technical Sophisticate | .804 |
| Flexibility and Adaptability in Use | .885 |
| Size | .888 |
| Weight | .858 |
| Speed | .867 |
| Warranty | .837 |
| Durability | .868 |
| **Total** | **.958** |

From Table 4.1, the researcher can conclude that the reliability of Performance in Operation by Cronbach's Alpha is equal to 0.872; reliability of Reliability by Cronbach's Alpha is equal to 0.892; reliability of Technical Sophisticate by Cronbach's Alpha is equal to 0.804; reliability of Flexibility and Adaptability in Use by Cronbach's Alpha is equal to 0.885; reliability of Size by Cronbach's Alpha is equal to 0.888; reliability of Weight by Cronbach's Alpha is equal to 0.858; reliability of Speed by Cronbach's Alpha is equal to 0.867; reliability of Warranty by Cronbach's Alpha is equal to 0.837; reliability of Durability by Cronbach's Alpha is equal to 0.868; and total reliability by Cronbach's Alpha is equal to 0.958, respectively.

The researcher has found that the reliability of the questionnaire is all above 0.7. Therefore, this questionnaire is acceptable to distribute to all 400 samples. Thus, this result will encourage further statistical relationships to be tested in Chapter 5.

**4.4 Data Collection Procedures**

The primary data is the data that the researcher gains from the respondents through the surveys (Saunder et al., 2003). In other words, Malhotra (2004) also cited that the primary data is originated by the researcher for the specific purpose of addressing the problem at hand.

In this study, the researcher used quantitative data to answer the questions of this research. The primary data were collected by using self-administered questionnaires distributed to 400 respondents. The survey research was designed to accomplish this research during February 16$^{th}$ – 27$^{th}$ 2009.

Secondary data is the data which are already existed and are collected for some other purposes and can be used in the second time (Malhotra, 2004). The advantages of secondary data are lower cost or less expensive and more time saving than primary data. Therefore, the secondary data of this research were collected from textbooks, journals and web sites in order to contribute the literature review of the study.

**4.5 Statistical Treatment of Data**

The data will be analyzed and summarized in a readable and easily interpretable form. The Statistical Package for Social (SPSS) version 15.0 was used to analyze the data where needed.

♣ Descriptive statistics

Descriptive statistics aims to describe and summarize the data that are collected in the survey. The statistical procedure reliability is measured by consistency and stability of the questionnaire's result. Frequency and percentage tables are the most common form of data description in the questionnaire. More importantly, the sample percentages used directly as an estimate of the percentages of the total population indicate each alternative response (Ankel, 2001).

In this study, the descriptive statistics, frequency tables, and average mean were used for analyzing the respondents' characteristics in terms of gender, age level, income level, education level and department as well as the satisfaction of respondents toward the arc welding robots of UNAC. The Arbitrary Level and Descriptive Rating given below were used for grouping the responses into levels as shown in Table 4.2.

**Table 4.2: The Arbitrary Level**

| **Arbitrary Level** | **Weighted Score** | **Descriptive Rating** |
|---|---|---|
| 1.00 – 1.80 | 1 point | Very Low Satisfaction |
| 1.81 – 2.60 | 2 points | Low Satisfaction |
| 2.61 – 3.40 | 3 points | Neutral |
| 3.41 – 4.20 | 4 points | High Satisfaction |
| 4.21 – 5.00 | 5 points | Very High Satisfaction |

Source: Malhotra (2004). *Marketing Research: Research Design*. p. 145. New Jersey, USA: Prentice Hall, Pearson Education International.

♣ Inferential statistics

All statistical interpretations of the data will follow commonly accepted research practices. The form of data presentation for these procedures would again be presented in an easily interpreted format. The computer ensures of accuracy and to minimizing errors. It will perform all statistical procedures (Zikmund, 2003).

There is hypothesis testing where an assessment is made as to how much a sample's findings support the researcher's a prior belief regarding the size of a population value. For hypothesis testing, it needs to find out the difference between the respondents' characteristic profiles and the level of satisfaction toward the arc welding robots of UNAC. Since the interval scale is being used for the questionnaire, this allows the researcher to use a broad range of statistical methods.

1) Independent Sample T-test was applied to find out the difference between male and female's satisfaction toward the arc welding robots of UNAC.

2) Analysis of variance (ANOVA) technique was applied for hypotheses testing in analyzing the difference among the other respondents' characteristic profiles and the level of satisfaction toward the arc welding robots of UNAC.

### 4.5.1 Independent Sample T-test

According to Malhotra and Peterson (2006), they mentioned that independent samples are two samples that are not experimentally related. The measurement of one sample has no effect on the values of the other sample. The two populations are sampled and the means and variances are computed, based on samples of size n1 and n2. If both samples are found to have the same variance, a pooled variance estimate is computed from the two sample variance as follows (use to test Hypotheses 1 - 9):

$$S^2 = \frac{(n_1 - 1)\, s_1^2 + (n_2 - 1)\, s_2^2}{n_1 + n_2 - 2}$$

**Where:**

| | | |
|---|---|---|
| $n_1$ | = | size of sample 1 |
| $n_2$ | = | size of sample 2 |
| $n_1 - 1$ | = | degree of freedom for sample 1 |
| $n_2 - 1$ | = | degree of freedom for sample 2 |
| $s_1^2$ | = | sample variance for sample 1 |
| $s_2^2$ | = | sample variance for sample 2 |

Source: Malhotra and Peterson (2006). *Basic Marketing Research: A Decision Making Approach.* 2nd ed. New Jersey, USA: Prentice Hall, Pearson Education International.

### 4.5.2 Analysis of Variance (ANOVA)

According to Curchill and Iacobucci (2002), the analysis of variance (ANOVA) is the distinct advantage of being applicable when more than two means are being compared. The basic underlying the analysis of variance (ANOVA) is that the parent population variance can be estimated from the sample in several ways, and the comparisons among these estimates can tell us a great deal about the population. The test statistics for ANOVA is the F ratio. It compares the variance from the last two sources (use to test Hypotheses 10 - 45).

$$SS_T = \sum x^2 \frac{(\sum x_T)^2}{N}$$

$$SS_b = \sum \frac{(\sum x)^2}{n} - \frac{(\sum x_T)^2}{N}$$

$$SS_w = SS_T - SS_b$$

$df_b$ = (number of groups - 1)

$df_T$ = (number of subjects - 1)

$df_w = df_T - df_b$

$$MS_b = \frac{SS_b}{df_b}$$

$$MS_w = \frac{SS_w}{df_w}$$

$$F = \frac{MS_b}{MS_w}$$

**Where:**

| | | |
|---|---|---|
| $MS_b$ | = | Mean square between group |
| $SS_b$ | = | Sum of squares between group |
| $df_b$ | = | Degree of freedom between group |
| $MS_w$ | = | Mean square within group |
| $SS_w$ | = | Sum of square within group |
| $df_w$ | = | Degree of freedom within group |

Source: Malhotra and Peterson (2006). *Basic Marketing Research: A Decision Making Approach.* 2nd ed. New Jersey, USA: Prentice Hall, Pearson Education International.

If the null hypothesis is true, there should be no difference between the populations and the ratio should be close to 1. If the population means are not equal, the numerator should manifest this difference, and the F ratio should be greater than 1. The F distribution determines the size of ration necessary to reject the null hypothesis for a particular sample size and level of significance (Churchill and Iacobucci, 2002).

**Table 4.3: Statistical Treatment Conclusion**

| No. | Null Hypothesis | Statistics Used |
|---|---|---|
| **H1o – H9o** | There is no significant difference between male and female on satisfaction toward the arc welding robots of UNAC. | Independent Sample T-test |
| **H10o – H 45o** | There is no significant difference among the respondents regarding their satisfaction toward the arc welding robots of UNAC when segmented by Age, Education, Income and Department. | Analysis of variance (ANOVA) |

# CHAPTER 5

# DATA ANALYSES AND RESULTS

## 5.1 Introduction

This chapter provides the results of the data based on 400 questionnaires with the target respondents of this study. The findings are organized into two sections which are Descriptive Statistics and Inferential Statistics.

Descriptive Statistics is a branch of statistics that provides researchers with summary measures for the data in their samples. The objective of descriptive statistics is to provide summary measures of the data contained in all the elements of a sample.

Inferential Statistics is the branch of statistics that consists of generalizing from samples to populations performing hypothesis and making interpretations, since data collected are interval scaled data; thus, to test the hypothesis about the variable of interval; Independent Sample T-test was used to test Hypotheses 1 to 9; and One Way ANOVA was used to test Hypotheses 10 to 45 as had been discussed in chapter 4.

## 5.2 Samples Profile

The research conducts the survey and collects the data by distributing 400 copies of the questionnaire as the research instrument. The self-administered questionnaire is distributed to the 400 customers or users who have been used or purchased the arc welding robots of Uni Arc Co., Ltd. [UNAC].

## 5.3 Descriptive Data Analyses

In this part the researcher is going to analyze the descriptive statistics of the user characteristic information of the respondents. The items are explained in this part are as follows:

User's characteristic data analyses consist of the result of population breakdown analysed by the following aspects.

a. Gender

b. Age

c. Income

d. Education

e. Department

### 5.3.1 Users' characteristic profiles of the respondents

**Table 5.1: Gender**

**Gender**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Male | 288 | 72.0 | 72.4 | 72.4 |
| | Female | 110 | 27.5 | 27.6 | 100.0 |
| | Total | 398 | 99.5 | 100.0 | |
| Missing | System | 2 | .5 | | |
| Total | | 400 | 100.0 | | |

From the above table, the researcher found that the majority of the respondents are male (72.4 percent); while the rest are female (27.6 percent).

**Table 5.2: Age**

**Age**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Under 22 | 52 | 13.0 | 13.0 | 13.0 |
| | 22-34 | 267 | 66.8 | 66.9 | 79.9 |
| | 35-54 | 68 | 17.0 | 17.0 | 97.0 |
| | 55-64 | 10 | 2.5 | 2.5 | 99.5 |
| | Over 64 | 2 | .5 | .5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

From the above table, the researcher found that the majority of the average age levels of respondents are between 22 and 34 years old around 67.0 percent, between 35 to 54 years old at 17.0 percent, under 22 years old at 13.0 percent, between 55 to 64 years old at 2.5 percent, and over 64 years old at 0.5 percent, respectively.

**Table 5.3: Income**

**Income**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Below 10,000 baht | 97 | 24.3 | 24.3 | 24.3 |
| | 10,000-20,000 baht | 181 | 45.3 | 45.3 | 69.5 |
| | 20,001-30,000 baht | 93 | 23.3 | 23.3 | 92.8 |
| | 30,001-40,000 baht | 24 | 6.0 | 6.0 | 98.8 |
| | 40,001-50,000 baht | 3 | .8 | .8 | 99.5 |
| | Above 50,000 baht | 2 | .5 | .5 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

From the above table, the researcher found that the majority of the average income levels of respondents are between 10,000 and 20,000 baht at 45.3 percent, between below 10,000 baht at 24.3 percent, between 20,001 and 30,000 baht at 23.3 percent, between 30.001 to 40,000 baht at 6.0 percent, between 40,001 and 50,000 baht at 0.8 percent, and above 50,000 bath at 0.5 percent, respectively.

**Table 5.4: Education**

**Education**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Below Bachelor' s Degree | 117 | 29.3 | 29.3 | 29.3 |
| | Bachelor' s Degree | 261 | 65.3 | 65.4 | 94.7 |
| | Master' s Degree | 21 | 5.3 | 5.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

From the above table, the researcher found that the majority of the average education levels of respondents are Bachelor's Degree at 65.4 percent, below Bachelor's Degree at 29.3 percent, and Master's Degree at 5.3 percent, respectively.

**Table 5.5: Department**

**Department**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Administrative | 37 | 9.3 | 9.3 | 9.3 |
| | Purchasing | 69 | 17.3 | 17.3 | 26.5 |
| | Engineering | 69 | 17.3 | 17.3 | 43.8 |
| | Production | 166 | 41.5 | 41.5 | 85.3 |
| | Maintenance | 55 | 13.8 | 13.8 | 99.0 |
| | Other | 4 | 1.0 | 1.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

From the above table, the researcher found that the majority of the department of respondents is production at 41.5 percent, purchasing and engineering equally at 17.3 percent, maintenance at 13.8 percent, administrative at 9.3 percent, and other at 1.0 percent, respectively.

### 5.3.2 Descriptive Analyses of Users' Satisfaction toward the Arc Welding Robots of Uni Arc Co., Ltd. [UNAC]

According to research **objective number one**, which is "To study the level of users' satisfaction toward the arc welding robots of UNAC", the results are shown below.

**Table 5.6: Descriptives: Performance in Operation**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the standard manipulator's working area of are welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8246 | .71895 | 1 |
| Satisfaction on the memory capacity of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7794 | .77750 | 2 |
| Satisfaction on the new manipulator (AX-V4) designed for moving into narrow space of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7694 | .69236 | 3 |
| Satisfaction on number of axis controlled by robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7544 | .74673 | 4 |
| Satisfaction on the long arm manipulator type designed for increasing the working area of are welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7419 | .68069 | 5 |
| Satisfaction on the stable arc provided by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 398 | 2.00 | 5.00 | 3.7236 | .74374 | 6 |
| Satisfaction on robot motion performance of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 398 | 2.00 | 5.00 | 3.7186 | .72118 | 7 |
| Satisfaction on the arc stability at very high welding speeds by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7168 | .72118 | 8 |
| Satisfaction on the low spatter provided by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7118 | .74661 | 9 |
| Satisfaction on the arc stability at very low current ranges by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6992 | .76662 | 10 |
| Valid N (listwise) | 397 | | | | | |

From Table 5.6, the researcher can conclude that the most satisfaction factor of Performance in Operation is “Satisfaction on the standard manipulator's working area of are welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.8246, which is close to “5 = Very High Satisfaction”. Meanwhile, the least satisfaction factor of Performance in Operation is “Satisfaction on the arc stability at very low current ranges by the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.6992.

**Table 5.7: Descriptives: Reliability**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the current and voltage precisely controlled and supplied by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7093 | .70937 | 1 |
| Satisfaction on the Operational Software (OS) of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6566 | .72285 | 2 |
| Satisfaction on the positional repeatability of manipulator of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6391 | .68368 | 3 |
| Valid N (listwise) | 399 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Reliability is “Satisfaction on the current and voltage precisely controlled and supplied by the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.7093, which is close to “5 = Very High Satisfaction”. Meanwhile, the least satisfaction factor of Reliability is “Satisfaction on the positional repeatability of manipulator of the arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean is equal to 3.6391.

**Table 5.8: Descriptives: Technical Sophisticate**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the Off-Line teaching software (AX-OT) for arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6291 | .81921 | 1 |
| Satisfaction on the slider designed for synchronized with arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6125 | .73053 | 2 |
| Satisfaction on the sensor designed for arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 1.00 | 5.00 | 3.5739 | .79504 | 3 |
| Satisfaction on the positioned designed for synchronized with arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.5414 | .72130 | 4 |
| Valid N (listwise) | 397 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Technical Sophisticate is "Satisfaction on the Off-Line teaching software (AX-OT) for the arc welding robot from Uni Arc Co., Ltd. [UNAC]" by mean is equal to 3.6291 which is close to "5 = Very High Satisfaction". Meanwhile, the least satisfaction factor of Technical Sophisticate is "Satisfaction on the positioner designed for synchronizing with the arc welding robot from Uni Arc Co., Ltd. [UNAC]" by mean is equal to 3.5414.

**Table 5.9: Descriptives: Flexibility and Adaptability in Use**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the compatibility to abundant applications of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7619 | .73734 | 1 |
| Satisfaction on the manipulator and robot controller to connect with various welding processes power source (Co2/ MAG/ TIG/ MIG) of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7550 | .72546 | 2 |
| Satisfaction on the welding capability for various kinds of materials by power supply of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7550 | .72891 | 2 |
| Satisfaction on the welding power source to meet various welding needs (provides 32 welding processes in pulse MAG/MIG, DC, MIG, Co2/ MAG) of welding power source from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7500 | .75094 | 3 |
| Satisfaction on the built-in coaxial power cable designed for avoiding welding obstacles of Arc Welding Robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7225 | .72236 | 4 |
| Satisfaction on the manipulator designed for moving into narrow space of Arc Welding Robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7193 | .70988 | 5 |
| Satisfaction on the welding capability for various thicknesses of materials by power supply of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7025 | .72823 | 6 |
| Satisfaction on the Field network compatible and reduce cable runs provided by robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6992 | .73994 | 7 |
| Satisfaction on the Software PLC Function of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6975 | .74658 | 8 |
| Satisfaction on the hanging installation capability (Ceiling/Wall type) of Manipulate if Arc Welding Robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6775 | .75824 | 9 |
| Satisfaction on the Data Management with Ethernet of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6742 | .73608 | 10 |
| Satisfaction on the changeable arm (Arm side) of manipulator for arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6650 | .73083 | 11 |
| Valid N (listwise) | 396 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Flexibility and Adaptability in Use is “Satisfaction on the compatibility to abundant applications of the robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.7619 which is close to “5 = Very High Satisfaction”. Meanwhile, the least satisfaction factor of Flexibility and Adaptability in Use is “Satisfaction on the changeable arm (Arm side) of the manipulator for arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.6650**.**

**Table 5.10: Descriptives: Size**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the size of welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7268 | .71808 | 1 |
| Satisfaction on the size of manipulator of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6917 | .80682 | 2 |
| Satisfaction on the size of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6150 | .71977 | 3 |
| Valid N (listwise) | 398 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Size is “Satisfaction on the size of welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.7268, which is close to “5 = Very High Satisfaction”. Meanwhile, the least satisfaction factor of Size is “Satisfaction on the size of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.6150.

**Table 5.11: Descriptives: Weight**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the weight of welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6942 | .81243 | 1 |
| Satisfaction on the weight of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6500 | .85106 | 2 |
| Satisfaction on the weight of manipulator of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.5550 | .88540 | 3 |
| Valid N (listwise) | 399 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Weight is "Satisfaction on the weight of welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]" by mean equal to 3.6942, which is close to "5 = Very High Satisfaction". Meanwhile, the least satisfaction factor of Weight is "Satisfaction on the weight of manipulator of arc welding robot from Uni Arc Co., Ltd. [UNAC]" by mean equal to 3.5550.

**Table 5.12: Descriptives: Speed**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the welding speed provided by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7575 | .74839 | 1 |
| Satisfaction on the speed of robot controller (Processing time) of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7300 | .72347 | 2 |
| Satisfaction on the speed of manipulator (Air-cut time) of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6975 | .74322 | 3 |
| Valid N (listwise) | 400 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Speed is “Satisfaction on the welding speed provided by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.7575, which is close to “5 = Very High Satisfaction”. Meanwhile, the least satisfaction factor of Speed is “Satisfaction on the speed of manipulator (Air-cut time) of arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.6975.

**Table 5.13: Descriptives: Warranty**

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the reserved spare parts for broken arc welding robot from Uni Arc Co., Ltd. [UNAC] | 398 | 1.00 | 5.00 | 3.7638 | .80895 | 1 |
| Satisfaction on the on-site robot checking and repairing (in warranty) of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7500 | .79944 | 2 |
| Satisfaction on the customer technical assistance (in warranty) of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7275 | .75144 | 3 |
| Satisfaction on the reserved spare part claim of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7025 | .76187 | 4 |
| Satisfaction on the one-year warranty period for arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 1.00 | 5.00 | 3.6792 | .82811 | 5 |
| Valid N (listwise) | 397 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Warranty is “Satisfaction on the reserved spare parts for broken arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.7638, which is close to “5 = Very High Satisfaction”. Meanwhile, the least satisfaction factor of Warranty is “Satisfaction on the one-year warranty period for arc welding robot from Uni Arc Co., Ltd. [UNAC]” by mean equal to 3.6792.

**Table 5.14: Descriptives: Durability**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Satisfaction on the robot welding consumable parts of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8221 | .81808 | 1 |
| Satisfaction on the robot welding spare parts of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8020 | .81345 | 2 |
| Satisfaction on the welding power source's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7393 | .74835 | 3 |
| Satisfaction on the manipulator's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6942 | .73447 | 4 |
| Satisfaction on the robot controller's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6617 | .69695 | 5 |
| Valid N (listwise) | 399 | | | | | |

From the above table, the researcher can conclude that the most satisfaction factor of Durability is "Satisfaction on the robot welding consumable parts of arc welding robot from Uni Arc Co., Ltd. [UNAC]" by mean equal to 3.8221, which is close to "5 = Very High Satisfaction". Meanwhile, the least satisfaction factor of Durability is "Satisfaction on the robot controller's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC]" by mean equal to 3.6617.

**Table 5.15: Descriptives: Product Factors of the Arc Welding Robot**

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation | Rank |
|---|---|---|---|---|---|---|
| Performance in Operation | 397 | 2.00 | 5.00 | 3.7456 | .51199 | 1 |
| Durability | 399 | 2.00 | 5.00 | 3.7439 | .62209 | 2 |
| Speed | 400 | 2.00 | 5.00 | 3.7283 | .63988 | 3 |
| Warranty | 397 | 2.00 | 5.00 | 3.7239 | .66161 | 4 |
| Flexibility and Adaptability in Use | 396 | 2.00 | 5.00 | 3.7155 | .50861 | 5 |
| Size | 398 | 2.00 | 5.00 | 3.6767 | .66026 | 6 |
| Reliability | 399 | 2.00 | 5.00 | 3.6683 | .58931 | 7 |
| Weight | 399 | 2.00 | 5.00 | 3.6332 | .76713 | 8 |
| Technical Sophisticate | 397 | 1.75 | 5.00 | 3.5894 | .63629 | 9 |
| Valid N (listwise) | 384 | | | | | |

From the above table, the researcher can conclude that the most satisfaction of product factors of arc welding robot is “Performance in Operation” by mean equal to 3.7456, which is close to “5 = Very High Satisfaction”. Meanwhile, the least satisfaction of product factors of arc welding robot is “Technical Sophisticate” by mean equal to 3.5894.

## 5.4 Inferential Statistics

According to research **objective number two**, which is “To identify the difference among the user’s characteristic profiles and their satisfaction toward the arc welding robots of UNAC”, the results are shown below (Testing of hypotheses 1 to 45).

### 5.4.1 Independent Sample T-test

Independent Sample T-test was applied to analyze the difference between male and female on satisfaction for Product Factors of the arc welding robots of UNAC, which are Performance in Operation, Reliability, Technical Sophisticate, Flexibility and Adaptability in Use, Size, Weight, Speed, Warranty and Durability. By testing of hypotheses 1 to 9, the results are shown from Table 5.16 to 5.24.

**Table 5.16: Independent Sample T-test (Performance in Operation)**

**H1**: The level of Performance in Operation is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Performance in Operation | Equal variances assumed | .041 | .839 | 2.517 | 393 | .012 | .14352 | .05703 | .03141 | .25564 |
| | Equal variances not assumed | | | 2.502 | 195.653 | .013 | .14352 | .05737 | .03038 | .25667 |

Ho: There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.839 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Performance in Operation**.**

**According to "t-test for Equality of Means", Sig. value is equal to 0.012 < 0.05.** Thus, Reject Ho and Accept Ha. There is a difference in mean of Performance in Operation between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Performance in Operation | Male | 285 | 3.7881 | .50609 | .02998 |
| | Female | 110 | 3.6445 | .51306 | .04892 |

The male respondents have greater satisfaction toward Performance in Operation than the female ones (3.7881 > 3.6445).

**Table 5.17: Independent Sample T-test (Reliability)**

**H2**: The level of Reliability is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Reliability | Equal variances assumed | 2.761 | .097 | 2.019 | 395 | .044 | .13272 | .06573 | .00350 | .26194 |
| | Equal variances not assumed | | | 1.954 | 185.398 | .052 | .13272 | .06791 | -.00125 | .26669 |

Ho: There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.097 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Reliability.

**According to "t-test for Equality of Means", Sig. value is equal to 0.044 < 0.05.** Thus, Reject Ho and Accept Ha. There is a difference in mean of Reliability between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Reliability | Male | 287 | 3.7085 | .57380 | .03387 |
| | Female | 110 | 3.5758 | .61730 | .05886 |

The male respondents have greater satisfaction toward Reliability than the female ones (3.7085 > 3.5758).

**Table 5.18: Independent Sample T-test (Technical Sophisticate)**

**H3**: The level of Technical Sophisticate is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Technical Sophisticate | Equal variances assumed | .024 | .878 | 1.164 | 393 | .245 | .08349 | .07173 | -.05753 | .22451 |
| | Equal variances not assumed | | | 1.157 | 193.064 | .249 | .08349 | .07214 | -.05879 | .22577 |

Ho: There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.878 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Technical Sophisticate**.**

**According to "t-test for Equality of Means", Sig. value is equal to 0.249 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. There is no difference in mean of Technical Sophisticate between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Technical Sophisticate | Male | 286 | 3.6110 | .63498 | .03755 |
| | Female | 109 | 3.5275 | .64311 | .06160 |

**Table 5.19: Independent Sample T-test (Flexibility and Adaptability in Use)**

**H4**: The level of Flexibility and Adaptability in Use is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Flexibility and Adaptability in use | Equal variances assumed | .419 | .518 | 2.765 | 392 | .006 | .15732 | .05690 | .04546 | .26917 |
| | Equal variances not assumed | | | 2.667 | 182.392 | .008 | .15732 | .05899 | .04093 | .27370 |

Ho: There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.518 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Flexibility and Adaptability in Use.

**According to "t-test for Equality of Means", Sig. value is equal to 0.006 < 0.05.** Thus, Reject Ho and Accept Ha. There is a difference in mean of Flexibility and Adaptability in Use between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Flexibility and Adaptability in use | Male | 285 | 3.7605 | .49344 | .02923 |
| | Female | 109 | 3.6032 | .53491 | .05123 |

The male respondents have greater satisfaction toward Flexibility and Adaptability in Use than the female ones (3.7605 > 3.6032).

**Table 5.20: Independent Sample T-test (Size)**

**H5**: The level of Size is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Size | Equal variances assumed | 4.595 | .033 | 1.931 | 394 | .054 | .14289 | .07399 | -.00257 | .28835 |
| | Equal variances not assumed | | | 1.817 | 176.272 | .071 | .14289 | .07863 | -.01229 | .29807 |

Ho: There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Size on arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.033 < 0.05.** Thus, Reject Ho and Accept Ha. Equal Variance is not assumed in Size.

**According to "t-test for Equality of Means", Sig. value is equal to 0.071 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. There is no difference in mean of Size between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Size | Male | 286 | 3.7156 | .63240 | .03739 |
| | Female | 110 | 3.5727 | .72544 | .06917 |

**Table 5.21: Independent Sample T-test (Weight)**

**H6**: The level of Weight is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Weight | Equal variances assumed | .260 | .610 | 4.227 | 395 | .000 | .35765 | .08461 | .19130 | .52400 |
| | Equal variances not assumed | | | 4.166 | 189.317 | .000 | .35765 | .08584 | .18831 | .52698 |

Ho: There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.610 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Weight.

**According to "t-test for Equality of Means", Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha. There is a difference in mean of Weight between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Weight | Male | 288 | 3.7338 | .74570 | .04394 |
| | Female | 109 | 3.3761 | .76994 | .07375 |

The male respondents have greater satisfaction toward Weight than the female ones (3.7338 > 3.3761).

**Table 5.22: Independent Sample T-test (Speed)**

**H7**: The level of Speed is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Speed | Equal variances assumed | .090 | .764 | 2.847 | 396 | .005 | .20290 | .07126 | .06280 | .34301 |
| | Equal variances not assumed | | | 2.838 | 195.928 | .005 | .20290 | .07150 | .06189 | .34392 |

Ho: There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.764 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Speed.

**According to "t-test for Equality of Means", Sig. value is equal to 0.005 < 0.05.** Thus, Reject Ho and Accept Ha. There is a difference in mean of Speed between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Speed | Male | 288 | 3.7847 | .63450 | .03739 |
| | Female | 110 | 3.5818 | .63925 | .06095 |

The male respondents have greater satisfaction toward Speed than the female ones (3.7847 > 3.5818).

**Table 5.23: Independent Sample T-test (Warranty)**

**H8**: The level of Warranty is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Warranty | Equal variances assumed | .015 | .903 | 3.790 | 393 | .000 | .27735 | .07318 | .13348 | .42122 |
| | Equal variances not assumed | | | 3.741 | 192.989 | .000 | .27735 | .07413 | .13114 | .42357 |

Ho: There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.903 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Warranty.

**According to "t-test for Equality of Means", Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha. There is a difference in mean of Warranty between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Warranty | Male | 285 | 3.8028 | .64654 | .03830 |
| | Female | 110 | 3.5255 | .66573 | .06348 |

The male respondents have greater satisfaction toward Warranty than the female ones (3.8028 > 3.5255).

**Table 5.24: Independent Sample T-test (Durability)**

**H9**: The level of Durability is different in mean between Male and Female.

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Durability | Equal variances assumed | .419 | .518 | 2.260 | 395 | .024 | .15724 | .06957 | .02048 | .29401 |
| | Equal variances not assumed | | | 2.274 | 199.922 | .024 | .15724 | .06915 | .02089 | .29360 |

Ho: There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by gender ($\mu_1 = \mu_2$).

Ha: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$).

**According to "Levene's Test", Sig. value is equal to 0.518 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Equal Variance is assumed in Durability.

**According to "t-test for Equality of Means", Sig. value is equal to 0.024 < 0.05.** Thus, Reject Ho and Accept Ha. There is a difference in mean of Durability between Male and Female.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Durability | Male | 287 | 3.7882 | .62265 | .03675 |
| | Female | 110 | 3.6309 | .61432 | .05857 |

The male respondents have greater satisfaction toward Durability than the female ones (3.7882 > 3.6309).

**5.4.2 One Way ANOVA (Interval & Nominal Scale)**

Analyses of variance (ANOVA) technique have been applied for hypotheses testing and analyzing the difference between the respondents' characteristic profiles toward satisfaction for Product Factors of the arc welding robots of UNAC including Performance in Operation, Reliability, Technical Sophisticate, Flexibility and Adaptability in Use, Size, Weight, Speed, Warranty and Durability. By testing of hypotheses 10 to 45, the results are shown in Table 5.20 to 5.55 below.

**Table 5.25: One Way ANOVA (Performance in Operation)**

**H10:** There is a difference in the mean of Performance in Operation among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Performance in Operation

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Under 22 | 51 | 4.1255 | .43259 | .06058 | 4.0038 | 4.2472 | 2.00 | 4.70 |
| 22-34 | 265 | 3.7445 | .50293 | .03089 | 3.6837 | 3.8054 | 2.30 | 4.90 |
| 35-54 | 68 | 3.5191 | .47324 | .05739 | 3.4046 | 3.6337 | 2.60 | 5.00 |
| 55-64 | 10 | 3.4600 | .25473 | .08055 | 3.2778 | 3.6422 | 2.90 | 3.80 |
| Over 64 | 2 | 3.5000 | .42426 | .30000 | -.3119 | 7.3119 | 3.20 | 3.80 |
| Total | 396 | 3.7465 | .51234 | .02575 | 3.6958 | 3.7971 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Performance in Operation.)

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 11.784 | 4 | 2.946 | 12.535 | .000 |
| Within Groups | 91.901 | 391 | .235 | | |
| Total | 103.685 | 395 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Performance in Operation of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Under 22 | 22-34 | .38096* | .07413 | .000 | .2352 | .5267 |
| | 35-54 | .60637* | .08981 | .000 | .4298 | .7829 |
| | 55-64 | .66549* | .16767 | .000 | .3358 | .9951 |
| | Over 64 | .62549 | .34947 | .074 | -.0616 | 1.3126 |
| 22-34 | Under 22 | -.38096* | .07413 | .000 | -.5267 | -.2352 |
| | 35-54 | .22541* | .06590 | .001 | .0958 | .3550 |
| | 55-64 | .28453 | .15618 | .069 | -.0225 | .5916 |
| | Over 64 | .24453 | .34410 | .478 | -.4320 | .9211 |
| 35-54 | Under 22 | -.60637* | .08981 | .000 | -.7829 | -.4298 |
| | 22-34 | -.22541* | .06590 | .001 | -.3550 | -.0958 |
| | 55-64 | .05912 | .16420 | .719 | -.2637 | .3819 |
| | Over 64 | .01912 | .34782 | .956 | -.6647 | .7029 |
| 55-64 | Under 22 | -.66549* | .16767 | .000 | -.9951 | -.3358 |
| | 22-34 | -.28453 | .15618 | .069 | -.5916 | .0225 |
| | 35-54 | -.05912 | .16420 | .719 | -.3819 | .2637 |
| | Over 64 | -.04000 | .37553 | .915 | -.7783 | .6983 |
| Over 64 | Under 22 | -.62549 | .34947 | .074 | -1.3126 | .0616 |
| | 22-34 | -.24453 | .34410 | .478 | -.9211 | .4320 |
| | 35-54 | -.01912 | .34782 | .956 | -.7029 | .6647 |
| | 55-64 | .04000 | .37553 | .915 | -.6983 | .7783 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have age under 22 years old have greater satisfaction on Performance in Operation of the arc welding robots of UNAC than those are who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05), followed by those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05) and those who have ages between 55 and 64 years old (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.38096), (0.60637) and (0.66549), respectively.

Moreover, the researcher found that those who have ages between 22 and 34 years old have greater satisfaction on Performance in Operation of the arc welding robots of UNAC than those who have ages between 35 and 54 years old (Sig. value = 0.001 < 0.05); by mean difference is equal to (0.22541).

**Table 5.26: One Way ANOVA (Reliability)**

**H11:** There is a difference in the mean of Reliability among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Reliability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Under 22 | 52 | 4.0769 | .47424 | .06577 | 3.9449 | 4.2090 | 3.00 | 5.00 |
| 22-34 | 266 | 3.6303 | .59552 | .03651 | 3.5584 | 3.7022 | 2.00 | 5.00 |
| 35-54 | 68 | 3.5294 | .55010 | .06671 | 3.3963 | 3.6626 | 2.00 | 5.00 |
| 55-64 | 10 | 3.5333 | .39126 | .12373 | 3.2534 | 3.8132 | 2.67 | 4.00 |
| Over 64 | 2 | 3.5000 | .70711 | .50000 | -2.8531 | 9.8531 | 3.00 | 4.00 |
| Total | 398 | 3.6683 | .59005 | .02958 | 3.6102 | 3.7265 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Reliability.)

**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.617 | 4 | 2.654 | 8.174 | .000 |
| Within Groups | 127.604 | 393 | .325 | | |
| Total | 138.221 | 397 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Reliability on arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Under 22 | 22-34 | .44660* | .08640 | .000 | .2767 | .6165 |
| | 35-54 | .54751* | .10497 | .000 | .3411 | .7539 |
| | 55-64 | .54359* | .19676 | .006 | .1568 | .9304 |
| | Over 64 | .57692 | .41060 | .161 | -.2303 | 1.3842 |
| 22-34 | Under 22 | -.44660* | .08640 | .000 | -.6165 | -.2767 |
| | 35-54 | .10091 | .07743 | .193 | -.0513 | .2531 |
| | 55-64 | .09699 | .18355 | .597 | -.2639 | .4579 |
| | Over 64 | .13033 | .40443 | .747 | -.6648 | .9255 |
| 35-54 | Under 22 | -.54751* | .10497 | .000 | -.7539 | -.3411 |
| | 22-34 | -.10091 | .07743 | .193 | -.2531 | .0513 |
| | 55-64 | -.00392 | .19299 | .984 | -.3833 | .3755 |
| | Over 64 | .02941 | .40880 | .943 | -.7743 | .8331 |
| 55-64 | Under 22 | -.54359* | .19676 | .006 | -.9304 | -.1568 |
| | 22-34 | -.09699 | .18355 | .597 | -.4579 | .2639 |
| | 35-54 | .00392 | .19299 | .984 | -.3755 | .3833 |
| | Over 64 | .03333 | .44138 | .940 | -.8344 | .9011 |
| Over 64 | Under 22 | -.57692 | .41060 | .161 | -1.3842 | .2303 |
| | 22-34 | -.13033 | .40443 | .747 | -.9255 | .6648 |
| | 35-54 | -.02941 | .40880 | .943 | -.8331 | .7743 |
| | 55-64 | -.03333 | .44138 | .940 | -.9011 | .8344 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have age under 22 years old have greater satisfaction on Reliability of the arc welding robots of UNAC than those who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05), followed by those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05) and those who have ages between 55 and 64 years old (Sig. value = 0.006 < 0.05); by mean difference are equal to (0.44660), (0.54751) and (0.54359), respectively.

**Table 5.27: One Way ANOVA (Technical Sophisticate)**

**H12:** There is a difference in the mean of Technical Sophisticate among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Technical Sophisticate

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Under 22 | 52 | 3.9471 | .72817 | .10098 | 3.7444 | 4.1498 | 2.00 | 5.00 |
| 22-34 | 266 | 3.5648 | .60249 | .03694 | 3.4921 | 3.6376 | 2.00 | 5.00 |
| 35-54 | 66 | 3.4053 | .61200 | .07533 | 3.2549 | 3.5558 | 1.75 | 4.75 |
| 55-64 | 10 | 3.6250 | .59219 | .18727 | 3.2014 | 4.0486 | 2.75 | 4.75 |
| Over 64 | 2 | 3.5000 | .70711 | .50000 | -2.8531 | 9.8531 | 3.00 | 4.00 |
| Total | 396 | 3.5896 | .63708 | .03201 | 3.5267 | 3.6526 | 1.75 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Technical Sophisticate.)

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 9.080 | 4 | 2.270 | 5.869 | .000 |
| Within Groups | 151.238 | 391 | .387 | | |
| Total | 160.318 | 395 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Technical Sophisticate of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Under 22 | 22-34 | .38227* | .09430 | .000 | .1969 | .5677 |
| | 35-54 | .54181* | .11532 | .000 | .3151 | .7685 |
| | 55-64 | .32212 | .21475 | .134 | -.1001 | .7443 |
| | Over 64 | .44712 | .44815 | .319 | -.4340 | 1.3282 |
| 22-34 | Under 22 | -.38227* | .09430 | .000 | -.5677 | -.1969 |
| | 35-54 | .15955 | .08553 | .063 | -.0086 | .3277 |
| | 55-64 | -.06015 | .20033 | .764 | -.4540 | .3337 |
| | Over 64 | .06485 | .44142 | .883 | -.8030 | .9327 |
| 35-54 | Under 22 | -.54181* | .11532 | .000 | -.7685 | -.3151 |
| | 22-34 | -.15955 | .08553 | .063 | -.3277 | .0086 |
| | 55-64 | -.21970 | .21105 | .299 | -.6346 | .1952 |
| | Over 64 | -.09470 | .44638 | .832 | -.9723 | .7829 |
| 55-64 | Under 22 | -.32212 | .21475 | .134 | -.7443 | .1001 |
| | 22-34 | .06015 | .20033 | .764 | -.3337 | .4540 |
| | 35-54 | .21970 | .21105 | .299 | -.1952 | .6346 |
| | Over 64 | .12500 | .48175 | .795 | -.8221 | 1.0721 |
| Over 64 | Under 22 | -.44712 | .44815 | .319 | -1.3282 | .4340 |
| | 22-34 | -.06485 | .44142 | .883 | -.9327 | .8030 |
| | 35-54 | .09470 | .44638 | .832 | -.7829 | .9723 |
| | 55-64 | -.12500 | .48175 | .795 | -1.0721 | .8221 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have ages under 22 years old have greater satisfaction on Technical Sophisticate of the arc welding robots of UNAC than those who have ages between 22 to34 years old (Sig. value = 0.000 < 0.05) and than those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.38227) and (0.54181), respectively.

**Table 5.28: One Way ANOVA (Flexibility and Adaptability in Use)**

**H13:** There is a difference in the mean of Flexibility and Adaptability in Use among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Flexibility and Adaptability in use

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Under 22 | 52 | 4.0176 | .40769 | .05654 | 3.9041 | 4.1311 | 2.83 | 4.50 |
| 22-34 | 264 | 3.7159 | .51009 | .03139 | 3.6541 | 3.7777 | 2.00 | 5.00 |
| 35-54 | 67 | 3.4925 | .46187 | .05643 | 3.3799 | 3.6052 | 2.33 | 4.50 |
| 55-64 | 10 | 3.6833 | .52675 | .16657 | 3.3065 | 4.0602 | 2.92 | 5.00 |
| Over 64 | 2 | 3.5000 | .70711 | .50000 | -2.8531 | 9.8531 | 3.00 | 4.00 |
| Total | 395 | 3.7158 | .50921 | .02562 | 3.6655 | 3.7662 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by age level → $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by age level → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Flexibility and Adaptability in Use.)

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 8.181 | 4 | 2.045 | 8.487 | .000 |
| Within Groups | 93.983 | 390 | .241 | | |
| Total | 102.164 | 394 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Under 22 | 22-34 | .30172* | .07448 | .000 | .1553 | .4481 |
| | 35-54 | .52509* | .09072 | .000 | .3467 | .7035 |
| | 55-64 | .33429* | .16951 | .049 | .0010 | .6676 |
| | Over 64 | .51763 | .35373 | .144 | -.1778 | 1.2131 |
| 22-34 | Under 22 | -.30172* | .07448 | .000 | -.4481 | -.1553 |
| | 35-54 | .22337* | .06715 | .001 | .0913 | .3554 |
| | 55-64 | .03258 | .15815 | .837 | -.2784 | .3435 |
| | Over 64 | .21591 | .34843 | .536 | -.4691 | .9009 |
| 35-54 | Under 22 | -.52509* | .09072 | .000 | -.7035 | -.3467 |
| | 22-34 | -.22337* | .06715 | .001 | -.3554 | -.0913 |
| | 55-64 | -.19080 | .16642 | .252 | -.5180 | .1364 |
| | Over 64 | -.00746 | .35226 | .983 | -.7000 | .6851 |
| 55-64 | Under 22 | -.33429* | .16951 | .049 | -.6676 | -.0010 |
| | 22-34 | -.03258 | .15815 | .837 | -.3435 | .2784 |
| | 35-54 | .19080 | .16642 | .252 | -.1364 | .5180 |
| | Over 64 | .18333 | .38025 | .630 | -.5643 | .9309 |
| Over 64 | Under 22 | -.51763 | .35373 | .144 | -1.2131 | .1778 |
| | 22-34 | -.21591 | .34843 | .536 | -.9009 | .4691 |
| | 35-54 | .00746 | .35226 | .983 | -.6851 | .7000 |
| | 55-64 | -.18333 | .38025 | .630 | -.9309 | .5643 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have ages under 22 years old have greater satisfaction on Flexibility and Adaptability of the arc welding robots of UNAC than those who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05), followed by those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05) and those who have ages between 55 and 64 years old (Sig. value = 0.049 < 0.05); by mean difference are equal to (0.30172), (0.52509) and (0.33429), respectively.

Moreover, the researcher also found that those who have ages between 22 and 34 years old have greater satisfaction on Flexibility and Adaptability of the arc welding robots of UNAC than those who have ages between 35 and 54 years old (Sig. value = 0.001 < 0.05); by mean difference is equal to (0.22337).

**Table 5.29: One Way ANOVA (Size)**

**H14:** There is a difference in the mean of Size among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Size

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Under 22 | 52 | 4.1474 | .55391 | .07681 | 3.9932 | 4.3016 | 2.67 | 5.00 |
| 22-34 | 265 | 3.6478 | .64750 | .03978 | 3.5695 | 3.7261 | 2.00 | 5.00 |
| 35-54 | 68 | 3.4853 | .63984 | .07759 | 3.3304 | 3.6402 | 2.00 | 5.00 |
| 55-64 | 10 | 3.4000 | .51640 | .16330 | 3.0306 | 3.7694 | 3.00 | 4.00 |
| Over 64 | 2 | 3.1667 | 1.17851 | .83333 | -7.4218 | 13.7552 | 2.33 | 4.00 |
| Total | 397 | 3.6767 | .66110 | .03318 | 3.6115 | 3.7420 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Size.)

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 15.521 | 4 | 3.880 | 9.655 | .000 |
| Within Groups | 157.550 | 392 | .402 | | |
| Total | 173.071 | 396 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Size of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .49964* | .09615 | .000 | .3106 | .6887 |
| | 35-54 | .66214* | .11679 | .000 | .4325 | .8918 |
| | 55-64 | .74744* | .21891 | .001 | .3171 | 1.1778 |
| | Over 64 | .98077* | .45682 | .032 | .0826 | 1.8789 |
| 22-34 | Under 22 | -.49964* | .09615 | .000 | -.6887 | -.3106 |
| | 35-54 | .16250 | .08618 | .060 | -.0069 | .3319 |
| | 55-64 | .24780 | .20422 | .226 | -.1537 | .6493 |
| | Over 64 | .48113 | .44997 | .286 | -.4035 | 1.3658 |
| 35-54 | Under 22 | -.66214* | .11679 | .000 | -.8918 | -.4325 |
| | 22-34 | -.16250 | .08618 | .060 | -.3319 | .0069 |
| | 55-64 | .08529 | .21471 | .691 | -.3368 | .5074 |
| | Over 64 | .31863 | .45483 | .484 | -.5756 | 1.2128 |
| 55-64 | Under 22 | -.74744* | .21891 | .001 | -1.1778 | -.3171 |
| | 22-34 | -.24780 | .20422 | .226 | -.6493 | .1537 |
| | 35-54 | -.08529 | .21471 | .691 | -.5074 | .3368 |
| | Over 64 | .23333 | .49107 | .635 | -.7321 | 1.1988 |
| Over 64 | Under 22 | -.98077* | .45682 | .032 | -1.8789 | -.0826 |
| | 22-34 | -.48113 | .44997 | .286 | -1.3658 | .4035 |
| | 35-54 | -.31863 | .45483 | .484 | -1.2128 | .5756 |
| | 55-64 | -.23333 | .49107 | .635 | -1.1988 | .7321 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have age under 22 years old have greater satisfaction on size of the arc welding robots of UNAC than those are who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05); flowing with those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05), those who have ages between 55 and 64 years old (Sig. value = 0.001 < 0.05) those who have age over 64 years old (Sig. value = 0.032 < 0.05); by mean difference are equal to (0.49964), (0.66214), (0.74744) and (0.98077), respectively.

**Table 5.30: One Way ANOVA (Weight)**

**H15:** There is a difference in the mean of Weight among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Weight

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Under 22 | 51 | 4.0980 | .58611 | .08207 | 3.9332 | 4.2629 | 2.00 | 5.00 |
| 22-34 | 267 | 3.6841 | .74122 | .04536 | 3.5948 | 3.7735 | 2.00 | 5.00 |
| 35-54 | 68 | 3.1814 | .75625 | .09171 | 2.9983 | 3.3644 | 2.00 | 5.00 |
| 55-64 | 10 | 3.1667 | .57198 | .18088 | 2.7575 | 3.5758 | 2.00 | 4.00 |
| Over 64 | 2 | 2.8333 | .70711 | .50000 | -3.5198 | 9.1864 | 2.33 | 3.33 |
| Total | 398 | 3.6340 | .76795 | .03849 | 3.5583 | 3.7097 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Weight.)

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 29.051 | 4 | 7.263 | 13.918 | .000 |
| Within Groups | 205.080 | 393 | .522 | | |
| Total | 234.131 | 397 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Weight of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .41389* | .11039 | .000 | .1969 | .6309 |
| | 35-54 | .91667* | .13381 | .000 | .6536 | 1.1797 |
| | 55-64 | .93137* | .24983 | .000 | .4402 | 1.4225 |
| | Over 64 | 1.26471* | .52072 | .016 | .2410 | 2.2884 |
| 22-34 | Under 22 | -.41389* | .11039 | .000 | -.6309 | -.1969 |
| | 35-54 | .50277* | .09812 | .000 | .3099 | .6957 |
| | 55-64 | .51748* | .23268 | .027 | .0600 | .9749 |
| | Over 64 | .85081 | .51271 | .098 | -.1572 | 1.8588 |
| 35-54 | Under 22 | -.91667* | .13381 | .000 | -1.1797 | -.6536 |
| | 22-34 | -.50277* | .09812 | .000 | -.6957 | -.3099 |
| | 55-64 | .01471 | .24466 | .952 | -.4663 | .4957 |
| | Over 64 | .34804 | .51826 | .502 | -.6709 | 1.3669 |
| 55-64 | Under 22 | -.93137* | .24983 | .000 | -1.4225 | -.4402 |
| | 22-34 | -.51748* | .23268 | .027 | -.9749 | -.0600 |
| | 35-54 | -.01471 | .24466 | .952 | -.4957 | .4663 |
| | Over 64 | .33333 | .55955 | .552 | -.7668 | 1.4334 |
| Over 64 | Under 22 | -1.26471* | .52072 | .016 | -2.2884 | -.2410 |
| | 22-34 | -.85081 | .51271 | .098 | -1.8588 | .1572 |
| | 35-54 | -.34804 | .51826 | .502 | -1.3669 | .6709 |
| | 55-64 | -.33333 | .55955 | .552 | -1.4334 | .7668 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have ages under 22 years old have greater satisfaction on Weight of the arc welding robots of UNAC than those who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05, followed by those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05), those who have ages between 55 and 64 years old (Sig. value = 0.000 < 0.05) and those who have ages over 64 years old (Sig. value = 0.016 < 0.05); by mean difference are equal to (0.41389), (0.91667), (0.93137) and (1.26471), respectively.

Moreover, the researcher also found that those who have ages between 22 and 34 years old have greater satisfaction on Weight of the arc welding robots of UNAC than those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05) and those who have ages between 55 and 64 years old (Sig. value = 0.027 < 0.05); by mean difference are equal to (0.50277) and (0.51748), respectively.

**Table 5.31: One Way ANOVA (Speed)**

**H16:** There is a difference in the mean of Speed among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Speed

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Under 22 | 52 | 4.2436 | .42326 | .05870 | 4.1258 | 4.3614 | 3.00 | 5.00 |
| 22-34 | 267 | 3.6879 | .64563 | .03951 | 3.6101 | 3.7657 | 2.00 | 5.00 |
| 35-54 | 68 | 3.5343 | .57343 | .06954 | 3.3955 | 3.6731 | 2.00 | 5.00 |
| 55-64 | 10 | 3.4667 | .63246 | .20000 | 3.0142 | 3.9191 | 2.00 | 4.00 |
| Over 64 | 2 | 3.6667 | .47140 | .33333 | -.5687 | 7.9021 | 3.33 | 4.00 |
| Total | 399 | 3.7285 | .64067 | .03207 | 3.6654 | 3.7915 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by age level → $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by age level → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Speed.)

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 17.494 | 4 | 4.374 | 11.813 | .000 |
| Within Groups | 145.870 | 394 | .370 | | |
| Total | 163.364 | 398 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Speed of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .55570* | .09223 | .000 | .3744 | .7370 |
| | 35-54 | .70928* | .11209 | .000 | .4889 | .9296 |
| | 55-64 | .77692* | .21010 | .000 | .3639 | 1.1900 |
| | Over 64 | .57692 | .43844 | .189 | -.2851 | 1.4389 |
| 22-34 | Under 22 | -.55570* | .09223 | .000 | -.7370 | -.3744 |
| | 35-54 | .15358 | .08265 | .064 | -.0089 | .3161 |
| | 55-64 | .22122 | .19598 | .260 | -.1641 | .6065 |
| | Over 64 | .02122 | .43186 | .961 | -.8278 | .8703 |
| 35-54 | Under 22 | -.70928* | .11209 | .000 | -.9296 | -.4889 |
| | 22-34 | -.15358 | .08265 | .064 | -.3161 | .0089 |
| | 55-64 | .06765 | .20608 | .743 | -.3375 | .4728 |
| | Over 64 | -.13235 | .43653 | .762 | -.9906 | .7259 |
| 55-64 | Under 22 | -.77692* | .21010 | .000 | -1.1900 | -.3639 |
| | 22-34 | -.22122 | .19598 | .260 | -.6065 | .1641 |
| | 35-54 | -.06765 | .20608 | .743 | -.4728 | .3375 |
| | Over 64 | -.20000 | .47131 | .672 | -1.1266 | .7266 |
| Over 64 | Under 22 | -.57692 | .43844 | .189 | -1.4389 | .2851 |
| | 22-34 | -.02122 | .43186 | .961 | -.8703 | .8278 |
| | 35-54 | .13235 | .43653 | .762 | -.7259 | .9906 |
| | 55-64 | .20000 | .47131 | .672 | -.7266 | 1.1266 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have ages under 22 years old have greater satisfaction on Speed of the arc welding robots of UNAC than those who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05), followed by those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05) and those who have ages between 55 and 64 years old (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.55570), (0.70928) and (0.77692), respectively.

**Table 5.32: One Way ANOVA (Warranty)**

**H17:** There is a difference in the mean of Warranty among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

**Descriptives**

Warranty

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean: Lower Bound | 95% Confidence Interval for Mean: Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Under 22 | 52 | 4.1538 | .53522 | .07422 | 4.0048 | 4.3029 | 2.80 | 5.00 |
| 22-34 | 264 | 3.7379 | .65936 | .04058 | 3.6580 | 3.8178 | 2.00 | 5.00 |
| 35-54 | 68 | 3.4324 | .53822 | .06527 | 3.3021 | 3.5626 | 2.20 | 5.00 |
| 55-64 | 10 | 3.3800 | .72694 | .22988 | 2.8600 | 3.9000 | 2.00 | 4.60 |
| Over 64 | 2 | 2.5000 | .70711 | .50000 | -3.8531 | 8.8531 | 2.00 | 3.00 |
| Total | 396 | 3.7247 | .66225 | .03328 | 3.6593 | 3.7902 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Warranty.)

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 19.622 | 4 | 4.906 | 12.486 | .000 |
| Within Groups | 153.615 | 391 | .393 | | |
| Total | 173.237 | 395 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Warranty of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Under 22 | 22-34 | .41597* | .09510 | .000 | .2290 | .6029 |
| | 35-54 | .72149* | .11547 | .000 | .4945 | .9485 |
| | 55-64 | .77385* | .21643 | .000 | .3483 | 1.1994 |
| | Over 64 | 1.65385* | .45166 | .000 | .7659 | 2.5418 |
| 22-34 | Under 22 | -.41597* | .09510 | .000 | -.6029 | -.2290 |
| | 35-54 | .30553* | .08524 | .000 | .1379 | .4731 |
| | 55-64 | .35788 | .20193 | .077 | -.0391 | .7549 |
| | Over 64 | 1.23788* | .44489 | .006 | .3632 | 2.1126 |
| 35-54 | Under 22 | -.72149* | .11547 | .000 | -.9485 | -.4945 |
| | 22-34 | -.30553* | .08524 | .000 | -.4731 | -.1379 |
| | 55-64 | .05235 | .21229 | .805 | -.3650 | .4697 |
| | Over 64 | .93235* | .44968 | .039 | .0482 | 1.8165 |
| 55-64 | Under 22 | -.77385* | .21643 | .000 | -1.1994 | -.3483 |
| | 22-34 | -.35788 | .20193 | .077 | -.7549 | .0391 |
| | 35-54 | -.05235 | .21229 | .805 | -.4697 | .3650 |
| | Over 64 | .88000 | .48552 | .071 | -.0746 | 1.8346 |
| Over 64 | Under 22 | -1.65385* | .45166 | .000 | -2.5418 | -.7659 |
| | 22-34 | -1.23788* | .44489 | .006 | -2.1126 | -.3632 |
| | 35-54 | -.93235* | .44968 | .039 | -1.8165 | -.0482 |
| | 55-64 | -.88000 | .48552 | .071 | -1.8346 | .0746 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have ages under 22 years old have greater satisfaction on Warranty of the arc welding robots of UNAC than those who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05), followed by those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05), those who have ages between 55 and 64 years old (Sig. value = 0.000 < 0.05) and those who have ages over 64 years old (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.41597), (0.72149), (0.77385) and (1.65385), respectively.

Moreover, the researcher also found that those who have ages between 22 and 34 years old have greater satisfaction on Warranty of the arc welding robots of UNAC than those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05) and those who have ages over 64 years old (Sig. value = 0.006); by mean difference are equal to (0.30553) and (1.23788), respectively.

**Table 5.33: One Way ANOVA (Durability)**

**H18:** There is a difference in the mean of Durability among Age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64).

Descriptives

Durability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Under 22 | 52 | 4.1731 | .45336 | .06287 | 4.0469 | 4.2993 | 2.80 | 5.00 |
| 22-34 | 267 | 3.7468 | .61217 | .03746 | 3.6731 | 3.8206 | 2.00 | 5.00 |
| 35-54 | 67 | 3.4716 | .58848 | .07189 | 3.3281 | 3.6152 | 2.00 | 4.80 |
| 55-64 | 10 | 3.4200 | .68928 | .21797 | 2.9269 | 3.9131 | 2.40 | 4.60 |
| Over 64 | 2 | 3.0000 | .00000 | .00000 | 3.0000 | 3.0000 | 3.00 | 3.00 |
| Total | 398 | 3.7442 | .62283 | .03122 | 3.6828 | 3.8056 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by age level $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$.

Ha: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal.

(Different age levels show a difference in the mean of Durability.)

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 16.702 | 4 | 4.176 | 11.952 | .000 |
| Within Groups | 137.299 | 393 | .349 | | |
| Total | 154.002 | 397 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among age level groups (Under 22, 22-34, 35-54, 55-64 and Over 64), there is a difference in satisfaction for Durability of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .42626* | .08959 | .000 | .2501 | .6024 |
| | 35-54 | .70144* | .10924 | .000 | .4867 | .9162 |
| | 55-64 | .75308* | .20409 | .000 | .3518 | 1.1543 |
| | Over 64 | 1.17308* | .42591 | .006 | .3357 | 2.0104 |
| 22-34 | Under 22 | -.42626* | .08959 | .000 | -.6024 | -.2501 |
| | 35-54 | .27517* | .08076 | .001 | .1164 | .4340 |
| | 55-64 | .32682 | .19038 | .087 | -.0475 | .7011 |
| | Over 64 | .74682 | .41951 | .076 | -.0779 | 1.5716 |
| 35-54 | Under 22 | -.70144* | .10924 | .000 | -.9162 | -.4867 |
| | 22-34 | -.27517* | .08076 | .001 | -.4340 | -.1164 |
| | 55-64 | .05164 | .20038 | .797 | -.3423 | .4456 |
| | Over 64 | .47164 | .42414 | .267 | -.3622 | 1.3055 |
| 55-64 | Under 22 | -.75308* | .20409 | .000 | -1.1543 | -.3518 |
| | 22-34 | -.32682 | .19038 | .087 | -.7011 | .0475 |
| | 35-54 | -.05164 | .20038 | .797 | -.4456 | .3423 |
| | Over 64 | .42000 | .45784 | .360 | -.4801 | 1.3201 |
| Over 64 | Under 22 | -1.17308* | .42591 | .006 | -2.0104 | -.3357 |
| | 22-34 | -.74682 | .41951 | .076 | -1.5716 | .0779 |
| | 35-54 | -.47164 | .42414 | .267 | -1.3055 | .3622 |
| | 55-64 | -.42000 | .45784 | .360 | -1.3201 | .4801 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have ages under 22 years old have greater satisfaction on Durability of the arc welding robots of UNAC than those who have ages between 22 and 34 years old (Sig. value = 0.000 < 0.05), followed by those who have ages between 35 and 54 years old (Sig. value = 0.000 < 0.05), those who have ages between 55 and 64 years old (Sig. value = 0.000 < 0.05) and those who have ages over 64 years old (Sig. = 0.006 < 0.05); by mean difference are equal to (0.42626), (0.70144), (0.75308) and (1.17308), respectively.

Moreover, the researcher also found that those who have ages between 22 and 34 years old have greater satisfaction on Durability of the arc welding robots of UNAC than those who have ages between 35 and 54 years old (Sig. value = 0.001 < 0.05); by mean difference is equal to (0.27517).

**Table 5.34: One Way ANOVA (Performance in Operation)**

**H19:** There is a difference in the mean of Performance in Operation among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Performance in Operation

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below 10,000 baht | 96 | 4.0375 | .54197 | .05532 | 3.9277 | 4.1473 | 2.00 | 4.90 |
| 10,000-20,000 baht | 181 | 3.7680 | .46924 | .03488 | 3.6991 | 3.8368 | 2.50 | 4.60 |
| 20,001-30,000 baht | 91 | 3.4857 | .42179 | .04422 | 3.3979 | 3.5736 | 2.30 | 5.00 |
| 30,001-40,000 baht | 24 | 3.4792 | .35993 | .07347 | 3.3272 | 3.6312 | 2.80 | 4.20 |
| 40,001-50,000 baht | 3 | 3.3333 | .37859 | .21858 | 2.3929 | 4.2738 | 2.90 | 3.60 |
| Above 50,000 baht | 2 | 3.3500 | .21213 | .15000 | 1.4441 | 5.2559 | 3.20 | 3.50 |
| Total | 397 | 3.7456 | .51199 | .02570 | 3.6951 | 3.7961 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Performance in Operation.)

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 16.943 | 5 | 3.389 | 15.253 | .000 |
| Within Groups | 86.862 | 391 | .222 | | |
| Total | 103.805 | 396 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Performance in Operation of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .26954* | .05951 | .000 | .1525 | .3865 |
| | 20,001-30,000 baht | .55179* | .06896 | .000 | .4162 | .6874 |
| | 30,001-40,000 baht | .55833* | .10757 | .000 | .3469 | .7698 |
| | 40,001-50,000 baht | .70417* | .27634 | .011 | .1609 | 1.2475 |
| | Above 50,000 baht | .68750* | .33674 | .042 | .0255 | 1.3495 |
| 10,000-20,000 baht | Below 10,000 baht | -.26954* | .05951 | .000 | -.3865 | -.1525 |
| | 20,001-30,000 baht | .28224* | .06057 | .000 | .1632 | .4013 |
| | 30,001-40,000 baht | .28879* | .10239 | .005 | .0875 | .4901 |
| | 40,001-50,000 baht | .43462 | .27437 | .114 | -.1048 | .9740 |
| | Above 50,000 baht | .41796 | .33512 | .213 | -.2409 | 1.0768 |
| 20,001-30,000 baht | Below 10,000 baht | -.55179* | .06896 | .000 | -.6874 | -.4162 |
| | 10,000-20,000 baht | -.28224* | .06057 | .000 | -.4013 | -.1632 |
| | 30,001-40,000 baht | .00655 | .10816 | .952 | -.2061 | .2192 |
| | 40,001-50,000 baht | .15238 | .27657 | .582 | -.3914 | .6961 |
| | Above 50,000 baht | .13571 | .33692 | .687 | -.5267 | .7981 |
| 30,001-40,000 baht | Below 10,000 baht | -.55833* | .10757 | .000 | -.7698 | -.3469 |
| | 10,000-20,000 baht | -.28879* | .10239 | .005 | -.4901 | -.0875 |
| | 20,001-30,000 baht | -.00655 | .10816 | .952 | -.2192 | .2061 |
| | 40,001-50,000 baht | .14583 | .28863 | .614 | -.4216 | .7133 |
| | Above 50,000 baht | .12917 | .34689 | .710 | -.5528 | .8112 |
| 40,001-50,000 baht | Below 10,000 baht | -.70417* | .27634 | .011 | -1.2475 | -.1609 |
| | 10,000-20,000 baht | -.43462 | .27437 | .114 | -.9740 | .1048 |
| | 20,001-30,000 baht | -.15238 | .27657 | .582 | -.6961 | .3914 |
| | 30,001-40,000 baht | -.14583 | .28863 | .614 | -.7133 | .4216 |
| | Above 50,000 baht | -.01667 | .43026 | .969 | -.8626 | .8293 |
| Above 50,000 baht | Below 10,000 baht | -.68750* | .33674 | .042 | -1.3495 | -.0255 |
| | 10,000-20,000 baht | -.41796 | .33512 | .213 | -1.0768 | .2409 |
| | 20,001-30,000 baht | -.13571 | .33692 | .687 | -.7981 | .5267 |
| | 30,001-40,000 baht | -.12917 | .34689 | .710 | -.8112 | .5528 |
| | 40,001-50,000 baht | .01667 | .43026 | .969 | -.8293 | .8626 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Performance in Operation of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.000 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05), those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05), those who have income between 40,001 and 50,000 baht (Sig. value = 0.011 < 0.05) and those who have income above

50,000 baht (Sig. value = 0.042 < 0.05); by mean difference are equal to (0.26954), (0.55179) , (0.55833), (0.70417) and (0.68750), respectively.

Moreover, the researcher also found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Performance in Operation of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05) and those who have income between 30,001 and 40,000 baht (Sig. value = 0.005 < 0.05); by mean difference are equal to (0.28224) and (0.28879), respectively.

**Table 5.35: One Way ANOVA (Reliability)**

**H20:** There is a difference in the mean of Reliability among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Reliability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below 10,000 baht | 97 | 3.8969 | .59969 | .06089 | 3.7760 | 4.0178 | 2.33 | 5.00 |
| 10,000-20,000 baht | 181 | 3.6796 | .60181 | .04473 | 3.5913 | 3.7678 | 2.00 | 5.00 |
| 20,001-30,000 baht | 92 | 3.5109 | .50019 | .05215 | 3.4073 | 3.6145 | 2.00 | 5.00 |
| 30,001-40,000 baht | 24 | 3.3333 | .42846 | .08746 | 3.1524 | 3.5143 | 2.00 | 4.00 |
| 40,001-50,000 baht | 3 | 3.3333 | .57735 | .33333 | 1.8991 | 4.7676 | 2.67 | 3.67 |
| Above 50,000 baht | 2 | 3.3333 | .47140 | .33333 | -.9021 | 7.5687 | 3.00 | 3.67 |
| Total | 399 | 3.6683 | .58931 | .02950 | 3.6103 | 3.7263 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Reliability.)

**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.626 | 5 | 2.125 | 6.546 | .000 |
| Within Groups | 127.595 | 393 | .325 | | |
| Total | 138.221 | 398 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Reliability of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .21735* | .07170 | .003 | .0764 | .3583 |
| | 20,001-30,000 baht | .38604* | .08292 | .000 | .2230 | .5491 |
| | 30,001-40,000 baht | .56357* | .12990 | .000 | .3082 | .8190 |
| | 40,001-50,000 baht | .56357 | .33402 | .092 | -.0931 | 1.2203 |
| | Above 50,000 baht | .56357 | .40704 | .167 | -.2367 | 1.3638 |
| 10,000-20,000 baht | Below 10,000 baht | -.21735* | .07170 | .003 | -.3583 | -.0764 |
| | 20,001-30,000 baht | .16869* | .07296 | .021 | .0253 | .3121 |
| | 30,001-40,000 baht | .34622* | .12378 | .005 | .1029 | .5896 |
| | 40,001-50,000 baht | .34622 | .33169 | .297 | -.3059 | .9983 |
| | Above 50,000 baht | .34622 | .40513 | .393 | -.4503 | 1.1427 |
| 20,001-30,000 baht | Below 10,000 baht | -.38604* | .08292 | .000 | -.5491 | -.2230 |
| | 10,000-20,000 baht | -.16869* | .07296 | .021 | -.3121 | -.0253 |
| | 30,001-40,000 baht | .17754 | .13060 | .175 | -.0792 | .4343 |
| | 40,001-50,000 baht | .17754 | .33429 | .596 | -.4797 | .8348 |
| | Above 50,000 baht | .17754 | .40726 | .663 | -.6232 | .9782 |
| 30,001-40,000 baht | Below 10,000 baht | -.56357* | .12990 | .000 | -.8190 | -.3082 |
| | 10,000-20,000 baht | -.34622* | .12378 | .005 | -.5896 | -.1029 |
| | 20,001-30,000 baht | -.17754 | .13060 | .175 | -.4343 | .0792 |
| | 40,001-50,000 baht | .00000 | .34893 | 1.000 | -.6860 | .6860 |
| | Above 50,000 baht | .00000 | .41936 | 1.000 | -.8245 | .8245 |
| 40,001-50,000 baht | Below 10,000 baht | -.56357 | .33402 | .092 | -1.2203 | .0931 |
| | 10,000-20,000 baht | -.34622 | .33169 | .297 | -.9983 | .3059 |
| | 20,001-30,000 baht | -.17754 | .33429 | .596 | -.8348 | .4797 |
| | 30,001-40,000 baht | .00000 | .34893 | 1.000 | -.6860 | .6860 |
| | Above 50,000 baht | .00000 | .52015 | 1.000 | -1.0226 | 1.0226 |
| Above 50,000 baht | Below 10,000 baht | -.56357 | .40704 | .167 | -1.3638 | .2367 |
| | 10,000-20,000 baht | -.34622 | .40513 | .393 | -1.1427 | .4503 |
| | 20,001-30,000 baht | -.17754 | .40726 | .663 | -.9782 | .6232 |
| | 30,001-40,000 baht | .00000 | .41936 | 1.000 | -.8245 | .8245 |
| | 40,001-50,000 baht | .00000 | .52015 | 1.000 | -1.0226 | 1.0226 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Reliability of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.003 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05) and those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.21735), (0.38604) and (0.56357), respectively.

Moreover, the researcher also found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Reliability of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.021 < 0.05) and those who have income between 30,001 and 40,000 baht (Sig. value = 0.005 < 0.05); by mean difference are equal to (0.16869) and (0.34622), respectively.

**Table 5.36: One Way ANOVA (Technical Sophisticate)**

**H21:** There is a difference in the mean of Technical Sophisticate among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Technical Sophisticate

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below 10,000 baht | 96 | 3.7813 | .72661 | .07416 | 3.6340 | 3.9285 | 2.00 | 4.75 |
| 10,000-20,000 baht | 180 | 3.6222 | .60231 | .04489 | 3.5336 | 3.7108 | 2.00 | 5.00 |
| 20,001-30,000 baht | 93 | 3.4140 | .52453 | .05439 | 3.3060 | 3.5220 | 2.00 | 4.75 |
| 30,001-40,000 baht | 23 | 3.2717 | .67804 | .14138 | 2.9785 | 3.5649 | 1.75 | 5.00 |
| 40,001-50,000 baht | 3 | 3.7500 | .25000 | .14434 | 3.1290 | 4.3710 | 3.50 | 4.00 |
| Above 50,000 baht | 2 | 3.0000 | .00000 | .00000 | 3.0000 | 3.0000 | 3.00 | 3.00 |
| Total | 397 | 3.5894 | .63629 | .03193 | 3.5266 | 3.6522 | 1.75 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Technical Sophisticate.)

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 9.682 | 5 | 1.936 | 5.026 | .000 |
| Within Groups | 150.643 | 391 | .385 | | |
| Total | 160.326 | 396 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Technical Sophisticate of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .15903* | .07845 | .043 | .0048 | .3133 |
| | 20,001-30,000 baht | .36727* | .09031 | .000 | .1897 | .5448 |
| | 30,001-40,000 baht | .50951* | .14410 | .000 | .2262 | .7928 |
| | 40,001-50,000 baht | .03125 | .36392 | .932 | -.6842 | .7467 |
| | Above 50,000 baht | .78125 | .44345 | .079 | -.0906 | 1.6531 |
| 10,000-20,000 baht | Below 10,000 baht | -.15903* | .07845 | .043 | -.3133 | -.0048 |
| | 20,001-30,000 baht | .20824* | .07927 | .009 | .0524 | .3641 |
| | 30,001-40,000 baht | .35048* | .13745 | .011 | .0803 | .6207 |
| | 40,001-50,000 baht | -.12778 | .36134 | .724 | -.8382 | .5826 |
| | Above 50,000 baht | .62222 | .44134 | .159 | -.2455 | 1.4899 |
| 20,001-30,000 baht | Below 10,000 baht | -.36727* | .09031 | .000 | -.5448 | -.1897 |
| | 10,000-20,000 baht | -.20824* | .07927 | .009 | -.3641 | -.0524 |
| | 30,001-40,000 baht | .14224 | .14455 | .326 | -.1419 | .4264 |
| | 40,001-50,000 baht | -.33602 | .36410 | .357 | -1.0519 | .3798 |
| | Above 50,000 baht | .41398 | .44360 | .351 | -.4582 | 1.2861 |
| 30,001-40,000 baht | Below 10,000 baht | -.50951* | .14410 | .000 | -.7928 | -.2262 |
| | 10,000-20,000 baht | -.35048* | .13745 | .011 | -.6207 | -.0803 |
| | 20,001-30,000 baht | -.14224 | .14455 | .326 | -.4264 | .1419 |
| | 40,001-50,000 baht | -.47826 | .38102 | .210 | -1.2274 | .2708 |
| | Above 50,000 baht | .27174 | .45759 | .553 | -.6279 | 1.1714 |
| 40,001-50,000 baht | Below 10,000 baht | -.03125 | .36392 | .932 | -.7467 | .6842 |
| | 10,000-20,000 baht | .12778 | .36134 | .724 | -.5826 | .8382 |
| | 20,001-30,000 baht | .33602 | .36410 | .357 | -.3798 | 1.0519 |
| | 30,001-40,000 baht | .47826 | .38102 | .210 | -.2708 | 1.2274 |
| | Above 50,000 baht | .75000 | .56663 | .186 | -.3640 | 1.8640 |
| Above 50,000 baht | Below 10,000 baht | -.78125 | .44345 | .079 | -1.6531 | .0906 |
| | 10,000-20,000 baht | -.62222 | .44134 | .159 | -1.4899 | .2455 |
| | 20,001-30,000 baht | -.41398 | .44360 | .351 | -1.2861 | .4582 |
| | 30,001-40,000 baht | -.27174 | .45759 | .553 | -1.1714 | .6279 |
| | 40,001-50,000 baht | -.75000 | .56663 | .186 | -1.8640 | .3640 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Technical Sophisticate of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.043 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05) and those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.15903), (0.36727) and (0.50951), respectively.

Moreover, the researcher also found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Technical Sophisticate arc of welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.009 < 0.05) and those who have income between 30,001 and 40,000 baht (Sig. value = 0.011 < 0.05); by mean difference are equal to (0.20824) and (0.35048), respectively.

**Table 5.37: One Way ANOVA (Flexibility and Adaptability in Use)**

**H22:** There is a difference in the mean of Flexibility and Adaptability in Use among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Flexibility and Adaptability in use

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below 10,000 baht | 96 | 3.9549 | .55972 | .05713 | 3.8415 | 4.0683 | 2.00 | 5.00 |
| 10,000-20,000 baht | 178 | 3.7509 | .47032 | .03525 | 3.6814 | 3.8205 | 2.33 | 4.75 |
| 20,001-30,000 baht | 93 | 3.5269 | .41651 | .04319 | 3.4411 | 3.6127 | 2.33 | 5.00 |
| 30,001-40,000 baht | 24 | 3.3056 | .33932 | .06926 | 3.1623 | 3.4488 | 2.50 | 4.17 |
| 40,001-50,000 baht | 3 | 3.6389 | .25459 | .14699 | 3.0065 | 4.2713 | 3.42 | 3.92 |
| Above 50,000 baht | 2 | 2.8750 | .17678 | .12500 | 1.2867 | 4.4633 | 2.75 | 3.00 |
| Total | 396 | 3.7155 | .50861 | .02556 | 3.6652 | 3.7657 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Flexibility and Adaptability in Use.)

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 14.496 | 5 | 2.899 | 12.895 | .000 |
| Within Groups | 87.685 | 390 | .225 | | |
| Total | 102.181 | 395 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .20392* | .06004 | .001 | .0859 | .3220 |
| | 20,001-30,000 baht | .42798* | .06899 | .000 | .2923 | .5636 |
| | 30,001-40,000 baht | .64931* | .10821 | .000 | .4366 | .8621 |
| | 40,001-50,000 baht | .31597 | .27800 | .256 | -.2306 | .8625 |
| | Above 50,000 baht | 1.07986* | .33876 | .002 | .4138 | 1.7459 |
| 10,000-20,000 baht | Below 10,000 baht | -.20392* | .06004 | .001 | -.3220 | -.0859 |
| | 20,001-30,000 baht | .22405* | .06067 | .000 | .1048 | .3433 |
| | 30,001-40,000 baht | .44538* | .10311 | .000 | .2427 | .6481 |
| | 40,001-50,000 baht | .11205 | .27606 | .685 | -.4307 | .6548 |
| | Above 50,000 baht | .87594* | .33716 | .010 | .2130 | 1.5388 |
| 20,001-30,000 baht | Below 10,000 baht | -.42798* | .06899 | .000 | -.5636 | -.2923 |
| | 10,000-20,000 baht | -.22405* | .06067 | .000 | -.3433 | -.1048 |
| | 30,001-40,000 baht | .22133* | .10856 | .042 | .0079 | .4348 |
| | 40,001-50,000 baht | -.11201 | .27814 | .687 | -.6588 | .4348 |
| | Above 50,000 baht | .65188 | .33887 | .055 | -.0144 | 1.3181 |
| 30,001-40,000 baht | Below 10,000 baht | -.64931* | .10821 | .000 | -.8621 | -.4366 |
| | 10,000-20,000 baht | -.44538* | .10311 | .000 | -.6481 | -.2427 |
| | 20,001-30,000 baht | -.22133* | .10856 | .042 | -.4348 | -.0079 |
| | 40,001-50,000 baht | -.33333 | .29037 | .252 | -.9042 | .2375 |
| | Above 50,000 baht | .43056 | .34898 | .218 | -.2556 | 1.1167 |
| 40,001-50,000 baht | Below 10,000 baht | -.31597 | .27800 | .256 | -.8625 | .2306 |
| | 10,000-20,000 baht | -.11205 | .27606 | .685 | -.6548 | .4307 |
| | 20,001-30,000 baht | .11201 | .27814 | .687 | -.4348 | .6588 |
| | 30,001-40,000 baht | .33333 | .29037 | .252 | -.2375 | .9042 |
| | Above 50,000 baht | .76389 | .43285 | .078 | -.0871 | 1.6149 |
| Above 50,000 baht | Below 10,000 baht | -1.07986* | .33876 | .002 | -1.7459 | -.4138 |
| | 10,000-20,000 baht | -.87594* | .33716 | .010 | -1.5388 | -.2130 |
| | 20,001-30,000 baht | -.65188 | .33887 | .055 | -1.3181 | .0144 |
| | 30,001-40,000 baht | -.43056 | .34898 | .218 | -1.1167 | .2556 |
| | 40,001-50,000 baht | -.76389 | .43285 | .078 | -1.6149 | .0871 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.001 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05), those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05) and those who have income above 50,000 baht (Sig. value = 0.002 < 0.05); by mean difference are equal to (0.20392), (0.42798), (0.64931) and (1.07986), respectively.

Also, the researcher found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05) ), followed by those who have income between30,001 to 40,000 baht (Sig. value = 0.000 < 0.05) and those who have income above 50,000 baht (Sig. value = 0.005 < 0.05); by mean difference are equal to (0.22405), (0.44538) and (0.87594), respectively.

Moreover, the researcher found that those who have income between 20,001 and 30,000 baht have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who have income between 30,001 and 40,000 baht (Sig. value = 0.042 < 0.05); by mean difference is equal to (0.22133).

**Table 5.38: One Way ANOVA (Size)**

**H23:** There is a difference in the mean of Size among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Size

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Below 10,000 baht | 96 | 3.9792 | .72517 | .07401 | 3.8322 | 4.1261 | 2.00 | 5.00 |
| 10,000-20,000 baht | 180 | 3.6815 | .61111 | .04555 | 3.5916 | 3.7714 | 2.00 | 5.00 |
| 20,001-30,000 baht | 93 | 3.4839 | .58051 | .06020 | 3.3643 | 3.6034 | 2.00 | 5.00 |
| 30,001-40,000 baht | 24 | 3.3333 | .49147 | .10032 | 3.1258 | 3.5409 | 2.00 | 4.00 |
| 40,001-50,000 baht | 3 | 3.3333 | .57735 | .33333 | 1.8991 | 4.7676 | 3.00 | 4.00 |
| Above 50,000 baht | 2 | 2.3333 | .00000 | .00000 | 2.3333 | 2.3333 | 2.33 | 2.33 |
| Total | 398 | 3.6767 | .66026 | .03310 | 3.6117 | 3.7418 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Size.)

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 19.037 | 5 | 3.807 | 9.690 | .000 |
| Within Groups | 154.034 | 392 | .393 | | |
| Total | 173.071 | 397 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Size of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .29769* | .07922 | .000 | .1419 | .4534 |
| | 20,001-30,000 baht | .49530* | .09120 | .000 | .3160 | .6746 |
| | 30,001-40,000 baht | .64583* | .14306 | .000 | .3646 | .9271 |
| | 40,001-50,000 baht | .64583 | .36752 | .080 | -.0767 | 1.3684 |
| | Above 50,000 baht | 1.64583* | .44784 | .000 | .7654 | 2.5263 |
| 10,000-20,000 baht | Below 10,000 baht | -.29769* | .07922 | .000 | -.4534 | -.1419 |
| | 20,001-30,000 baht | .19761* | .08005 | .014 | .0402 | .3550 |
| | 30,001-40,000 baht | .34815* | .13622 | .011 | .0803 | .6160 |
| | 40,001-50,000 baht | .34815 | .36492 | .341 | -.3693 | 1.0656 |
| | Above 50,000 baht | 1.34815* | .44571 | .003 | .4719 | 2.2244 |
| 20,001-30,000 baht | Below 10,000 baht | -.49530* | .09120 | .000 | -.6746 | -.3160 |
| | 10,000-20,000 baht | -.19761* | .08005 | .014 | -.3550 | -.0402 |
| | 30,001-40,000 baht | .15054 | .14352 | .295 | -.1316 | .4327 |
| | 40,001-50,000 baht | .15054 | .36770 | .682 | -.5724 | .8735 |
| | Above 50,000 baht | 1.15054* | .44799 | .011 | .2698 | 2.0313 |
| 30,001-40,000 baht | Below 10,000 baht | -.64583* | .14306 | .000 | -.9271 | -.3646 |
| | 10,000-20,000 baht | -.34815* | .13622 | .011 | -.6160 | -.0803 |
| | 20,001-30,000 baht | -.15054 | .14352 | .295 | -.4327 | .1316 |
| | 40,001-50,000 baht | .00000 | .38387 | 1.000 | -.7547 | .7547 |
| | Above 50,000 baht | 1.00000* | .46135 | .031 | .0930 | 1.9070 |
| 40,001-50,000 baht | Below 10,000 baht | -.64583 | .36752 | .080 | -1.3684 | .0767 |
| | 10,000-20,000 baht | -.34815 | .36492 | .341 | -1.0656 | .3693 |
| | 20,001-30,000 baht | -.15054 | .36770 | .682 | -.8735 | .5724 |
| | 30,001-40,000 baht | .00000 | .38387 | 1.000 | -.7547 | .7547 |
| | Above 50,000 baht | 1.00000 | .57223 | .081 | -.1250 | 2.1250 |
| Above 50,000 baht | Below 10,000 baht | -1.64583* | .44784 | .000 | -2.5263 | -.7654 |
| | 10,000-20,000 baht | -1.34815* | .44571 | .003 | -2.2244 | -.4719 |
| | 20,001-30,000 baht | -1.15054* | .44799 | .011 | -2.0313 | -.2698 |
| | 30,001-40,000 baht | -1.00000* | .46135 | .031 | -1.9070 | -.0930 |
| | 40,001-50,000 baht | -1.00000 | .57223 | .081 | -2.1250 | .1250 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Size of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.000 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05), those who have income between 30,001 and

40,000 baht (Sig. value = 0.000 < 0.05) and those who have income above 50,000 baht (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.29769), (0.49530), (0.64583) and (1.64583), respectively.

Also, the researcher found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Size of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.014 < 0.05), followed by those who have income between 30,001 and 40,000 baht (Sig. value = 0.011 < 0.05) and those who have income above 50,000 baht (Sing. Vale = 0.003 < 0.05); by mean difference are equal to (0.19761), (0.34815) and (1.34815), respectively.

Moreover, the researcher also found that those who have income between 20,001 and 30,000 baht have greater satisfaction on Size of the arc welding robots of UNAC than those who have income above 50,000 baht (Sing. Vale = 0.011 < 0.05); by mean difference is equal to (1.15054).

Finally, the researcher also found that those who have income between 30,001 and 40,000 baht have greater satisfaction on Size of the arc welding robots of UNAC than those who have income above 50,000 baht (Sing. Vale = 0.031 < 0.05); by mean difference is equal to (1.00000).

**Table 5.39: One Way ANOVA (Weight)**

**H24:** There is a difference in the mean of Weight among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Weight

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below 10,000 baht | 96 | 3.9931 | .71734 | .07321 | 3.8477 | 4.1384 | 2.00 | 5.00 |
| 10,000-20,000 baht | 181 | 3.6722 | .78369 | .05825 | 3.5572 | 3.7871 | 2.00 | 5.00 |
| 20,001-30,000 baht | 93 | 3.3333 | .65016 | .06742 | 3.1994 | 3.4672 | 2.00 | 5.00 |
| 30,001-40,000 baht | 24 | 3.1667 | .49147 | .10032 | 2.9591 | 3.3742 | 2.00 | 4.33 |
| 40,001-50,000 baht | 3 | 3.6667 | .57735 | .33333 | 2.2324 | 5.1009 | 3.00 | 4.00 |
| Above 50,000 baht | 2 | 2.3333 | .00000 | .00000 | 2.3333 | 2.3333 | 2.33 | 2.33 |
| Total | 399 | 3.6332 | .76713 | .03840 | 3.5577 | 3.7088 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Weight.)

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 29.676 | 5 | 5.935 | 11.403 | .000 |
| Within Groups | 204.545 | 393 | .520 | | |
| Total | 234.221 | 398 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Weight of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .32086* | .09109 | .000 | .1418 | .4999 |
| | 20,001-30,000 baht | .65972* | .10497 | .000 | .4534 | .8661 |
| | 30,001-40,000 baht | .82639* | .16464 | .000 | .5027 | 1.1501 |
| | 40,001-50,000 baht | .32639 | .42298 | .441 | -.5052 | 1.1580 |
| | Above 50,000 baht | 1.65972* | .51542 | .001 | .6464 | 2.6730 |
| 10,000-20,000 baht | Below 10,000 baht | -.32086* | .09109 | .000 | -.4999 | -.1418 |
| | 20,001-30,000 baht | .33886* | .09204 | .000 | .1579 | .5198 |
| | 30,001-40,000 baht | .50552* | .15672 | .001 | .1974 | .8136 |
| | 40,001-50,000 baht | .00552 | .41996 | .990 | -.8201 | .8312 |
| | Above 50,000 baht | 1.33886* | .51294 | .009 | .3304 | 2.3473 |
| 20,001-30,000 baht | Below 10,000 baht | -.65972* | .10497 | .000 | -.8661 | -.4534 |
| | 10,000-20,000 baht | -.33886* | .09204 | .000 | -.5198 | -.1579 |
| | 30,001-40,000 baht | .16667 | .16518 | .314 | -.1581 | .4914 |
| | 40,001-50,000 baht | -.33333 | .42319 | .431 | -1.1653 | .4987 |
| | Above 50,000 baht | 1.00000 | .51559 | .053 | -.0137 | 2.0137 |
| 30,001-40,000 baht | Below 10,000 baht | -.82639* | .16464 | .000 | -1.1501 | -.5027 |
| | 10,000-20,000 baht | -.50552* | .15672 | .001 | -.8136 | -.1974 |
| | 20,001-30,000 baht | -.16667 | .16518 | .314 | -.4914 | .1581 |
| | 40,001-50,000 baht | -.50000 | .44179 | .258 | -1.3686 | .3686 |
| | Above 50,000 baht | .83333 | .53096 | .117 | -.2106 | 1.8772 |
| 40,001-50,000 baht | Below 10,000 baht | -.32639 | .42298 | .441 | -1.1580 | .5052 |
| | 10,000-20,000 baht | -.00552 | .41996 | .990 | -.8312 | .8201 |
| | 20,001-30,000 baht | .33333 | .42319 | .431 | -.4987 | 1.1653 |
| | 30,001-40,000 baht | .50000 | .44179 | .258 | -.3686 | 1.3686 |
| | Above 50,000 baht | 1.33333* | .65858 | .044 | .0386 | 2.6281 |
| Above 50,000 baht | Below 10,000 baht | -1.65972* | .51542 | .001 | -2.6730 | -.6464 |
| | 10,000-20,000 baht | -1.33886* | .51294 | .009 | -2.3473 | -.3304 |
| | 20,001-30,000 baht | -1.00000 | .51559 | .053 | -2.0137 | .0137 |
| | 30,001-40,000 baht | -.83333 | .53096 | .117 | -1.8772 | .2106 |
| | 40,001-50,000 baht | -1.33333* | .65858 | .044 | -2.6281 | -.0386 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Weight of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.000 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05), those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05) and those who have income above 50,000 baht (Sig. value = 0.001 < 0.05); by mean difference are equal to (0.32086), (0.65972), (0.82639) and (1.65972), respectively.

Moreover, the researcher also found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Weight of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05); following those who have income between 30,001 and 40,000 baht (Sig. value = 0.001 < 0.05) and those who have income above 50,000 baht (Sig. Value = 0.009 < 0.05); by mean difference are equal to (0.33886), (0.50552) and (1.33886), respectively.

Finally, the users who have income between 40,001 and 50,000 baht per month have greater satisfaction on Weight of the arc welding robots of UNAC than those who have income above 50,000 baht (Sig. Value = 0.044 < 0.05); by mean difference are equal to (1.33333).

**Table 5.40: One Way ANOVA (Speed)**

**H25:** There is a difference in the mean of Speed among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Speed

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below 10,000 baht | 97 | 4.0722 | .66706 | .06773 | 3.9377 | 4.2066 | 2.00 | 5.00 |
| 10,000-20,000 baht | 181 | 3.7053 | .62091 | .04615 | 3.6143 | 3.7964 | 2.33 | 5.00 |
| 20,001-30,000 baht | 93 | 3.4982 | .50749 | .05262 | 3.3937 | 3.6027 | 2.00 | 4.67 |
| 30,001-40,000 baht | 24 | 3.4722 | .61319 | .12517 | 3.2133 | 3.7312 | 2.00 | 5.00 |
| 40,001-50,000 baht | 3 | 3.4444 | .38490 | .22222 | 2.4883 | 4.4006 | 3.00 | 3.67 |
| Above 50,000 baht | 2 | 3.3333 | .00000 | .00000 | 3.3333 | 3.3333 | 3.33 | 3.33 |
| Total | 400 | 3.7283 | .63988 | .03199 | 3.6654 | 3.7912 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Speed.)

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 18.616 | 5 | 3.723 | 10.134 | .000 |
| Within Groups | 144.752 | 394 | .367 | | |
| Total | 163.368 | 399 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Speed of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .36682* | .07627 | .000 | .2169 | .5168 |
| | 20,001-30,000 baht | .57396* | .08797 | .000 | .4010 | .7469 |
| | 30,001-40,000 baht | .59994* | .13819 | .000 | .3283 | .8716 |
| | 40,001-50,000 baht | .62772 | .35532 | .078 | -.0708 | 1.3263 |
| | Above 50,000 baht | .73883 | .43299 | .089 | -.1124 | 1.5901 |
| 10,000-20,000 baht | Below 10,000 baht | -.36682* | .07627 | .000 | -.5168 | -.2169 |
| | 20,001-30,000 baht | .20713* | .07733 | .008 | .0551 | .3592 |
| | 30,001-40,000 baht | .23312 | .13167 | .077 | -.0258 | .4920 |
| | 40,001-50,000 baht | .26090 | .35284 | .460 | -.4328 | .9546 |
| | Above 50,000 baht | .37201 | .43096 | .389 | -.4753 | 1.2193 |
| 20,001-30,000 baht | Below 10,000 baht | -.57396* | .08797 | .000 | -.7469 | -.4010 |
| | 10,000-20,000 baht | -.20713* | .07733 | .008 | -.3592 | -.0551 |
| | 30,001-40,000 baht | .02599 | .13877 | .852 | -.2468 | .2988 |
| | 40,001-50,000 baht | .05376 | .35555 | .880 | -.6452 | .7528 |
| | Above 50,000 baht | .16487 | .43318 | .704 | -.6868 | 1.0165 |
| 30,001-40,000 baht | Below 10,000 baht | -.59994* | .13819 | .000 | -.8716 | -.3283 |
| | 10,000-20,000 baht | -.23312 | .13167 | .077 | -.4920 | .0258 |
| | 20,001-30,000 baht | -.02599 | .13877 | .852 | -.2988 | .2468 |
| | 40,001-50,000 baht | .02778 | .37118 | .940 | -.7020 | .7575 |
| | Above 50,000 baht | .13889 | .44610 | .756 | -.7381 | 1.0159 |
| 40,001-50,000 baht | Below 10,000 baht | -.62772 | .35532 | .078 | -1.3263 | .0708 |
| | 10,000-20,000 baht | -.26090 | .35284 | .460 | -.9546 | .4328 |
| | 20,001-30,000 baht | -.05376 | .35555 | .880 | -.7528 | .6452 |
| | 30,001-40,000 baht | -.02778 | .37118 | .940 | -.7575 | .7020 |
| | Above 50,000 baht | .11111 | .55332 | .841 | -.9767 | 1.1989 |
| Above 50,000 baht | Below 10,000 baht | -.73883 | .43299 | .089 | -1.5901 | .1124 |
| | 10,000-20,000 baht | -.37201 | .43096 | .389 | -1.2193 | .4753 |
| | 20,001-30,000 baht | -.16487 | .43318 | .704 | -1.0165 | .6868 |
| | 30,001-40,000 baht | -.13889 | .44610 | .756 | -1.0159 | .7381 |
| | 40,001-50,000 baht | -.11111 | .55332 | .841 | -1.1989 | .9767 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Speed of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.000 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05)and those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.36682), (0.57396) and (0.59994), respectively.

Moreover, the researcher also found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Speed of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.008 < 0.05); by mean difference is equal to (0.20713).

**Table 5.41: One Way ANOVA (Warranty)**

**H26:** There is a difference in the mean of Warranty among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Warranty

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below 10,000 baht | 97 | 4.1072 | .66712 | .06774 | 3.9728 | 4.2417 | 2.00 | 5.00 |
| 10,000-20,000 baht | 181 | 3.7249 | .62119 | .04617 | 3.6338 | 3.8160 | 2.00 | 5.00 |
| 20,001-30,000 baht | 90 | 3.4378 | .53033 | .05590 | 3.3267 | 3.5489 | 2.00 | 5.00 |
| 30,001-40,000 baht | 24 | 3.3750 | .56665 | .11567 | 3.1357 | 3.6143 | 2.60 | 5.00 |
| 40,001-50,000 baht | 3 | 3.4667 | .50332 | .29059 | 2.2163 | 4.7170 | 3.00 | 4.00 |
| Above 50,000 baht | 2 | 2.5000 | .70711 | .50000 | -3.8531 | 8.8531 | 2.00 | 3.00 |
| Total | 397 | 3.7239 | .66161 | .03321 | 3.6586 | 3.7892 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Warranty.)

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 27.736 | 5 | 5.547 | 14.896 | .000 |
| Within Groups | 145.606 | 391 | .372 | | |
| Total | 173.343 | 396 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Warranty of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .38235* | .07679 | .000 | .2314 | .5333 |
| | 20,001-30,000 baht | .66944* | .08931 | .000 | .4938 | .8450 |
| | 30,001-40,000 baht | .73222* | .13912 | .000 | .4587 | 1.0057 |
| | 40,001-50,000 baht | .64055 | .35773 | .074 | -.0628 | 1.3439 |
| | Above 50,000 baht | 1.60722* | .43593 | .000 | .7502 | 2.4643 |
| 10,000-20,000 baht | Below 10,000 baht | -.38235* | .07679 | .000 | -.5333 | -.2314 |
| | 20,001-30,000 baht | .28708* | .07871 | .000 | .1323 | .4418 |
| | 30,001-40,000 baht | .34986* | .13257 | .009 | .0892 | .6105 |
| | 40,001-50,000 baht | .25820 | .35523 | .468 | -.4402 | .9566 |
| | Above 50,000 baht | 1.22486* | .43388 | .005 | .3718 | 2.0779 |
| 20,001-30,000 baht | Below 10,000 baht | -.66944* | .08931 | .000 | -.8450 | -.4938 |
| | 10,000-20,000 baht | -.28708* | .07871 | .000 | -.4418 | -.1323 |
| | 30,001-40,000 baht | .06278 | .14019 | .655 | -.2128 | .3384 |
| | 40,001-50,000 baht | -.02889 | .35815 | .936 | -.7330 | .6752 |
| | Above 50,000 baht | .93778* | .43627 | .032 | .0800 | 1.7955 |
| 30,001-40,000 baht | Below 10,000 baht | -.73222* | .13912 | .000 | -1.0057 | -.4587 |
| | 10,000-20,000 baht | -.34986* | .13257 | .009 | -.6105 | -.0892 |
| | 20,001-30,000 baht | -.06278 | .14019 | .655 | -.3384 | .2128 |
| | 40,001-50,000 baht | -.09167 | .37370 | .806 | -.8264 | .6430 |
| | Above 50,000 baht | .87500 | .44913 | .052 | -.0080 | 1.7580 |
| 40,001-50,000 baht | Below 10,000 baht | -.64055 | .35773 | .074 | -1.3439 | .0628 |
| | 10,000-20,000 baht | -.25820 | .35523 | .468 | -.9566 | .4402 |
| | 20,001-30,000 baht | .02889 | .35815 | .936 | -.6752 | .7330 |
| | 30,001-40,000 baht | .09167 | .37370 | .806 | -.6430 | .8264 |
| | Above 50,000 baht | .96667 | .55707 | .083 | -.1286 | 2.0619 |
| Above 50,000 baht | Below 10,000 baht | -1.60722* | .43593 | .000 | -2.4643 | -.7502 |
| | 10,000-20,000 baht | -1.22486* | .43388 | .005 | -2.0779 | -.3718 |
| | 20,001-30,000 baht | -.93778* | .43627 | .032 | -1.7955 | -.0800 |
| | 30,001-40,000 baht | -.87500 | .44913 | .052 | -1.7580 | .0080 |
| | 40,001-50,000 baht | -.96667 | .55707 | .083 | -2.0619 | .1286 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Warranty of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.000 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05), those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05) and those who have income above 50,000 baht (Sig. value = 0.042 < 0.05); by mean difference are equal to (0.38235), (0.66944), (0.73222) and (1.60722), respectively.

Also, the researcher found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Warranty of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05), followed by those who have income between 30,001 and 40,000 baht (Sig. value = 0.005 < 0.05) and those who have income above 50,000 baht; by mean difference are equal to (0.28708), (0.34986) and (1.22486), respectively.

Moreover, the researcher also found that those who have income between 20,001 and 30,000 baht have greater satisfaction on Warranty of the arc welding robots of UNAC than those who have income above 50,000 baht (Sig. value = 0.032 < 0.05); by mean difference is equal to (0.93778).

**Table 5.42: One Way ANOVA (Durability)**

**H27:** There is a difference in the mean of Durability among Income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht).

**Descriptives**

Durability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Below 10,000 baht | 97 | 4.0660 | .62298 | .06325 | 3.9404 | 4.1915 | 2.00 | 5.00 |
| 10,000-20,000 baht | 180 | 3.7689 | .60936 | .04542 | 3.6793 | 3.8585 | 2.00 | 5.00 |
| 20,001-30,000 baht | 93 | 3.5054 | .49834 | .05168 | 3.4027 | 3.6080 | 2.00 | 5.00 |
| 30,001-40,000 baht | 24 | 3.2667 | .45556 | .09299 | 3.0743 | 3.4590 | 2.00 | 4.40 |
| 40,001-50,000 baht | 3 | 3.5333 | .50332 | .29059 | 2.2830 | 4.7837 | 3.00 | 4.00 |
| Above 50,000 baht | 2 | 3.0000 | .00000 | .00000 | 3.0000 | 3.0000 | 3.00 | 3.00 |
| Total | 399 | 3.7439 | .62209 | .03114 | 3.6826 | 3.8051 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by income $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by income $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different income level groups show a difference in the mean of Durability.)

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 22.172 | 5 | 4.434 | 13.217 | .000 |
| Within Groups | 131.851 | 393 | .335 | | |
| Total | 154.022 | 398 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among income level groups (Below 10,000 baht, 10,000-20,000 baht, 20,001-30,000 baht, 30,001-40,000 baht, 40,001-50,000 baht and Above 50,000 baht), there is significant difference in satisfaction for Durability of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .29709* | .07296 | .000 | .1537 | .4405 |
| | 20,001-30,000 baht | .56060* | .08406 | .000 | .3953 | .7259 |
| | 30,001-40,000 baht | .79931* | .13205 | .000 | .5397 | 1.0589 |
| | 40,001-50,000 baht | .53265 | .33955 | .118 | -.1349 | 1.2002 |
| | Above 50,000 baht | 1.06598* | .41377 | .010 | .2525 | 1.8795 |
| 10,000-20,000 baht | Below 10,000 baht | -.29709* | .07296 | .000 | -.4405 | -.1537 |
| | 20,001-30,000 baht | .26351* | .07397 | .000 | .1181 | .4089 |
| | 30,001-40,000 baht | .50222* | .12587 | .000 | .2548 | .7497 |
| | 40,001-50,000 baht | .23556 | .33719 | .485 | -.4274 | .8985 |
| | Above 50,000 baht | .76889 | .41184 | .063 | -.0408 | 1.5786 |
| 20,001-30,000 baht | Below 10,000 baht | -.56060* | .08406 | .000 | -.7259 | -.3953 |
| | 10,000-20,000 baht | -.26351* | .07397 | .000 | -.4089 | -.1181 |
| | 30,001-40,000 baht | .23871 | .13261 | .073 | -.0220 | .4994 |
| | 40,001-50,000 baht | -.02796 | .33977 | .934 | -.6959 | .6400 |
| | Above 50,000 baht | .50538 | .41395 | .223 | -.3085 | 1.3192 |
| 30,001-40,000 baht | Below 10,000 baht | -.79931* | .13205 | .000 | -1.0589 | -.5397 |
| | 10,000-20,000 baht | -.50222* | .12587 | .000 | -.7497 | -.2548 |
| | 20,001-30,000 baht | -.23871 | .13261 | .073 | -.4994 | .0220 |
| | 40,001-50,000 baht | -.26667 | .35470 | .453 | -.9640 | .4307 |
| | Above 50,000 baht | .26667 | .42630 | .532 | -.5714 | 1.1048 |
| 40,001-50,000 baht | Below 10,000 baht | -.53265 | .33955 | .118 | -1.2002 | .1349 |
| | 10,000-20,000 baht | -.23556 | .33719 | .485 | -.8985 | .4274 |
| | 20,001-30,000 baht | .02796 | .33977 | .934 | -.6400 | .6959 |
| | 30,001-40,000 baht | .26667 | .35470 | .453 | -.4307 | .9640 |
| | Above 50,000 baht | .53333 | .52876 | .314 | -.5062 | 1.5729 |
| Above 50,000 baht | Below 10,000 baht | -1.06598* | .41377 | .010 | -1.8795 | -.2525 |
| | 10,000-20,000 baht | -.76889 | .41184 | .063 | -1.5786 | .0408 |
| | 20,001-30,000 baht | -.50538 | .41395 | .223 | -1.3192 | .3085 |
| | 30,001-40,000 baht | -.26667 | .42630 | .532 | -1.1048 | .5714 |
| | 40,001-50,000 baht | -.53333 | .52876 | .314 | -1.5729 | .5062 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have income below 10,000 baht have greater satisfaction on Durability of the arc welding robots of UNAC than those who have income between 10,000 and 20,000 baht (Sig. value = 0.000 < 0.05), followed by those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05), those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05) and those who have income above 50,000 baht (Sig. value = 0.010 < 0.05); by mean difference are equal to (0.29709), (0.56060), (0.79931) and (1.06598), respectively.

Moreover, the researcher also found that those who have income between 10,000 and 20,000 baht have greater satisfaction on Durability of the arc welding robots of UNAC than those who have income between 20,001 and 30,000 baht (Sig. value = 0.000 < 0.05) and those who have income between 30,001 and 40,000 baht (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.26351) and (0.50222), respectively.

**Table 5.43: One Way ANOVA (Performance in Operation)**

**H28:** There is a difference in the mean of Performance in Operation among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Performance in Operation

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below Bachelor's Degree | 116 | 3.9474 | .55771 | .05178 | 3.8448 | 4.0500 | 2.00 | 5.00 |
| Bachelor's Degree | 259 | 3.6749 | .47245 | .02936 | 3.6171 | 3.7327 | 2.30 | 4.60 |
| Master's Degree | 21 | 3.4762 | .36042 | .07865 | 3.3121 | 3.6403 | 2.80 | 4.20 |
| Total | 396 | 3.7442 | .51188 | .02572 | 3.6936 | 3.7948 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Performance in Operation.)

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 7.542 | 2 | 3.771 | 15.446 | .000 |
| Within Groups | 95.954 | 393 | .244 | | |
| Total | 103.497 | 395 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is significant difference in satisfaction for Performance in Operation of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below Bachelor's Degree | Bachelor's Degree | .27251* | .05520 | .000 | .1640 | .3810 |
| | Master's Degree | .47122* | .11718 | .000 | .2408 | .7016 |
| Bachelor's Degree | Below Bachelor's Degree | -.27251* | .05520 | .000 | -.3810 | -.1640 |
| | Master's Degree | .19871 | .11211 | .077 | -.0217 | .4191 |
| Master's Degree | Below Bachelor's Degree | -.47122* | .11718 | .000 | -.7016 | -.2408 |
| | Bachelor's Degree | -.19871 | .11211 | .077 | -.4191 | .0217 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Performance in Operation of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.000 < 0.05) and those who have education master's degree (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.27251) and (0.47122), respectively.

**Table 5.44: One Way ANOVA (Reliability)**

**H29:** There is a difference in the mean of Reliability among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Reliability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below Bachelor's Degree | 117 | 3.8490 | .59612 | .05511 | 3.7398 | 3.9582 | 2.33 | 5.00 |
| Bachelor's Degree | 260 | 3.6038 | .58134 | .03605 | 3.5329 | 3.6748 | 2.00 | 5.00 |
| Master's Degree | 21 | 3.4444 | .41276 | .09007 | 3.2566 | 3.6323 | 2.67 | 4.33 |
| Total | 398 | 3.6675 | .58982 | .02956 | 3.6094 | 3.7256 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Reliability.)

**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.953 | 2 | 2.976 | 8.896 | .000 |
| Within Groups | 132.158 | 395 | .335 | | |
| Total | 138.111 | 397 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is a significant difference in satisfaction for Reliability of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below Bachelor' s Degree | Bachelor' s Degree | .24516* | .06439 | .000 | .1186 | .3718 |
| | Master' s Degree | .40456* | .13708 | .003 | .1351 | .6741 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.24516* | .06439 | .000 | -.3718 | -.1186 |
| | Master' s Degree | .15940 | .13122 | .225 | -.0986 | .4174 |
| Master' s Degree | Below Bachelor' s Degree | -.40456* | .13708 | .003 | -.6741 | -.1351 |
| | Bachelor' s Degree | -.15940 | .13122 | .225 | -.4174 | .0986 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Reliability of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.000 < 0.05) and those who have education master's degree (Sig. value = 0.003 < 0.05); by mean difference are equal to (0.24516) and (0.40456), respectively.

**Table 5.45: One Way ANOVA (Technical Sophisticate)**

**H30:** There is a difference in the mean of Technical Sophisticate among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Technical Sophisticate

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Below Bachelor's Degree | 115 | 3.7283 | .68870 | .06422 | 3.6010 | 3.8555 | 2.00 | 4.75 |
| Bachelor's Degree | 261 | 3.5268 | .59586 | .03688 | 3.4542 | 3.5994 | 2.00 | 5.00 |
| Master's Degree | 20 | 3.5750 | .73494 | .16434 | 3.2310 | 3.9190 | 1.75 | 5.00 |
| Total | 396 | 3.5878 | .63622 | .03197 | 3.5249 | 3.6506 | 1.75 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Technical Sophisticate.)

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 3.243 | 2 | 1.621 | 4.068 | .018 |
| Within Groups | 156.645 | 393 | .399 | | |
| Total | 159.888 | 395 | | | |

**Sig. value is equal to 0.018 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is significant difference in satisfaction for Technical Sophisticate of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor's Degree | Bachelor's Degree | .20144* | .07066 | .005 | .0625 | .3404 |
| | Master's Degree | .15326 | .15296 | .317 | -.1475 | .4540 |
| Bachelor's Degree | Below Bachelor's Degree | -.20144* | .07066 | .005 | -.3404 | -.0625 |
| | Master's Degree | -.04818 | .14648 | .742 | -.3362 | .2398 |
| Master's Degree | Below Bachelor's Degree | -.15326 | .15296 | .317 | -.4540 | .1475 |
| | Bachelor's Degree | .04818 | .14648 | .742 | -.2398 | .3362 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Technical Sophisticate of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.005 < 0.05); by mean difference is equal to (0.20144).

**Table 5.46: One Way ANOVA (Flexibility and Adaptability in Use)**

**H31:** There is a difference in the mean of Flexibility and Adaptability in Use among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Flexibility and Adaptability in use

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below Bachelor's Degree | 116 | 3.8707 | .56587 | .05254 | 3.7666 | 3.9748 | 2.00 | 5.00 |
| Bachelor's Degree | 258 | 3.6647 | .47060 | .02930 | 3.6070 | 3.7224 | 2.33 | 4.75 |
| Master's Degree | 21 | 3.4484 | .38683 | .08441 | 3.2723 | 3.6245 | 2.50 | 4.08 |
| Total | 395 | 3.7137 | .50803 | .02556 | 3.6635 | 3.7640 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Flexibility and Adaptability in Use.)

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 4.956 | 2 | 2.478 | 10.041 | .000 |
| Within Groups | 96.733 | 392 | .247 | | |
| Total | 101.688 | 394 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is a significant difference in satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use

LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below Bachelor' s Degree | Bachelor' s Degree | .20596* | .05553 | .000 | .0968 | .3151 |
| | Master' s Degree | .42228* | .11781 | .000 | .1907 | .6539 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.20596* | .05553 | .000 | -.3151 | -.0968 |
| | Master' s Degree | .21632 | .11273 | .056 | -.0053 | .4379 |
| Master' s Degree | Below Bachelor' s Degree | -.42228* | .11781 | .000 | -.6539 | -.1907 |
| | Bachelor' s Degree | -.21632 | .11273 | .056 | -.4379 | .0053 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.000 < 0.05) and those who have education master's degree (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.20596) and (0.42228), respectively.

**Table 5.47: One Way ANOVA (Size)**

**H32:** There is a difference in the mean of Size among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Size

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Below Bachelor's Degree | 117 | 3.9003 | .70203 | .06490 | 3.7717 | 4.0288 | 2.00 | 5.00 |
| Bachelor's Degree | 259 | 3.5933 | .61508 | .03822 | 3.5180 | 3.6686 | 2.00 | 5.00 |
| Master's Degree | 21 | 3.4286 | .66786 | .14574 | 3.1246 | 3.7326 | 2.00 | 4.67 |
| Total | 397 | 3.6751 | .66027 | .03314 | 3.6099 | 3.7402 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Size.)

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 8.942 | 2 | 4.471 | 10.761 | .000 |
| Within Groups | 163.697 | 394 | .415 | | |
| Total | 172.639 | 396 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is significant difference in satisfaction for Size of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor's Degree | Bachelor's Degree | .30698* | .07180 | .000 | .1658 | .4481 |
| | Master's Degree | .47171* | .15276 | .002 | .1714 | .7720 |
| Bachelor's Degree | Below Bachelor's Degree | -.30698* | .07180 | .000 | -.4481 | -.1658 |
| | Master's Degree | .16474 | .14625 | .261 | -.1228 | .4523 |
| Master's Degree | Below Bachelor's Degree | -.47171* | .15276 | .002 | -.7720 | -.1714 |
| | Bachelor's Degree | -.16474 | .14625 | .261 | -.4523 | .1228 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Size of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.000 < 0.05) and those who have education master's degree (Sig. value = 0.002 < 0.05); by mean difference are equal to (0.30698) and (0.47171), respectively.

**Table 5.48: One Way ANOVA (Weight)**

**H33:** There is a difference in the mean of Weight among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Weight

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Below Bachelor's Degree | 116 | 3.8046 | .80346 | .07460 | 3.6568 | 3.9524 | 2.00 | 5.00 |
| Bachelor's Degree | 261 | 3.5670 | .75240 | .04657 | 3.4753 | 3.6588 | 2.00 | 5.00 |
| Master's Degree | 21 | 3.4762 | .60159 | .13128 | 3.2024 | 3.7500 | 2.33 | 5.00 |
| Total | 398 | 3.6315 | .76729 | .03846 | 3.5559 | 3.7071 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Weight.)

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.066 | 2 | 2.533 | 4.376 | .013 |
| Within Groups | 228.663 | 395 | .579 | | |
| Total | 233.730 | 397 | | | |

**Sig. value is equal to 0.013 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is significant difference in satisfaction for Weight of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below Bachelor' s Degree | Bachelor' s Degree | .23755* | .08490 | .005 | .0706 | .4045 |
| | Master' s Degree | .32841 | .18044 | .070 | -.0263 | .6831 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.23755* | .08490 | .005 | -.4045 | -.0706 |
| | Master' s Degree | .09086 | .17258 | .599 | -.2484 | .4302 |
| Master' s Degree | Below Bachelor' s Degree | -.32841 | .18044 | .070 | -.6831 | .0263 |
| | Bachelor' s Degree | -.09086 | .17258 | .599 | -.4302 | .2484 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Weight of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.005 < 0.05); by mean difference is equal to (0.23755).

**Table 5.49: One Way ANOVA (Speed)**

**H34:** There is a difference in the mean of Speed among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Speed

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below Bachelor's Degree | 117 | 3.9744 | .64201 | .05935 | 3.8568 | 4.0919 | 2.33 | 5.00 |
| Bachelor's Degree | 261 | 3.6335 | .61094 | .03782 | 3.5590 | 3.7079 | 2.00 | 5.00 |
| Master's Degree | 21 | 3.5079 | .62021 | .13534 | 3.2256 | 3.7903 | 2.00 | 4.67 |
| Total | 399 | 3.7268 | .63996 | .03204 | 3.6638 | 3.7898 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Speed.)

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.450 | 2 | 5.225 | 13.564 | .000 |
| Within Groups | 152.551 | 396 | .385 | | |
| Total | 163.001 | 398 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is significant difference in satisfaction for Speed of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below Bachelor' s Degree | Bachelor' s Degree | .34090* | .06905 | .000 | .2051 | .4767 |
| | Master' s Degree | .46642* | .14709 | .002 | .1772 | .7556 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.34090* | .06905 | .000 | -.4767 | -.2051 |
| | Master' s Degree | .12552 | .14078 | .373 | -.1513 | .4023 |
| Master' s Degree | Below Bachelor' s Degree | -.46642* | .14709 | .002 | -.7556 | -.1772 |
| | Bachelor' s Degree | -.12552 | .14078 | .373 | -.4023 | .1513 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Speed of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.000 < 0.05) and those who have education master's degree (Sig. value = 0.002 < 0.05); by mean difference are equal to (0.34090) and (0.46642), respectively.

**Table 5.50: One Way ANOVA (Warranty)**

**H35:** There is a difference in the mean of Warranty among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Warranty

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below Bachelor's Degree | 117 | 3.9504 | .69625 | .06437 | 3.8229 | 4.0779 | 2.00 | 5.00 |
| Bachelor's Degree | 259 | 3.6347 | .63236 | .03929 | 3.5574 | 3.7121 | 2.00 | 5.00 |
| Master's Degree | 20 | 3.5200 | .49161 | .10993 | 3.2899 | 3.7501 | 2.80 | 4.80 |
| Total | 396 | 3.7222 | .66158 | .03325 | 3.6569 | 3.7876 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Warranty.)

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 8.893 | 2 | 4.446 | 10.656 | .000 |
| Within Groups | 163.992 | 393 | .417 | | |
| Total | 172.884 | 395 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is significant difference in satisfaction for Warranty of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below Bachelor's Degree | Bachelor's Degree | .31568* | .07196 | .000 | .1742 | .4571 |
| | Master's Degree | .43043* | .15630 | .006 | .1231 | .7377 |
| Bachelor's Degree | Below Bachelor's Degree | -.31568* | .07196 | .000 | -.4571 | -.1742 |
| | Master's Degree | .11475 | .14992 | .444 | -.1800 | .4095 |
| Master's Degree | Below Bachelor's Degree | -.43043* | .15630 | .006 | -.7377 | -.1231 |
| | Bachelor's Degree | -.11475 | .14992 | .444 | -.4095 | .1800 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Warranty of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.000 < 0.05) and those who have education master's degree (Sig. value = 0.006 < 0.05); by mean difference are equal to (0.31568) and (0.43043), respectively.

**Table 5.51: One Way ANOVA (Durability)**

**H36:** There is a difference in the mean of Durability among Education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree).

**Descriptives**

Durability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Below Bachelor's Degree | 117 | 3.9761 | .62487 | .05777 | 3.8616 | 4.0905 | 2.40 | 5.00 |
| Bachelor's Degree | 260 | 3.6654 | .59951 | .03718 | 3.5922 | 3.7386 | 2.00 | 5.00 |
| Master's Degree | 21 | 3.3905 | .48364 | .10554 | 3.1703 | 3.6106 | 2.00 | 4.40 |
| Total | 398 | 3.7422 | .62200 | .03118 | 3.6809 | 3.8035 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by education level $\rightarrow \mu_1 = \mu_2 = \mu_3$.

Ha: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal.

(Different education levels show a difference in the mean of Durability.)

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.531 | 2 | 5.266 | 14.539 | .000 |
| Within Groups | 143.060 | 395 | .362 | | |
| Total | 153.591 | 397 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the education levels (Below Bachelor's Degree, Bachelor's Degree and Master's Degree), there is significant difference in satisfaction for Durability of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Below Bachelor's Degree | Bachelor's Degree | .31068* | .06700 | .000 | .1790 | .4424 |
| | Master's Degree | .58559* | .14263 | .000 | .3052 | .8660 |
| Bachelor's Degree | Below Bachelor's Degree | -.31068* | .06700 | .000 | -.4424 | -.1790 |
| | Master's Degree | .27491* | .13653 | .045 | .0065 | .5433 |
| Master's Degree | Below Bachelor's Degree | -.58559* | .14263 | .000 | -.8660 | -.3052 |
| | Bachelor's Degree | -.27491* | .13653 | .045 | -.5433 | -.0065 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who have education below bachelor's degree have greater satisfaction on Durability of the arc welding robots of UNAC than those who have education bachelor's degree (Sig. value = 0.000 < 0.05) and those who have education master's degree (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.31068) and (0.58559), respectively.

Moreover, the researcher found that those who have education bachelor's degree have greater satisfaction on Durability of the arc welding robots of UNAC than those who have education master's degree (Sig. value = 0.045 < 0.05); by mean difference is equal to (0.27491).

**Table 5.52: One Way ANOVA (Performance in Operation)**

**H37:** There is a difference in the mean of Performance in Operation among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Performance in Operation

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Administraive | 37 | 3.7784 | .59355 | .09758 | 3.5805 | 3.9763 | 2.60 | 5.00 |
| Purchasing | 68 | 3.5912 | .46319 | .05617 | 3.4791 | 3.7033 | 2.00 | 4.30 |
| Engineering | 69 | 3.6478 | .46356 | .05581 | 3.5365 | 3.7592 | 2.30 | 4.50 |
| Production | 166 | 3.8542 | .51317 | .03983 | 3.7756 | 3.9329 | 2.30 | 4.90 |
| Maintenance | 53 | 3.7396 | .51078 | .07016 | 3.5988 | 3.8804 | 2.40 | 4.60 |
| Other | 4 | 3.3250 | .20616 | .10308 | 2.9970 | 3.6530 | 3.10 | 3.50 |
| Total | 397 | 3.7456 | .51199 | .02570 | 3.6951 | 3.7961 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Performance in Operation.)

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 4.989 | 5 | .998 | 3.948 | .002 |
| Within Groups | 98.816 | 391 | .253 | | |
| Total | 103.805 | 396 | | | |

**Sig. value is equal to 0.002 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is significant difference in satisfaction for Performance in Operation of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Administraive | Purchasing | .18720 | .10270 | .069 | -.0147 | .3891 |
| | Engineering | .13055 | .10244 | .203 | -.0708 | .3319 |
| | Production | -.07584 | .09139 | .407 | -.2555 | .1038 |
| | Maintenance | .03876 | .10770 | .719 | -.1730 | .2505 |
| | Other | .45338 | .26460 | .087 | -.0668 | .9736 |
| Purchasing | Administraive | -.18720 | .10270 | .069 | -.3891 | .0147 |
| | Engineering | -.05665 | .08590 | .510 | -.2255 | .1122 |
| | Production | -.26304* | .07238 | .000 | -.4053 | -.1207 |
| | Maintenance | -.14845 | .09211 | .108 | -.3295 | .0327 |
| | Other | .26618 | .25865 | .304 | -.2423 | .7747 |
| Engineering | Administraive | -.13055 | .10244 | .203 | -.3319 | .0708 |
| | Purchasing | .05665 | .08590 | .510 | -.1122 | .2255 |
| | Production | -.20639* | .07201 | .004 | -.3480 | -.0648 |
| | Maintenance | -.09180 | .09182 | .318 | -.2723 | .0887 |
| | Other | .32283 | .25854 | .213 | -.1855 | .8311 |
| Production | Administraive | .07584 | .09139 | .407 | -.1038 | .2555 |
| | Purchasing | .26304* | .07238 | .000 | .1207 | .4053 |
| | Engineering | .20639* | .07201 | .004 | .0648 | .3480 |
| | Maintenance | .11459 | .07931 | .149 | -.0413 | .2705 |
| | Other | .52922* | .25437 | .038 | .0291 | 1.0293 |
| Maintenance | Administraive | -.03876 | .10770 | .719 | -.2505 | .1730 |
| | Purchasing | .14845 | .09211 | .108 | -.0327 | .3295 |
| | Engineering | .09180 | .09182 | .318 | -.0887 | .2723 |
| | Production | -.11459 | .07931 | .149 | -.2705 | .0413 |
| | Other | .41462 | .26067 | .113 | -.0979 | .9271 |
| Other | Administraive | -.45338 | .26460 | .087 | -.9736 | .0668 |
| | Purchasing | -.26618 | .25865 | .304 | -.7747 | .2423 |
| | Engineering | -.32283 | .25854 | .213 | -.8311 | .1855 |
| | Production | -.52922* | .25437 | .038 | -1.0293 | -.0291 |
| | Maintenance | -.41462 | .26067 | .113 | -.9271 | .0979 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who are working in production department have greater satisfaction on Performance in Operation of the arc welding robots of UNAC than those who are working in purchasing department (Sig. value = 0.000 < 0.05), followed by those who are working in engineering department (Sig. value = 0.004 < 0.05) and those who working in other departments (Sig. = 0.038< 0.05); by mean difference are equal to (0.26304), (0.20639) and (0.52992), respectively.

**Table 5.53: One Way ANOVA (Reliability)**

**H38:** There is a difference in the mean of Reliability among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Reliability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Administraive | 37 | 3.7658 | .58196 | .09567 | 3.5717 | 3.9598 | 2.33 | 4.67 |
| Purchasing | 68 | 3.5882 | .56168 | .06811 | 3.4523 | 3.7242 | 2.00 | 5.00 |
| Engineering | 69 | 3.6329 | .56344 | .06783 | 3.4975 | 3.7682 | 2.00 | 4.67 |
| Production | 166 | 3.6928 | .61517 | .04775 | 3.5985 | 3.7870 | 2.33 | 5.00 |
| Maintenance | 55 | 3.6909 | .59093 | .07968 | 3.5312 | 3.8507 | 2.00 | 5.00 |
| Other | 4 | 3.4167 | .50000 | .25000 | 2.6211 | 4.2123 | 3.00 | 4.00 |
| Total | 399 | 3.6683 | .58931 | .02950 | 3.6103 | 3.7263 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Reliability of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Reliability.)



**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1.255 | 5 | .251 | .720 | .609 |
| Within Groups | 136.966 | 393 | .349 | | |
| Total | 138.221 | 398 | | | |

**Sig. value is equal to 0.609 > 0.05.** Thus, Fail to Reject Ho and Accept Ho. Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is no significant difference in satisfaction for Reliability of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Administraive | Purchasing | .17753 | .12060 | .142 | -.0596 | .4146 |
| | Engineering | .13292 | .12029 | .270 | -.1036 | .3694 |
| | Production | .07299 | .10733 | .497 | -.1380 | .2840 |
| | Maintenance | .07486 | .12552 | .551 | -.1719 | .3216 |
| | Other | .34910 | .31072 | .262 | -.2618 | .9600 |
| Purchasing | Administraive | -.17753 | .12060 | .142 | -.4146 | .0596 |
| | Engineering | -.04461 | .10088 | .659 | -.2429 | .1537 |
| | Production | -.10454 | .08500 | .219 | -.2716 | .0626 |
| | Maintenance | -.10267 | .10706 | .338 | -.3132 | .1078 |
| | Other | .17157 | .30373 | .572 | -.4256 | .7687 |
| Engineering | Administraive | -.13292 | .12029 | .270 | -.3694 | .1036 |
| | Purchasing | .04461 | .10088 | .659 | -.1537 | .2429 |
| | Production | -.05992 | .08456 | .479 | -.2262 | .1063 |
| | Maintenance | -.05806 | .10671 | .587 | -.2679 | .1517 |
| | Other | .21618 | .30361 | .477 | -.3807 | .8131 |
| Production | Administraive | -.07299 | .10733 | .497 | -.2840 | .1380 |
| | Purchasing | .10454 | .08500 | .219 | -.0626 | .2716 |
| | Engineering | .05992 | .08456 | .479 | -.1063 | .2262 |
| | Maintenance | .00186 | .09185 | .984 | -.1787 | .1824 |
| | Other | .27610 | .29871 | .356 | -.3112 | .8634 |
| Maintenance | Administraive | -.07486 | .12552 | .551 | -.3216 | .1719 |
| | Purchasing | .10267 | .10706 | .338 | -.1078 | .3132 |
| | Engineering | .05806 | .10671 | .587 | -.1517 | .2679 |
| | Production | -.00186 | .09185 | .984 | -.1824 | .1787 |
| | Other | .27424 | .30572 | .370 | -.3268 | .8753 |
| Other | Administraive | -.34910 | .31072 | .262 | -.9600 | .2618 |
| | Purchasing | -.17157 | .30373 | .572 | -.7687 | .4256 |
| | Engineering | -.21618 | .30361 | .477 | -.8131 | .3807 |
| | Production | -.27610 | .29871 | .356 | -.8634 | .3112 |
| | Maintenance | -.27424 | .30572 | .370 | -.8753 | .3268 |

**Table 5.54: One Way ANOVA (Technical Sophisticate)**

**H39:** There is a difference in the mean of Technical Sophisticate among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Technical Sophisticate

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Administraive | 37 | 3.7365 | .69957 | .11501 | 3.5032 | 3.9697 | 1.75 | 4.75 |
| Purchasing | 68 | 3.5294 | .51567 | .06253 | 3.4046 | 3.6542 | 2.50 | 4.50 |
| Engineering | 69 | 3.6667 | .63978 | .07702 | 3.5130 | 3.8204 | 2.00 | 5.00 |
| Production | 165 | 3.5167 | .66036 | .05141 | 3.4152 | 3.6182 | 2.00 | 5.00 |
| Maintenance | 54 | 3.7361 | .61892 | .08422 | 3.5672 | 3.9050 | 2.00 | 4.75 |
| Other | 4 | 2.9375 | .12500 | .06250 | 2.7386 | 3.1364 | 2.75 | 3.00 |
| Total | 397 | 3.5894 | .63629 | .03193 | 3.5266 | 3.6522 | 1.75 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Technical Sophisticate.)

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.192 | 5 | 1.038 | 2.617 | .024 |
| Within Groups | 155.133 | 391 | .397 | | |
| Total | 160.326 | 396 | | | |

**Sig. value is equal to 0.024 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is significant difference in satisfaction for Technical Sophisticate of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .20707 | .12868 | .108 | -.0459 | .4601 |
| | Engineering | .06982 | .12835 | .587 | -.1825 | .3222 |
| | Production | .21982 | .11458 | .056 | -.0054 | .4451 |
| | Maintenance | .00038 | .13443 | .998 | -.2639 | .2647 |
| | Other | .79899* | .33153 | .016 | .1472 | 1.4508 |
| Purchasing | Administraive | -.20707 | .12868 | .108 | -.4601 | .0459 |
| | Engineering | -.13725 | .10763 | .203 | -.3489 | .0744 |
| | Production | .01275 | .09077 | .888 | -.1657 | .1912 |
| | Maintenance | -.20670 | .11481 | .073 | -.4324 | .0190 |
| | Other | .59191 | .32408 | .069 | -.0452 | 1.2291 |
| Engineering | Administraive | -.06982 | .12835 | .587 | -.3222 | .1825 |
| | Purchasing | .13725 | .10763 | .203 | -.0744 | .3489 |
| | Production | .15000 | .09030 | .098 | -.0275 | .3275 |
| | Maintenance | -.06944 | .11444 | .544 | -.2944 | .1556 |
| | Other | .72917* | .32394 | .025 | .0923 | 1.3661 |
| Production | Administraive | -.21982 | .11458 | .056 | -.4451 | .0054 |
| | Purchasing | -.01275 | .09077 | .888 | -.1912 | .1657 |
| | Engineering | -.15000 | .09030 | .098 | -.3275 | .0275 |
| | Maintenance | -.21944* | .09875 | .027 | -.4136 | -.0253 |
| | Other | .57917 | .31874 | .070 | -.0475 | 1.2058 |
| Maintenance | Administraive | -.00038 | .13443 | .998 | -.2647 | .2639 |
| | Purchasing | .20670 | .11481 | .073 | -.0190 | .4324 |
| | Engineering | .06944 | .11444 | .544 | -.1556 | .2944 |
| | Production | .21944* | .09875 | .027 | .0253 | .4136 |
| | Other | .79861* | .32640 | .015 | .1569 | 1.4403 |
| Other | Administraive | -.79899* | .33153 | .016 | -1.4508 | -.1472 |
| | Purchasing | -.59191 | .32408 | .069 | -1.2291 | .0452 |
| | Engineering | -.72917* | .32394 | .025 | -1.3661 | -.0923 |
| | Production | -.57917 | .31874 | .070 | -1.2058 | .0475 |
| | Maintenance | -.79861* | .32640 | .015 | -1.4403 | -.1569 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who are working in administrative department have greater satisfaction on Technical Sophisticate of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.016 < 0.05); by mean difference is equal to (0.79899).

Also, the researcher found that those who are working in engineering department have greater satisfaction on Technical Sophisticate of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.025 < 0.05); by mean difference is equal to (0.72917).

Moreover, the researcher found that those who are working in maintenance department have greater satisfaction on Technical Sophisticate of the arc welding robots of UNAC than those who are working in production department (Sig. value = 0.027 < 0.05) and those who are working in other departments (Sig. value = 0.015 < 0.05); by mean difference are equal to (0.21944) and (0.79861), respectively.

**Table 5.55: One Way ANOVA (Flexibility and Adaptability in Use)**

**H40:** There is a difference in the mean of Flexibility and Adaptability in Use among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Flexibility and Adaptability in use

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Administraive | 37 | 3.7387 | .57941 | .09525 | 3.5456 | 3.9319 | 2.33 | 5.00 |
| Purchasing | 69 | 3.5785 | .45529 | .05481 | 3.4691 | 3.6879 | 2.33 | 4.42 |
| Engineering | 67 | 3.6766 | .44701 | .05461 | 3.5676 | 3.7857 | 2.67 | 4.42 |
| Production | 165 | 3.8086 | .52271 | .04069 | 3.7282 | 3.8889 | 2.00 | 5.00 |
| Maintenance | 54 | 3.6975 | .48653 | .06621 | 3.5647 | 3.8303 | 2.33 | 4.50 |
| Other | 4 | 2.9167 | .11785 | .05893 | 2.7291 | 3.1042 | 2.75 | 3.00 |
| Total | 396 | 3.7155 | .50861 | .02556 | 3.6652 | 3.7657 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Flexibility and Adaptability in Use.)

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.416 | 5 | 1.083 | 4.366 | .001 |
| Within Groups | 96.765 | 390 | .248 | | |
| Total | 102.181 | 395 | | | |

**Sig. value is equal to 0.001 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is significant difference in satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .16024 | .10150 | .115 | -.0393 | .3598 |
| | Engineering | .06212 | .10202 | .543 | -.1385 | .2627 |
| | Production | -.06985 | .09061 | .441 | -.2480 | .1083 |
| | Maintenance | .04121 | .10630 | .698 | -.1678 | .2502 |
| | Other | .82207* | .26217 | .002 | .3066 | 1.3375 |
| Purchasing | Administraive | -.16024 | .10150 | .115 | -.3598 | .0393 |
| | Engineering | -.09811 | .08543 | .252 | -.2661 | .0699 |
| | Production | -.23008* | .07141 | .001 | -.3705 | -.0897 |
| | Maintenance | -.11903 | .09050 | .189 | -.2970 | .0589 |
| | Other | .66184* | .25617 | .010 | .1582 | 1.1655 |
| Engineering | Administraive | -.06212 | .10202 | .543 | -.2627 | .1385 |
| | Purchasing | .09811 | .08543 | .252 | -.0699 | .2661 |
| | Production | -.13197 | .07216 | .068 | -.2738 | .0099 |
| | Maintenance | -.02091 | .09109 | .819 | -.2000 | .1582 |
| | Other | .75995* | .25638 | .003 | .2559 | 1.2640 |
| Production | Administraive | .06985 | .09061 | .441 | -.1083 | .2480 |
| | Purchasing | .23008* | .07141 | .001 | .0897 | .3705 |
| | Engineering | .13197 | .07216 | .068 | -.0099 | .2738 |
| | Maintenance | .11105 | .07809 | .156 | -.0425 | .2646 |
| | Other | .89192* | .25206 | .000 | .3964 | 1.3875 |
| Maintenance | Administraive | -.04121 | .10630 | .698 | -.2502 | .1678 |
| | Purchasing | .11903 | .09050 | .189 | -.0589 | .2970 |
| | Engineering | .02091 | .09109 | .819 | -.1582 | .2000 |
| | Production | -.11105 | .07809 | .156 | -.2646 | .0425 |
| | Other | .78086* | .25812 | .003 | .2734 | 1.2883 |
| Other | Administraive | -.82207* | .26217 | .002 | -1.3375 | -.3066 |
| | Purchasing | -.66184* | .25617 | .010 | -1.1655 | -.1582 |
| | Engineering | -.75995* | .25638 | .003 | -1.2640 | -.2559 |
| | Production | -.89192* | .25206 | .000 | -1.3875 | -.3964 |
| | Maintenance | -.78086* | .25812 | .003 | -1.2883 | -.2734 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who are working in administrative department have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.002 < 0.05); by mean difference is equal to (0.82207).

Also, the researcher found that those who are working in purchasing department have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.010 < 0.05); by mean difference is equal to (0.66184).

Besides, the researcher found that those who are working in engineering department have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.003 < 0.05); by mean difference is equal to (0.75995).

Moreover, the researcher found that those who are working in production department have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who are working in purchasing department (Sig. value = 0.001 < 0.05) and those who are working in other departments (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.23008) and (0.89192), respectively.

Finally, the researcher found that those who are working in maintenance department have greater satisfaction on Flexibility and Adaptability in Use of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.015 < 0.05); by mean difference is equal to (0.78086).

**Table 5.56: One Way ANOVA (Size)**

**H41:** There is a difference in the mean of Size among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Size

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Administraive | 37 | 3.7477 | .63053 | .10366 | 3.5375 | 3.9580 | 2.67 | 4.67 |
| Purchasing | 69 | 3.6522 | .59802 | .07199 | 3.5085 | 3.7958 | 2.00 | 5.00 |
| Engineering | 67 | 3.5920 | .66874 | .08170 | 3.4289 | 3.7552 | 2.00 | 4.67 |
| Production | 166 | 3.7209 | .65885 | .05114 | 3.6199 | 3.8218 | 2.00 | 5.00 |
| Maintenance | 55 | 3.7030 | .71628 | .09658 | 3.5094 | 3.8967 | 2.00 | 5.00 |
| Other | 4 | 2.6667 | .38490 | .19245 | 2.0542 | 3.2791 | 2.33 | 3.00 |
| Total | 398 | 3.6767 | .66026 | .03310 | 3.6117 | 3.7418 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Size.)

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.151 | 5 | 1.030 | 2.405 | .036 |
| Within Groups | 167.920 | 392 | .428 | | |
| Total | 173.071 | 397 | | | |

**Sig. value is equal to 0.036 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is significant difference in satisfaction for Size of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .09557 | .13336 | .474 | -.1666 | .3578 |
| | Engineering | .15571 | .13406 | .246 | -.1079 | .4193 |
| | Production | .02686 | .11899 | .821 | -.2071 | .2608 |
| | Maintenance | .04472 | .13916 | .748 | -.2289 | .3183 |
| | Other | 1.08108* | .34448 | .002 | .4038 | 1.7583 |
| Purchasing | Administraive | -.09557 | .13336 | .474 | -.3578 | .1666 |
| | Engineering | .06013 | .11226 | .592 | -.1606 | .2808 |
| | Production | -.06871 | .09375 | .464 | -.2530 | .1156 |
| | Maintenance | -.05086 | .11831 | .668 | -.2835 | .1817 |
| | Other | .98551* | .33660 | .004 | .3237 | 1.6473 |
| Engineering | Administraive | -.15571 | .13406 | .246 | -.4193 | .1079 |
| | Purchasing | -.06013 | .11226 | .592 | -.2808 | .1606 |
| | Production | -.12884 | .09473 | .175 | -.3151 | .0574 |
| | Maintenance | -.11099 | .11909 | .352 | -.3451 | .1231 |
| | Other | .92537* | .33688 | .006 | .2631 | 1.5877 |
| Production | Administraive | -.02686 | .11899 | .821 | -.2608 | .2071 |
| | Purchasing | .06871 | .09375 | .464 | -.1156 | .2530 |
| | Engineering | .12884 | .09473 | .175 | -.0574 | .3151 |
| | Maintenance | .01785 | .10183 | .861 | -.1823 | .2181 |
| | Other | 1.05422* | .33117 | .002 | .4031 | 1.7053 |
| Maintenance | Administraive | -.04472 | .13916 | .748 | -.3183 | .2289 |
| | Purchasing | .05086 | .11831 | .668 | -.1817 | .2835 |
| | Engineering | .11099 | .11909 | .352 | -.1231 | .3451 |
| | Production | -.01785 | .10183 | .861 | -.2181 | .1823 |
| | Other | 1.03636* | .33894 | .002 | .3700 | 1.7027 |
| Other | Administraive | -1.08108* | .34448 | .002 | -1.7583 | -.4038 |
| | Purchasing | -.98551* | .33660 | .004 | -1.6473 | -.3237 |
| | Engineering | -.92537* | .33688 | .006 | -1.5877 | -.2631 |
| | Production | -1.05422* | .33117 | .002 | -1.7053 | -.4031 |
| | Maintenance | -1.03636* | .33894 | .002 | -1.7027 | -.3700 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who are working in administrative department have greater satisfaction on Size of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.002 < 0.05); by mean difference is equal to (1.08108).

Also, the researcher found that those who are working in purchasing department have greater satisfaction on Size of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.004 < 0.05); by mean difference is equal to (0.98551).

Besides, the researcher found that those who are working in engineering department have greater satisfaction on Size of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.006 < 0.05); by mean difference is equal to (0.92537).

Moreover, the researcher found that those who are working in production department have greater satisfaction on Size of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.002 < 0.05); by mean difference is equal to (1.05422).

Finally, the researcher found that those who are working in maintenance department have greater satisfaction on Size of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.002 < 0.05); by mean difference is equal to (1.03636).

**Table 5.57: One Way ANOVA (Weight)**

**H42:** There is a difference in the mean of Weight among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Weight

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean Lower Bound | 95% Confidence Interval for Mean Upper Bound | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| Administraive | 37 | 3.4865 | .89785 | .14761 | 3.1871 | 3.7858 | 2.00 | 5.00 |
| Purchasing | 68 | 3.4902 | .63994 | .07760 | 3.3353 | 3.6451 | 2.00 | 5.00 |
| Engineering | 69 | 3.4300 | .74995 | .09028 | 3.2498 | 3.6101 | 2.00 | 5.00 |
| Production | 166 | 3.8534 | .75696 | .05875 | 3.7374 | 3.9694 | 2.00 | 5.00 |
| Maintenance | 55 | 3.5879 | .68483 | .09234 | 3.4027 | 3.7730 | 2.00 | 5.00 |
| Other | 4 | 2.4167 | .41944 | .20972 | 1.7493 | 3.0841 | 2.00 | 3.00 |
| Total | 399 | 3.6332 | .76713 | .03840 | 3.5577 | 3.7088 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by department

$\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by department

$\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Weight.)

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 19.120 | 5 | 3.824 | 6.987 | .000 |
| Within Groups | 215.101 | 393 | .547 | | |
| Total | 234.221 | 398 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is significant difference in satisfaction for Weight of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Administraive | Purchasing | -.00371 | .15113 | .980 | -.3008 | .2934 |
| | Engineering | .05653 | .15075 | .708 | -.2398 | .3529 |
| | Production | -.36693* | .13450 | .007 | -.6314 | -.1025 |
| | Maintenance | -.10139 | .15730 | .520 | -.4107 | .2079 |
| | Other | 1.06982* | .38939 | .006 | .3043 | 1.8354 |
| Purchasing | Administraive | .00371 | .15113 | .980 | -.2934 | .3008 |
| | Engineering | .06024 | .12642 | .634 | -.1883 | .3088 |
| | Production | -.36322* | .10652 | .001 | -.5726 | -.1538 |
| | Maintenance | -.09768 | .13417 | .467 | -.3615 | .1661 |
| | Other | 1.07353* | .38063 | .005 | .3252 | 1.8219 |
| Engineering | Administraive | -.05653 | .15075 | .708 | -.3529 | .2398 |
| | Purchasing | -.06024 | .12642 | .634 | -.3088 | .1883 |
| | Production | -.42346* | .10597 | .000 | -.6318 | -.2151 |
| | Maintenance | -.15793 | .13373 | .238 | -.4208 | .1050 |
| | Other | 1.01329* | .38048 | .008 | .2653 | 1.7613 |
| Production | Administraive | .36693* | .13450 | .007 | .1025 | .6314 |
| | Purchasing | .36322* | .10652 | .001 | .1538 | .5726 |
| | Engineering | .42346* | .10597 | .000 | .2151 | .6318 |
| | Maintenance | .26553* | .11510 | .022 | .0392 | .4918 |
| | Other | 1.43675* | .37434 | .000 | .7008 | 2.1727 |
| Maintenance | Administraive | .10139 | .15730 | .520 | -.2079 | .4107 |
| | Purchasing | .09768 | .13417 | .467 | -.1661 | .3615 |
| | Engineering | .15793 | .13373 | .238 | -.1050 | .4208 |
| | Production | -.26553* | .11510 | .022 | -.4918 | -.0392 |
| | Other | 1.17121* | .38312 | .002 | .4180 | 1.9244 |
| Other | Administraive | -1.06982* | .38939 | .006 | -1.8354 | -.3043 |
| | Purchasing | -1.07353* | .38063 | .005 | -1.8219 | -.3252 |
| | Engineering | -1.01329* | .38048 | .008 | -1.7613 | -.2653 |
| | Production | -1.43675* | .37434 | .000 | -2.1727 | -.7008 |
| | Maintenance | -1.17121* | .38312 | .002 | -1.9244 | -.4180 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who are working in administrative department have greater satisfaction on Weight of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.006 < 0.05); by mean difference is equal to (1.06982).

Also, the researcher found that those who are working in purchasing department have greater satisfaction on Weight of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.005 < 0.05); by mean difference is equal to (1.07353).

Moreover, the researcher found that those who are working in engineering department have greater satisfaction on Weight of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.008 < 0.05); by mean difference is equal to (1.01329).

Besides, the researcher found that those who are working in production department have greater satisfaction on Weight of the arc welding robots of UNAC than those who are working in administrative department (Sig. value = 0.007 < 0.05), followed by those who are working in Purchasing department (Sig. value = 0.001 < 0.05), those who are working in engineering department (Sig. value = 0.000 < 0.05), those who are working in maintenance department (Sig. value = 0.022 < 0.05) and those who are working in Other departments (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.36693), (0.36322), (0.42346), (0.26553) and (1.43675), respectively.

Finally, the researcher found that those who are working in maintenance department have greater satisfaction on Weight of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.002 < 0.05); by mean difference is equal to (1.17121).

**Table 5.58: One Way ANOVA (Speed)**

**H43:** There is a difference in the mean of Speed among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Speed

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Administraive | 37 | 3.7117 | .58880 | .09680 | 3.5154 | 3.9080 | 2.67 | 4.67 |
| Purchasing | 69 | 3.5942 | .59097 | .07114 | 3.4522 | 3.7362 | 2.00 | 4.67 |
| Engineering | 69 | 3.6667 | .55719 | .06708 | 3.5328 | 3.8005 | 2.33 | 4.67 |
| Production | 166 | 3.8193 | .69689 | .05409 | 3.7125 | 3.9261 | 2.00 | 5.00 |
| Maintenance | 55 | 3.7515 | .63251 | .08529 | 3.5805 | 3.9225 | 2.67 | 5.00 |
| Other | 4 | 3.1667 | .19245 | .09623 | 2.8604 | 3.4729 | 3.00 | 3.33 |
| Total | 400 | 3.7283 | .63988 | .03199 | 3.6654 | 3.7912 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Speed.)

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 4.178 | 5 | .836 | 2.068 | .069 |
| Within Groups | 159.189 | 394 | .404 | | |
| Total | 163.368 | 399 | | | |

**Sig. value is equal to 0.069 > 0.05.** Thus, Fail to Reject Ho and Accept Ho.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenence and Other), there is no significant difference in satisfaction for Speed of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Administraive | Purchasing | .11751 | .12952 | .365 | -.1371 | .3721 |
| | Engineering | .04505 | .12952 | .728 | -.2096 | .2997 |
| | Production | -.10757 | .11556 | .353 | -.3348 | .1196 |
| | Maintenance | -.03980 | .13515 | .769 | -.3055 | .2259 |
| | Other | .54505 | .33456 | .104 | -.1127 | 1.2028 |
| Purchasing | Administraive | -.11751 | .12952 | .365 | -.3721 | .1371 |
| | Engineering | -.07246 | .10822 | .503 | -.2852 | .1403 |
| | Production | -.22507* | .09105 | .014 | -.4041 | -.0461 |
| | Maintenance | -.15731 | .11490 | .172 | -.3832 | .0686 |
| | Other | .42754 | .32690 | .192 | -.2152 | 1.0702 |
| Engineering | Administraive | -.04505 | .12952 | .728 | -.2997 | .2096 |
| | Purchasing | .07246 | .10822 | .503 | -.1403 | .2852 |
| | Production | -.15261 | .09105 | .094 | -.3316 | .0264 |
| | Maintenance | -.08485 | .11490 | .461 | -.3107 | .1410 |
| | Other | .50000 | .32690 | .127 | -.1427 | 1.1427 |
| Production | Administraive | .10757 | .11556 | .353 | -.1196 | .3348 |
| | Purchasing | .22507* | .09105 | .014 | .0461 | .4041 |
| | Engineering | .15261 | .09105 | .094 | -.0264 | .3316 |
| | Maintenance | .06776 | .09889 | .494 | -.1267 | .2622 |
| | Other | .65261* | .32162 | .043 | .0203 | 1.2849 |
| Maintenance | Administraive | .03980 | .13515 | .769 | -.2259 | .3055 |
| | Purchasing | .15731 | .11490 | .172 | -.0686 | .3832 |
| | Engineering | .08485 | .11490 | .461 | -.1410 | .3107 |
| | Production | -.06776 | .09889 | .494 | -.2622 | .1267 |
| | Other | .58485 | .32917 | .076 | -.0623 | 1.2320 |
| Other | Administraive | -.54505 | .33456 | .104 | -1.2028 | .1127 |
| | Purchasing | -.42754 | .32690 | .192 | -1.0702 | .2152 |
| | Engineering | -.50000 | .32690 | .127 | -1.1427 | .1427 |
| | Production | -.65261* | .32162 | .043 | -1.2849 | -.0203 |
| | Maintenance | -.58485 | .32917 | .076 | -1.2320 | .0623 |

*. The mean difference is significant at the .05 level.

**Table 5.59: One Way ANOVA (Warranty)**

**H44:** There is a difference in the mean of Warranty among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Warranty

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Administraive | 37 | 3.7297 | .60958 | .10021 | 3.5265 | 3.9330 | 2.60 | 4.60 |
| Purchasing | 69 | 3.5275 | .58206 | .07007 | 3.3877 | 3.6674 | 2.00 | 5.00 |
| Engineering | 69 | 3.5536 | .64182 | .07727 | 3.3994 | 3.7078 | 2.00 | 4.60 |
| Production | 165 | 3.9285 | .64806 | .05045 | 3.8289 | 4.0281 | 2.40 | 5.00 |
| Maintenance | 53 | 3.6415 | .66258 | .09101 | 3.4589 | 3.8241 | 2.00 | 5.00 |
| Other | 4 | 2.6500 | .47258 | .23629 | 1.8980 | 3.4020 | 2.00 | 3.00 |
| Total | 397 | 3.7239 | .66161 | .03321 | 3.6586 | 3.7892 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Warranty.)

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 16.541 | 5 | 3.308 | 8.249 | .000 |
| Within Groups | 156.801 | 391 | .401 | | |
| Total | 173.343 | 396 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is significant difference in satisfaction for Warranty of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .20219 | .12904 | .118 | -.0515 | .4559 |
| | Engineering | .17611 | .12904 | .173 | -.0776 | .4298 |
| | Production | -.19876 | .11519 | .085 | -.4252 | .0277 |
| | Maintenance | .08822 | .13567 | .516 | -.1785 | .3549 |
| | Other | 1.07973* | .33331 | .001 | .4244 | 1.7350 |
| Purchasing | Administraive | -.20219 | .12904 | .118 | -.4559 | .0515 |
| | Engineering | -.02609 | .10781 | .809 | -.2381 | .1859 |
| | Production | -.40095* | .09079 | .000 | -.5794 | -.2225 |
| | Maintenance | -.11397 | .11567 | .325 | -.3414 | .1134 |
| | Other | .87754* | .32568 | .007 | .2372 | 1.5178 |
| Engineering | Administraive | -.17611 | .12904 | .173 | -.4298 | .0776 |
| | Purchasing | .02609 | .10781 | .809 | -.1859 | .2381 |
| | Production | -.37486* | .09079 | .000 | -.5534 | -.1964 |
| | Maintenance | -.08789 | .11567 | .448 | -.3153 | .1395 |
| | Other | .90362* | .32568 | .006 | .2633 | 1.5439 |
| Production | Administraive | .19876 | .11519 | .085 | -.0277 | .4252 |
| | Purchasing | .40095* | .09079 | .000 | .2225 | .5794 |
| | Engineering | .37486* | .09079 | .000 | .1964 | .5534 |
| | Maintenance | .28698* | .09999 | .004 | .0904 | .4836 |
| | Other | 1.27848* | .32045 | .000 | .6485 | 1.9085 |
| Maintenance | Administraive | -.08822 | .13567 | .516 | -.3549 | .1785 |
| | Purchasing | .11397 | .11567 | .325 | -.1134 | .3414 |
| | Engineering | .08789 | .11567 | .448 | -.1395 | .3153 |
| | Production | -.28698* | .09999 | .004 | -.4836 | -.0904 |
| | Other | .99151* | .32836 | .003 | .3459 | 1.6371 |
| Other | Administraive | -1.07973* | .33331 | .001 | -1.7350 | -.4244 |
| | Purchasing | -.87754* | .32568 | .007 | -1.5178 | -.2372 |
| | Engineering | -.90362* | .32568 | .006 | -1.5439 | -.2633 |
| | Production | -1.27848* | .32045 | .000 | -1.9085 | -.6485 |
| | Maintenance | -.99151* | .32836 | .003 | -1.6371 | -.3459 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who are working in administrative department have greater satisfaction on Warranty of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.001 < 0.05); by mean difference is equal to (1.07973).

Also, the researcher found that those who are working in purchasing department have greater satisfaction on Warranty of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.007 < 0.05); by mean difference is equal to (0.87754).

Moreover, the researcher found that those who are working in engineering department have greater satisfaction on Warranty of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.006 < 0.05); by mean difference is equal to (0.90362).

Besides, the researcher found that those who are working in production department have greater satisfaction on Warranty of the arc welding robots of UNAC than those who are working in purchasing department (Sig. value = 0.000 < 0.05), followed by those who are working in engineering department (Sig. value = 0.000 < 0.05), those who are working in maintenance department (Sig. value = 0.004 < 0.05) and those who are working in other departments (Sig. value = 0.000 < 0.05); by mean difference are equal to (0.40095), (0.37486), (0.28698) and (1.27848), respectively.

Finally, the researcher found that those who are working in maintenance department have greater satisfaction on Warranty of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.003 < 0.05); by mean difference is equal to (0.99151).

**Table 5.60: One Way ANOVA (Durability)**

**H45:** There is a difference in the mean of Durability among Departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other).

**Descriptives**

Durability

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| Administraive | 37 | 3.8486 | .50860 | .08361 | 3.6791 | 4.0182 | 2.60 | 4.60 |
| Purchasing | 69 | 3.5913 | .59945 | .07216 | 3.4473 | 3.7353 | 2.00 | 4.80 |
| Engineering | 68 | 3.6000 | .60742 | .07366 | 3.4530 | 3.7470 | 2.00 | 4.80 |
| Production | 166 | 3.8735 | .63867 | .04957 | 3.7756 | 3.9714 | 2.00 | 5.00 |
| Maintenance | 55 | 3.7164 | .58587 | .07900 | 3.5580 | 3.8747 | 2.40 | 5.00 |
| Other | 4 | 2.8500 | .30000 | .15000 | 2.3726 | 3.3274 | 2.40 | 3.00 |
| Total | 399 | 3.7439 | .62209 | .03114 | 3.6826 | 3.8051 | 2.00 | 5.00 |

Ho: There is no difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by department $\rightarrow \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$.

Ha: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by department $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal.

(Different departments show a difference in the mean of Durability.)

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 9.447 | 5 | 1.889 | 5.136 | .000 |
| Within Groups | 144.576 | 393 | .368 | | |
| Total | 154.022 | 398 | | | |

**Sig. value is equal to 0.000 < 0.05.** Thus, Reject Ho and Accept Ha.

Among the departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other), there is significant difference in satisfaction for Durability of the arc welding robots of UNAC.

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Administraive | Purchasing | .25734* | .12359 | .038 | .0144 | .5003 |
| | Engineering | .24865* | .12391 | .045 | .0050 | .4922 |
| | Production | -.02485 | .11027 | .822 | -.2416 | .1919 |
| | Maintenance | .13229 | .12896 | .306 | -.1213 | .3858 |
| | Other | .99865* | .31924 | .002 | .3710 | 1.6263 |
| Purchasing | Administraive | -.25734* | .12359 | .038 | -.5003 | -.0144 |
| | Engineering | -.00870 | .10364 | .933 | -.2125 | .1951 |
| | Production | -.28219* | .08688 | .001 | -.4530 | -.1114 |
| | Maintenance | -.12506 | .10964 | .255 | -.3406 | .0905 |
| | Other | .74130* | .31193 | .018 | .1280 | 1.3546 |
| Engineering | Administraive | -.24865* | .12391 | .045 | -.4922 | -.0050 |
| | Purchasing | .00870 | .10364 | .933 | -.1951 | .2125 |
| | Production | -.27349* | .08733 | .002 | -.4452 | -.1018 |
| | Maintenance | -.11636 | .10999 | .291 | -.3326 | .0999 |
| | Other | .75000* | .31206 | .017 | .1365 | 1.3635 |
| Production | Administraive | .02485 | .11027 | .822 | -.1919 | .2416 |
| | Purchasing | .28219* | .08688 | .001 | .1114 | .4530 |
| | Engineering | .27349* | .08733 | .002 | .1018 | .4452 |
| | Maintenance | .15713 | .09437 | .097 | -.0284 | .3427 |
| | Other | 1.02349* | .30690 | .001 | .4201 | 1.6269 |
| Maintenance | Administraive | -.13229 | .12896 | .306 | -.3858 | .1213 |
| | Purchasing | .12506 | .10964 | .255 | -.0905 | .3406 |
| | Engineering | .11636 | .10999 | .291 | -.0999 | .3326 |
| | Production | -.15713 | .09437 | .097 | -.3427 | .0284 |
| | Other | .86636* | .31410 | .006 | .2488 | 1.4839 |
| Other | Administraive | -.99865* | .31924 | .002 | -1.6263 | -.3710 |
| | Purchasing | -.74130* | .31193 | .018 | -1.3546 | -.1280 |
| | Engineering | -.75000* | .31206 | .017 | -1.3635 | -.1365 |
| | Production | -1.02349* | .30690 | .001 | -1.6269 | -.4201 |
| | Maintenance | -.86636* | .31410 | .006 | -1.4839 | -.2488 |

*. The mean difference is significant at the .05 level.

**From the multiple comparison table,** the researcher found that those who are working in administrative department have greater satisfaction on Durability of the arc welding robots of UNAC than those who are working in purchasing department (Sig. value = 0.038 < 0.05), followed by those who are working in engineering department (Sig. value = 0.045 < 0.05) and those who are working in other departments (Sig. value = 0.002 < 0.05); by mean difference are equal to (0.25734 ), (0.24865) and (0.99865), respectively.

Also, the researcher found that those who are working in purchasing department have greater satisfaction on Durability of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.018 < 0.05); by mean difference is equal to (0.74130).

Besides, the researcher found that those who are working in engineering department have greater satisfaction on Durability of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.017 < 0.05); by mean difference is equal to (0.75000).

Moreover, the researcher found that those who are working in production department have greater satisfaction on Durability of the arc welding robots of UNAC than those who are working in purchasing department (Sig. value = 0.001 < 0.05), followed by those who are working in engineering department (Sig. value = 0.002 < 0.05) and those who are working in other departments (Sig. value = 0.001 < 0.05); by mean difference are equal to (0.28219), (0.27349) and (1.02349), respectively.

Finally, the researcher found that those who are working in maintenance department have greater satisfaction on Durability of the arc welding robots of UNAC than those who are working in other departments (Sig. value = 0.006 < 0.05); by mean difference is equal to (0.86636).

### 5.5 Summary of Hypotheses Testing Results

**Table 5.61: Summary of Hypotheses Testing Results**

The below table shows the summary of the hypotheses testing results by using Independent Sample T-test (Interval & Nominal Scale) and One Way ANOVA (Interval & Nominal Scale).

| Hypotheses Test | Sig. (2-tailed) | Result |
|---|---|---|
| **Independent Sample T-test (Interval & Nominal Scale)** | | |
| $Ha_1$: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.012** | Reject Ho |
| $Ha_2$: There is a difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.044** | Reject Ho |
| $Ha_3$: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.245** | Fail to Reject Ho |

| | | |
|---|---|---|
| $Ha_4$: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.006** | Reject Ho |
| $Ha_5$: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.054** | Fail to Reject Ho |
| $Ha_6$: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.000** | Reject Ho |
| $Ha_7$: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.005** | Reject Ho |
| $Ha_8$: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.000** | Reject Ho |
| $Ha_9$: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by gender ($\mu_1 \neq \mu_2$). | **0.024** | Reject Ho |

| One Way ANOVA (Interval & Nominal Scale) | | |
|---|---|---|
| $Ha_{10}$: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{11}$: There is a difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{12}$: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{13}$: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{14}$: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |

| | | |
|---|---|---|
| $Ha_{15}$: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{16}$: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{17}$: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{18}$: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by age level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ are equal. | **0.000** | Reject Ho |
| $Ha_{19}$: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{20}$: There is a difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |

| | | |
|---|---|---|
| $Ha_{21}$: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{22}$: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{23}$: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{24}$: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{25}$: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |

| | | |
|---|---|---|
| $Ha_{26}$: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{27}$: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by income level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{28}$: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.000** | Reject Ho |
| $Ha_{29}$: There is a difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.000** | Reject Ho |
| $Ha_{30}$: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.018** | Reject Ho |

| | | |
|---|---|---|
| $Ha_{31}$: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.000** | Reject Ho |
| $Ha_{32}$: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.000** | Reject Ho |
| $Ha_{33}$: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.013** | Reject Ho |
| $Ha_{34}$: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.000** | Reject Ho |
| $Ha_{35}$: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.000** | Reject Ho |
| $Ha_{36}$: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by education level $\rightarrow$ Not all $\mu_1 = \mu_2 = \mu_3$ are equal. | **0.000** | Reject Ho |

| | | |
|---|---|---|
| $Ha_{37}$: There is a difference among the respondents regarding their satisfaction for Performance in Operation of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.002** | Reject Ho |
| $Ha_{38}$: There is a difference among the respondents regarding their satisfaction for Reliability on arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.609** | Fail to Reject Ho |
| $Ha_{39}$: There is a difference among the respondents regarding their satisfaction for Technical Sophisticate of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.024** | Reject Ho |
| $Ha_{40}$: There is a difference among the respondents regarding their satisfaction for Flexibility and Adaptability in Use of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.001** | Reject Ho |
| $Ha_{41}$: There is a difference among the respondents regarding their satisfaction for Size of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.036** | Reject Ho |

| | | |
|---|---|---|
| $Ha_{42}$: There is a difference among the respondents regarding their satisfaction for Weight of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{43}$: There is a difference among the respondents regarding their satisfaction for Speed of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.069** | Fail to Reject Ho |
| $Ha_{44}$: There is a difference among the respondents regarding their satisfaction for Warranty of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |
| $Ha_{45}$: There is a difference among the respondents regarding their satisfaction for Durability of the arc welding robots of UNAC when classified by department → Not all $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ are equal. | **0.000** | Reject Ho |

# CHAPTER 6

# CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the main finding, conclusions, discussions, implication and recommendation based on the research. The first section shows the summary of study that is based on the statement of the problem and research objectives. The second section is summary of findings. The third section is to discuss the recommendations and conclusion from the study and recommendation for future research.

## 6.1 Summary of the study

This research project was conducted by using Independent Sample T-test and One Way ANOVA to find and analyze the results of users' satisfaction for the arc welding robots: A case study of Uni Arc Co., Ltd.

As described in the statement of the problem, nowadays, the arc welding robot sales situation of each distributor not only in Thailand but around the world is in the midst of the fear that the equipment investment is curbed down due to the global recession.

One factor in environmental changes that would promote the demand of robots is the need for improving arc welding robots to meet the highest levels of users' satisfaction. Only taking action on reduced price strategy, all of arc welding distributors will finally not survive as this way have limitation by their buying cost from manufacturers. Therefore, in this global recession situation, the distributors of arc welding robots should know what they should do; or their manufacturers should produce or improve arc welding robots by utmost understanding their various users' satisfaction. This will be necessary for the current situation and also support a long-term strategy in the arc welding robot supply industry.

The sample elements of this study are users who have ever used or purchased arc welding robots. The target respondents needed were 400. The primary data were collected through the structured questionnaire. The questions have been projected from the main variables of the study: the independent variables and the dependent variables. The independent variables are users' characteristic profiles of the customers (Gender, Age level, Income level, Education level, and Department). The dependent variables are Performance in Operation, Reliability, Technology Sophisticate, Flexibility and Adaptability in Use, Size, Weight, Speed, Warranty, and Durability. The variables would help the researcher more understand the users' satisfaction for the arc welding robots.

## 6.2 Conclusion of the Research Findings

### 6.2.1 General Information of Users' Characteristic Profiles

In this study, the researcher found that most of the respondents are male who have average ages between 22 and 34 years old and the average income is between 10,000 and 20,000 baht. Besides that, most of them graduated Bachelor's Degree and also most of them are working in production department.

### 6.2.2 Levels of Customer's Satisfaction toward Arc welding Robot Factors

**__Question One__** in the statement of the problem of this research asks, **"Which product factors of arc welding robots satisfy the users of Uni Arc Co., Ltd. [UNAC]?"**

In this study, the researcher can conclude that most of users have the highest satisfaction on the "Performance in Operation" of the arc welding robots, Durability, Speed, Warranty, Flexibility and adaptability in use, Size, Reliability, Weight, and "Technical Sophisticate", respectively.

In deep details of each factor, for users' satisfaction toward the arc welding robot factors started with **Performance in operation**. The highest satisfaction level is "Satisfaction on the standard manipulator's working area of arc welding robot from Uni Arc Co., Ltd. [UNAC] and the lowest satisfaction level is "Satisfaction on the arc stability at very low current ranges by the welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]". Next is **Reliability.** The highest satisfaction level is "Satisfaction on the current and voltage precisely controlled and supplied by the welding power source of arc welding robot of Uni Arc Co., Ltd. [UNAC] and the lowest satisfaction level is "Satisfaction on the positional repeatability of manipulator of arc welding robot from Uni Arc Co., Ltd. [UNAC]". Next is **Technical sophisticate**. The highest satisfaction level is "Satisfaction on the Off-Line teaching software (AX-OT) for the arc welding robot from Uni Arc Co., Ltd. [UNAC] and the lowest satisfaction level is "Satisfaction on the positioner designed to be synchronized with the arc welding robot from Uni Arc Co., Ltd. [UNAC]". Next is **Flexibility and**

**adaptability in use**. The highest satisfaction level is "Satisfaction on the compatibility to abundant applications of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC] and the lowest satisfaction level is "Satisfaction on the changeable arc (Arm side) of manipulator for arc welding robot from Uni Arc Co., Ltd. [UNAC]". Next is **Size**. The highest satisfaction level is "Satisfaction on the size of welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] and the lowest satisfaction level is "Satisfaction on the size of robot controller of arc welding robot from Uni Arc Co., Ltd. [UNAC]". Next is **Weight**. The highest satisfaction level is "Satisfaction on the weight of welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC] and the lowest satisfaction level is "Satisfaction on the weight of manipulator of arc welding robot from Uni Arc Co., Ltd. [UNAC]". Next is **Speed**. The highest satisfaction level is "Satisfaction on the speed provided by welding power source of arc welding robot from Uni Arc Co., Ltd. [UNAC]" and the lowest satisfaction level is "Satisfaction on the speed of manipulator (Air-cut time) of arc welding robot from Uni Arc Co., Ltd. Next is **Warranty**. The highest satisfaction level is "Satisfaction on the reserved spare parts for the broken arc welding robot from Uni Arc Co., Ltd. [UNAC]" and the lowest satisfaction level is "Satisfaction on the one-year warranty period for arc welding robot from Uni Arc Co., Ltd. [UNAC]". Next is **Durability**. The highest satisfaction level is "Satisfaction on the robot consumable parts of arc welding robot from Uni Arc Co., Ltd. [UNAC] and the lowest satisfaction level is "Satisfaction on the robot controller's durability of arc welding robot from Uni Arc Co., Ltd. [UNAC]".

**The top three important arc welding robots factors that have the highest satisfaction by the users are Performance in operation, Durability, and Speed. Thus, UNAC sales representative should focus on these three factors. Especially on Performance in operation on the item of standard manipulator's working area that the users have the highest satisfaction as the top priority when make sales activities to existing or new customers. Moreover, arc welding robots manufacturers should focus on this product factor when develop a new model or new generation of arc welding robots.**

**6.2.3 Independent Sample T-test (Interval & Nominal Scale)**

**Question Two** in statement of the problem of this study asks, **"Is the users' satisfaction toward arc welding robots of Uni Arc Co., Ltd. [UNAC] different among the users' characteristic profiles (Gender, Age, Income, Education, and Department)?"** The results are shown as the followings.

**Levels of Satisfaction when Classified by Gender**

In this study, the researcher can conclude that male users have greater satisfaction than female users on the arc welding robots toward Performance in operation, followed by Durability, Speed, Warranty, Flexibility and adaptability in use, Reliability, and Weight, respectively.

However, only Technical sophisticate and Size of arc welding robot factors, both Male and Female users have the same level on satisfactions.

**On the top three items of product factors that most satisfy users which are Performance in operation, Durability, and speed; Male users which are the majority respondents of this research also have the greater satisfaction than Female users. Thus, UNAC sales representative should focus on these three items as the top priority when make sales activities.**

### 6.2.4 One Way ANOVA (Interval & Nominal Scale)

The research's question two in statement of the problem of this study asks "Is the users' satisfaction toward arc welding robots of Uni Arc Co., Ltd. [UNAC] different among the users' characteristic profiles (Gender, Age, Income, Education, and Department)?" The results are shown as the followings:

**Levels of Satisfaction when Classified by Age**

In this study, the researcher can conclude that users who have ages under 22 years old have greater satisfaction on Performance in operation, Reliability, Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Speed, Warranty, and Durability of the arc welding robots than those who have ages between 22 and 34 years old and those who have ages between 35 and 54 years old.

Besides, the researcher also can conclude that users who have ages under 22 years old have greater satisfaction on Performance in operation, Reliability, Flexibility and adaptability in use, Size, Weight, Speed, Warranty, and Durability of the arc welding robots than those are who have ages between 55 and 64 years old; except Technology sophisticate factor that both of them have the same level of users' satisfactions toward the arc welding robots.

Also, the researcher can conclude that the users who have ages under 22 years old have greater satisfaction on Size, Weight, Warranty, and Durability of arc welding robots than those who have ages above 64 years old; except Performance in operation, Reliability, Flexibility and adaptability in use, Technology sophisticate, and Speed factors that both of them have the same level of users' satisfaction toward the arc welding robots.

Moreover, the researcher also can conclude that the users who have ages between 22 and 34 years old have greater satisfaction on, respectively, Performance in operation, Flexibility and adaptability in use, Weight, Warranty, and Durability of arc welding robots than those who have ages between 35 and 54 years old; except Reliability, Size, Speed, and Technology sophisticate of arc welding robot factors that both of them have the same level of users' satisfaction toward arc welding robots.

The researcher can also conclude that, the users who have ages between 22 and 34 years old have greater satisfaction on Weight of arc welding robots than those who have ages between 55 and 64 years old; except Performance in operation, Reliability, Flexibility and adaptability in use, Technology sophisticate, Size, Speed, Warranty and Durability of arc welding robot factors that both of them have the same level of users' satisfaction toward arc welding robots. And the users who have ages between 22 and 34 years old also have greater satisfaction on Warranty of arc welding robots than those who have age above 64 years old; except Performance in operation, Reliability, Flexibility and adaptability in use, Weight, Technology sophisticate, Speed, Size, and Durability of arc welding robot factors that both of them have the same level of users' satisfaction toward arc welding robots.

**On the top three items of product factors that most satisfy users which are Performance in operation, Durability, and speed; the users who have age between 22 and 34 which are the majority respondents of this research still have greater satisfaction on Performance in operation and Durability than other Age groups. Thus, UNAC sales representative should focus on Performance in operation and Durability items as the top priority when make sales activities. Moreover, the results of levels of satisfaction when classified by Age can be concluded that lower Age groups have the greater satisfaction than the higher Age groups. Therefore, UNAC sales representative should try to close sales with the youngest users.**

**<u>Levels of Satisfaction when Classified by Income</u>**

In this study, the researcher can conclude that the users who have income per month below 10,000 baht have greater satisfaction on, respectively, Performance in operation, then Reliability, Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Speed, Warranty, and Durability of arc welding robots than those who have income between 10,000 and 20,000 baht, followed by those who have income between 20,001 and 30,000 baht, and those who have income between 30,001 and 40,000 baht.

Besides, the researcher also can conclude that the users who have income per month below 10,000 baht have greater satisfaction on Performance in operation than those who have income between 40,001 and 50,000 baht; except Reliability, Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Speed, Warranty, and Durability factors that both of them have the same level of users' satisfaction toward the arc welding robots.

Also, the researcher also can conclude that the users who have income per month below 10,000 baht have greater satisfaction on, respectively, Performance in operation, Flexibility and adaptability in use, Size, Weight, Warranty, and Durability than those who have income more than 50,000 baht; except Reliability, Technology sophisticate, and Speed factors that both of them have the same level of users' satisfaction toward arc welding robots.

Moreover, the researcher also can conclude that the users who have income per month between 10,000 and 20,000 baht have greater satisfaction on, respectively, Performance in operation, Reliability, Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Speed, Warranty, and Durability of arc welding robots than those are who have income between 20,001 and 30,000 baht, followed by those who have income between 30,001 and 40,000 baht except Speed factor that both income groups have the same level of satisfaction.

The researcher can also conclude that the users who have income per month between 10,000 and 20,000 baht have greater satisfaction on Flexibility and adaptability in use, Size, Weight, and Warranty of arc welding robots than those are who have income above 50,000 baht.

The researcher can also conclude that the users who have income per month between 20,001 and 30,000 baht have greater satisfaction on Flexibility and adaptability in use of arc welding robots than those who have income between 30,001 and 40,000 baht.

For the users who have income per month between 20,001 and 30,000 baht have greater satisfaction on Size and Warranty of arc welding robots than those who have income above 50,000 baht.

Finally, the users who have income between 30,001 and 40,000 baht have greater satisfaction on Size of arc welding robots than those who have income above 50,000 baht per month. And the users who have income between 40,001 and 50,000 baht have greater satisfaction on Weight of arc welding robots than those who have income above 50,000 baht per month.

**On the top three items of product factors that most satisfy users which are Performance in operation, Durability, and speed; the users who have income between 10,000 and 20,000 which are the majority respondents of this research still have greater satisfaction on Performance in operation and Durability than other Income groups. Thus, UNAC sales representative should still focus on Performance in operation and Durability items as the top priority when make sales activities. Moreover, the results of levels of satisfaction when classified by Income can be concluded that lower Income groups have the greater satisfaction than the higher Income groups. Therefore, UNAC sales representative should try to close sales with users who have lowest income.**

**<u>Levels of Satisfaction when Classified by Education</u>**

In this study, the researcher can conclude that the users who have education below bachelor's degree have greater satisfaction on Performance in operation, Reliability, Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Speed, Warranty, and Durability of the arc welding robots than those who graduated bachelor's degree.

The researcher can also conclude that the users who have education below bachelor's degree have greater satisfaction on all factors of the arc welding robots than those who graduated master's degree except Technology sophisticate and Weight.

Finally, the users who graduated bachelor's degree have greater satisfaction on Durability of the arc welding robots than those who graduated master's degree.

**On the top three items of product factors that most satisfy users which are Performance in operation, Durability, and speed; the users who graduated Bachelor's degree which are the majority respondents of this research still have greater satisfaction on Durability than Master's degree. Thus, UNAC sales representative should still focus on Durability items as the top priority when make sales activities especially for the users who graduated Bachelor's degree. Moreover, the results of levels of satisfaction when classified by Education can be concluded that lower Education groups have the greater satisfaction than the higher Education groups. Therefore, UNAC sales representative should try to close sales with users who have lowest education level.**

**Levels of Satisfaction when Classified by Department**

In this study, the researcher can conclude that the users who are working in all departments (Administrative, Purchasing, Engineering, Production, Maintenance and Other) have same level of satisfaction toward the Reliability and Speed of the arc welding robots.

The users who are working in Production department have greater satisfaction on, respectively, Performance in operation, Weight, Warranty, and Durability of the arc welding robots than those who are working in Engineering Department.

Then, the users who are working in Production Department also have greater satisfaction on, respectively, Performance in operation, Flexibility and adaptability in use, Weight, Warranty, and Durability of arc welding robots than those who are working in Purchasing Department. The users who are working in Production department also have greater satisfaction on, in order, Performance in operation, Flexibility and adaptability in use, Size, Weight, Warranty, and Durability of the arc welding robots than those who are working in other departments.

Moreover, the researcher can conclude that the users who are working in Production Department also have greater satisfaction on Weight factor of arc welding robots than those who are working in Administrative Department. The users who are working in Production Department have greater satisfaction on Weight and Warranty factors of the arc welding robots than those who are working in Maintenance Department, respectively.

Besides, the researcher can conclude that the users who are working in Administrative Department have greater satisfaction on Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Warranty, and Durability of the arc welding robots than those who are working in other departments. And also users who are working in Administrative Department have greater satisfaction on Durability of the arc welding robots than those who are working in Purchasing Department and Engineering Department.

In Engineering Department, the researcher can conclude that the users have greater satisfaction on Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Warranty, and Durability of the arc welding robots than those who are working in other departments.

In Maintenance Department, the researcher can conclude that the users have greater satisfaction on Technology sophisticate, Flexibility and adaptability in use, Size, Weight, Warranty, and Durability of the arc welding robots than those who are working in other departments. Then those users who are working in Maintenance Department also have greater satisfaction on Technology sophisticate of the arc welding robots than those who are working in Production Department.

Finally, the researcher can conclude that the users who are working in Purchasing Department have greater satisfaction on Flexibility and adaptability in use, Size, Weight, Warranty, and Durability of the arc welding robots than those who are working in other departments.

**On the top three items of product factors that most satisfy users which are Performance in operation, Durability, and speed; the users who are working in Production Department which are the majority respondents of this research still have greater satisfaction on Performance in operation and Durability than the rest departments (Engineering Department, Purchasing Department, Administrative Department, Other Department). Thus, UNAC sales**

**representative should still focus on Performance in operation and Durability items as the top priority when make sales activities. However, even all departments have the same level of satisfaction on Speed factor, UNAC sales representative should also focus on this item.**

### 6.3 Recommendations

The purpose of this study is to conduct the research about the users' satisfaction for the arc welding robots in order to provide the beneficial results to arc welding robot distributors to better understand their users, which will increase the capability of arc welding distributors to make the appropriative action to survive in the tough competition. Also, the findings can cause the beneficial results to the arc welding robot manufacturers to develop, improve, or generate ideas for the next model of arc welding robots by best understanding their various users' satisfaction in the current situation when the investment on equipment is curbed down due to the global recession.

**According to the results of descriptive statistics of user's characteristic profiles**, the researcher would like to recommend that, to meet the highest satisfaction from users of arc welding robots, the arc welding robot distributors should know and understand the characteristics of the users. Most of them are male who have ages between 22 and 34 years old, graduated bachelor's degree, have income between 10,000 and 20,000 baht, and have industrial engineering skills (or work in Production Department). Therefore, to be successful in the sales activities, the sales representatives of arc welding robot distributors must have personal characteristics which match to the users. For example, only having product knowledge but having no industrial engineering and selling skills is very difficult to succeed in sales activities.

**According to descriptive statistic results of the product factors of arc welding robot,** the researcher would like to provide recommendations as follows:

- **Hitting the strength sales point by emphasizing on the performance in operation, durability, and speed of the arc welding robot.**

  Uni Arc Co., Ltd. [UNAC] should present their product attributes by focusing on the performance in operation, durability, and speed of arc welding robots because these three items meet the highest satisfaction among the respondents. Also, with the experience of the researcher who is working in this field, in actual sales situation, the research findings confirm the researcher's belief that these three product factors are very important to hit customers or users' requirements for making purchase decision.

- **Concerning the low satisfaction of the users on Warranty, Reliability and Technical sophisticate of the arc welding robot**

  UNAC provides only one-year warranty for the arc welding robot. This factor should be reconsidered because it seems too short for the users as shown in No.4 among 9 factors of the product factors satisfied by users; by deep analysis from the questionnaire, the researcher found that the lowest satisfaction on warranty factor is "Satisfaction on the one-year warranty period for arc welding robot from Uni Arc Co., Ltd. [UNAC]".

Another focus is reliability. The result from descriptive statistic analysis of arc welding robot factors shows its rank at No. 7 from 9 factors of users' satisfaction. Normally, when customers make purchase decision for an arc welding robot, the reliability factor should be in the top three factors for buyers to be concerned. Therefore, UNAC has to focus on this product factor or try to find the reason why reliability of the arc welding robot of UNAC is less important in terms of satisfaction from the respondents.

Technical sophisticate, defined as peripherals in this study, meets the lowest satisfaction among the respondents. Therefore, it should be more concentrated by the sales department or the sales representative of UNAC to find out the problem why the users have less satisfaction on this product factor of the arc welding robot. Off-line teaching program, Positioner, Slider, and Sensor are normally also important for the completion of welding system using the arc welding robot.

**According to the inferential statistic analysis,** aimed to find out whether there is a difference among the users toward the product factors of arc welding robots. Although, the results were shown that most of users are countable that they satisfied the product factor of arc welding robots and there are difference among users' satisfaction toward the product factors of arc welding robots; except only "Technical Sophisticate" and "Size" that both male and female have the same level of satisfaction and "Reliability" and "Speed" that all departments have the same level of satisfaction but for the least satisfaction items of product factors, distributors and manufacturers need to improve the product factors of arc welding robots in order to increase the levels of users' satisfaction which is the most important aspect that the researcher would like to make a recommendation from the result of research findings.

Moreover, the distributors and manufacturers of arc welding robots need to know the different satisfaction among the users in various departments toward product factors of arc welding robot. Then, the factors should be improved for making the better or satisfying product to the specific users.

Finally, below are the recommendations based on the level of least satisfaction factors of the arc welding robots to be improved in each department.

**Production Department**

The key purchase decision-making on arc welding robots is from Production Department, they make purchase requests of arc welding robots through Purchasing Department. From the research findings, the researcher found that Production Department has greater satisfaction on Performance in operation, Reliability, Flexibility and adaptability in use, Size, Weight, Speed, Warranty, and Durability of the arc welding robots than other departments (Administrative, Purchasing, Engineering, Maintenance and Other). However, for the satisfaction toward Technology sophisticate, the users in Production Department have less or the same satisfaction with other departments (Administrative, Purchasing, Engineering, Maintenance and Others).

Therefore, the distributors and manufacturers of arc welding robots should improve the Technology sophisticate factor, by focusing on the positioner that should be designed to be synchronized with the arc welding robot, then the sensor for the arc welding robot, the slider should be compatible with the arc welding robot and the Off-Line teaching software (AX-OT) for the arc welding robot, respectively.

**Engineering Department**

Also in some companies, the key purchase decision-making on the arc welding robots is from Engineering Department, again, they make purchase requests of arc welding robots through Purchasing Department. From the findings, the researcher found that the users in Engineering Department have greater satisfaction only on Size and Speed of the arc welding robots than other departments (Administrative, Purchasing, Production, Maintenance and Other). For the satisfaction toward Performance in operation, Reliability, Technology sophisticate, Flexibility and adaptability in use, Weight, Warranty, and Durability, the users have less or the same satisfaction with other departments (Administrative, Purchasing, Production, Maintenance and Other).

Therefore, the arc welding robots distributors and manufacturers need to improve the Weight factor as the first priority by focusing on the weight of manipulator of the arc welding robot, Warranty factor by focusing on one-year warranty for the arc welding robot, and then Durability factor by focusing on the robot controller's durability of the arc welding robot, respectively.

**Purchasing Department**

In some companies, the key purchase decision-making on the arc welding robots is directly from Purchasing Department. From the findings, the researcher found that the users in Purchasing Department have greater satisfaction only on Technology sophisticate of the arc welding robots than other departments (Administrative, Production, Engineering, Maintenance and Other). For the satisfaction toward Performance in operation, Reliability, Flexibility and adaptability in use, Weight, Warranty, Speed, Size and Durability, the users have less or the same satisfaction with other departments (Administrative, Production, Engineering, Maintenance and Other).

Therefore, the arc welding robot distributors and manufacturers need to improve the Weight factor as the first priority by focusing on the weight of manipulator of the arc welding robot, then the Warranty factor by focusing on one-year warranty for the arc welding robot, and then the Flexibility and adaptability in use factor by focusing on changeable arm (Arm side) of manipulator, respectively.

### 6.4 Suggestions for Further Studies

For the further research, the researcher would like to suggest that:

- The respondents of this research are the customers of Uni Arc Co., Ltd. For further studies, there should be more respondents by, for example, collecting data from all users of arc welding robot in Thailand;
- The scope of this study focuses only arc welding robot in Co2/ MAG/ MIG/ TIG processes which is the most popular in the arc welding industry. For further studies, this study can be applied to other welding processes which can be welded by robots such as resistance (SPOT) welding;
- The scope of this study is limitation with the arc welding robot. For further studies, the study also can be applied to other types of robot application.
- For further studies, some parts of the model, such as users' characteristic profiles and product factors can be applied to study users' satisfaction for other industrial products;
- For further studies, to study marketing mix of the arc welding robots with users' purchase intention is also recommended to study; and
- For further studies, to study the relationship between users' satisfaction toward arc welding robots and repurchase intention is also recommended to study.

# BIBLIOGRAPHY


Anderson, G. (1998). Customer satisfaction and its role in quality management. *Journal of Total Quality Management, Vol. 9, NO 4&5*, pp. 80-85.

Anderson, G. and Fornell C. (2000). Customer Satisfaction: Dimensions of customer satisfaction. *Journal of Marketing Science, Vol. 32, No. 4,* pp. 55-201.

Anderson, G., Fornell C. and Rust R.T. (1997). Customer Satisfaction, Productivity, and Profitability: Differences between Goods and Services. *Journal of Marketing Science Vol. 16, No. 2*, pp. 129-145.

Anderson, G. and Sullivan H. (1993). *Fundamentals of Educational Research*. pp. 202. New York, USA: Routledge.

Ang, H., Assael H. W., and Sheth W.A. (1996). *Product strategy and Management: Dimension of high technology products*. New Jersey, USA: Prentice Hall, Pearson Education International.

Ankel, D.A. (2001). *Marketing Research*. 7th ed. New York, USA: John & Sons Inc.

Assael, H. (1993). *Consumer Behaviour and Marketing Action.* USA: Pws-Kent Publishing Company.

Baker, Michael and Hart, Susan (1999). *Product Strategy and Management*. London: Prentice Hall.

Baker, Michael and Hart, Susan (2007). *The Marketing Book*. 6th ed. UK: Butterworth-Heinemann.

Berkowitz, E. N., Kerin, R. A., Hartley, S. W., and Rudelius, W. (2000). *Marketing*. 6th ed. USA: McGraw-Hill.

Boulding W. (1990). Model of Customer Satisfaction: A Dynamic Process of Expectations to Customer Satisfaction. *Journal of Marketing Research, Vol. 12*, pp. 7-27.

Burns A.C. and Bush R.F. (2005). *Marketing Research*. USA: Prentice Hall.

Burns A.C. and Bush R.F. (2007). *Marketing Research*. 2nd ed. USA: Prentice Hall.

Churchill, Jr. G. A. (1991). *Marketing Research: Research Designs*. USA: Thomson South-Western Publishers.

Churchill, Jr. G.A. and Brown, T. J. (2007). *Basic Marketing Research*. 6th ed. USA: Thomson South-Western Publishers.

Churchill, Jr. G.A., Brown T.J. and Amico, R. (1982). *Marketing Research*. USA: Thomson South-Western Publishers.

Churchill, Jr. G. A. and Iacobucci, D. (2002). *Marketing Research: Methodological Foundations*. pp. 56 – 334. USA: Thomson South-Western Publishers.

CMP Media (2008). Summary of Uni Arc Co., Ltd. *Intermach Times 2008, Vol.26, No.2, February*, p.10.

Daihen Corp (1991). Welding and Cutting. *OTC Principle of Welding & Cutting* (Vol.16, No.1, November). Japan: Daihen Corporation welding products division.

Daihen Corp (2008). *Positioner/Slider: Almega AX Series Peripheral Equipment*. Japan: Daihen Corporation.

DeLone, W.H and McLean, E.R. (1992). Information systems success: the quest for the dependent variable. *Information Systems Research, Vol. 3, March*, pp.60-95.

Dholakia G. R., Sheth J. N., and Luthans F.(1990). *Customer behavior: Consumer Behaviors and Beyond*. Boston: Irwin/McGraw-Hill.

Evans, R. J. and Berman, B. (1982). *Marketing*. 5th ed. pp. 155-162. New York: Macmillan Publishing Company.

Fornell C. (1992). A National Customer Satisfaction Barometer: The Swedish Experience. *Journal of marketing, Vol.56*, pp.1-18.

Fornell C., Anderson S.W. and Bounlding L. (1996). *Customer Satisfaction: Between Products and Service*. London, UK: Prentice-Hall International.

Garvin, D. A. (1987). Product technology: Competing on the Eight Dimensions of Quality. *Harvard Business Review, November 1987*.

Gross, R., Rix, P. and Stantion W.J. (1987). *Consumer Behaviour: Customer Satisfaction Relationship with Personality*. Hong Kong: McGraw-Hill.

Handscombe R. S. (1989). *The Product Management Hand book: Technical Sophiticates*. London: McGraw-Hill.

Hanna K. and Wozniak M. (2001). *Marketing Management: People, Products, Demographic, and Markets*. Westport, Connecticut: Praeger.

Hawkins, H. C., Best, A., and Coney, K. (1998). *Consumer Behaviour: Building Marketing Strategy*. USA: McGraw-Hill.

Hawkins, H. C., Best, A., and Coney, K., (2001). *Consumer Behaviour: Segmentation customers by demographic profile*. 2nd ed. New York: McGraw-Hill.

Hayashi T., (2003). Development of Robot Equipped with Full Digital Welding Power Supply (Welding Engineering). *Japan Welding Engineering Society, Vol. 51, No. 1*, pp. 72.

Howard G. and Sheth W. A. (1969). *Marketing Handbook: Customer Satisfaction*. 3rd ed. UK: Gower.

Huang, E. and Lin, E.A. (2005). *Marketing Management: The important of customer satisfaction*. London: Thomson.

Jobber D. (2001). *Principles and Practice of Marketing*. UK: McGraw Hill Higher Education.

Jones, L. and Sasser, A. (1995). *Handbook of Marketing Strategy*. California: Sage Publications Inc.

Kawahara M. (2008). *The Global Sales Data of Daihen Corp*. Japan: Daihen Corporation welding products division.

Kotler, P. (1989). *Marketing Management*. New Jersey: Prentice Hall.

Kotler P. (2000). *Marketing Management: Product Differentiate*. 10th ed. pp.15-288. London, UK: Prentice-Hall International.

Kotler, P. (2003). *Marketing Management*. 11th ed. New Jersey: Prentice-Hall.

Kotler, P. (2004). *Marketing Management*. 12th ed. New Jersey: Prentice-Hall.

Kotler, P. and Armstrong, G. (1997). *Marketing: An Introduction*. London, UK: Prentice Hall International.

Kotler P. and Keller K.L. (2007). *Marketing Management*. USA: Pearson Prentice Hall.

Kristensen, D. A., Dubrovski D., and Westlund A. (1999). The role of customer satisfaction in achieving business excellence. *Journal of Total Quality Management, Vol. 12, NO 7&*8, pp. 920-925.

Lincoln A. (1994). Arc welding uses a power source to create an electric arc. *The procedure handbook of arc welding, Vol.23, No.6*.

Lovelock C. (2001). *Services Marketing: People, Technology and Strategy*. 4th ed. USA: Prentice Hall.

Mahoney R. (1995). *Robotic Products for Rehabilitation: Status and Strategy*. New Jersey, USA: Applied Resources Corporation, Rehabilitation Technologies Division.

Mahoney R. (2006). *Great Expectations for Rehabilitation Mechatronics in the Coming Decade*. Berlin, Germany: Springer.

Malhotra, N. K. (1999). *Marketing Research: United States*. New Jersey, USA: Prentice Hall, Pearson Education International.

Malhotra K. N. (2004). *Marketing Research: Research Design*. pp. 100-145. New Jersey, USA: Prentice Hall, Pearson Education International.

Malhotra K. N. and Peterson M. (2006). *Basic Marketing Research: A Decision Making Approach*. 2nd ed. New Jersey, USA: Prentice Hall, Pearson Education International.

Mandell, M.I. and Rosenberg, L. (1981). *Marketing*. New Jersey, USA: Prentice Hall.

Oliver, R.L. (1977). Response determinants in satisfaction judgment. *Journal of Consumer Research, March 1977*, pp. 495-507.

Paothong P. (2002). *Speed Control of Permanent Magnet Brushless DG Motor Drive (Thesis)*. Bangkok: Assumption University.

Phomnart, M. (2000). *Determinants of Customer Satisfaction in Personal Computer(PC) Purchase: A Selected Survey on Pantip Plaza Area (Thesis)*. Bangkok: Assumption University.

Ranch S. (2007). *Marketing of high-technology products and innovations: competing through weight and size*. Upper Saddle River, NJ: Prentice Hall.

Ratsameeuthai M. (2002). *A study of the factors influencing consumer's purchase decision of notebook computers (Thesis)*. Bangkok: Assumption University.

Rattana S. (2004). *SPSS Analyses: Internal reliability*. London: McGraw-Hill

Reed Tradex (2008). Father of Industrial Robots. *Metalex Magazine, Vol.5, No.2, August-September 2008,* pp.52-53.

Saunders, M., Lewis, P. and Thornhill A. (2003). *Research Methods for Business Students*. 3rd ed. UK: Prentice Hall.

Schiffman G.L. and Kanuk L.L. (1997). *Consumer Behavior*. Upper Saddle River, NJ: Prentice Hall.

Schiffman G.L. and Kanuk L.L. (2007). *Consumer Behavior*. 2nd ed. Upper Saddle River, NJ: Prentice Hall.

Sekaran, U. (1992). *Research Methods for Business a Skill-Building Approach*. 2nd ed. New York: John Wiley & Sons.

Shimon Y. Nof (1999). *Handbook of Industrial Robotics*. 2nd ed. New York, USA: John Wiley and Sons.

Shimpo Corporation (2009). Arc Welding Robots: Forecast for 2009. *The Japan Welding News for the World, Vol.13, No.46, Winter Issue*.

Skinner, J. (1994). *Marketing*. 2nd ed. Boston: Houghton Mifflin.

Slawsby D.A. (2006). *The product development challenge: competing through speed, quality, and creativity*. Boston: Harvard Business School Press.

Smith, Jane (1996). *Planning and Decision Making*. 1st ed. Oxford: Blackwell Business.

Tanphaibul, D. (2001). Determinants of Customer Satisfaction: The Windmill Park Country Club Case (Thesis). Bangkok: Assumption University.

Uni Arc's service division (2008). *Introduction of Arc Welding Robots*. Thailand: Uni Arc Co., Ltd., Service Division.

US Department of Labor (2005). *OSHA Technical Manual (2005): Directory Manual for Robotics*. USA: US Department of Labor, Occupational Safety and Health Administration.

US Department of Labor (2008). *OSHA Technical Manual (2008): Glossary for robotics and robotic systems*. USA: US Department of Labor, Occupational Safety and Health Administration.

Walters D.J. and Bergiel K. (1989). *Marketing management & information technology: Product Technology*. New York: Prentice Hall.

William H. and Slama D. (1989). *Marketing high technology: an insider's view.* New York: Free Press.

Winter R.S. (2007). *Marketing Management.* 3rd ed. USA: Pearson Education Inc.

Yaskawa Electric Corporation (2007). The new robot optimum for arc welding applications. *Pursuit of further efficiency, Robotics Division, February 2007*.

Zikmund W.G. (2000). *Basic marketing*. St. Paul, Minneapolis: West Publishing Company.

Zikmund W.G. (2003). *Basic marketing*. 2nd ed. St. Paul, Minneapolis: West Publishing Company.

Zikmund W.G. and Amico, M. (1996). *Marketing*. 5th ed. St. Paul, Minneapolis: West Publishing Company.

Zikmund W.G., and Amico, M. (2001). *Business Research*. International ed. UK: Prentice Hall.

# WEB SITES


JETRO (March 2006). Trends in the Japanese Robotics Industry. *Industrial Reports*. Retrieved May 06, 2008, from The Japan External Trade Organization (JETRO) website: http://www.jetro.go.jp/en/reports/market/pdf/2006_15_c.pdf

Litzenberger, G. (2007, October 23). The Robots are coming! *Press' Corner*. Retrieved May 05, 2008, from International Federation of Robotics website: http://www.worldrobotics.org/downloads/20071023_Pressinfo.pdf

Piamkulvanich, M. (2004, January 10). Profile and Mission. Retrieved May 5, 2008, from Uni Arc Co., Ltd.

website: http://www.uniarc.com/company_profile.htm

**APPENDIX A:** Questionnaire

# Questionnaire

This questionnaire is designed as the partial fulfillment of thesis subject "Users' Overall Satisfaction for Arc Welding Robot: A Case Study of Uni Arc Co., Ltd.". The survey is conducted for the purpose of the preparation of a Thesis for the completion of Master Degree in Business Administration, Assumption University. All the collected information obtained will only be used for study purpose. Your participation is very much appreciated.

## Part 1: Users' Characteristic Profiles Questions

**Please mark an X in which is the most applicable to your case.**

1. Gender

   Male Female

2. Age

   Under 22 22-34 35-54

   55-64 Over 64

3. Income

   Below 10,000 baht 10,000 – 20,000 baht

   20,001 – 30,000 baht 30,001 – 40,000 baht

   40,001 – 50,000 baht Above 50,000 baht

4. Education

   Below Bachelor's Degree Bachelor's Degree

   Master's Degree Doctoral's Degree

5. Department

   Administrative Purchasing

   Engineering Production

   Maintenance Other (Please specify)___________

## Part 2: Users' Satisfaction Level toward Arc Welding Robots of Uni Arc Co., Ltd. [UNAC].

**Please rate your satisfaction on the following topics by marking an X in the appropriate box or boxes.**

| 5 = Very High Satisfaction | 4 = High Satisfaction | 3 = Neutral | 2 = Low Satisfaction | 1 = Very Low Satisfaction |
|---|---|---|---|---|

| | Performance in Operation | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|
| 6. | Satisfaction on the standard manipulator's working area of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 7. | Satisfaction on the long arm manipulator type designed for increasing the working area of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 8. | Satisfaction on the new manipulator (AX-V4) designed for moving into narrow space of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 9. | Satisfaction on the robot motion performance of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 10. | Satisfaction on number of axis controlled by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 11. | Satisfaction on the memory capacity of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 12. | Satisfaction on stable arc provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 13. | Satisfaction on low spatter provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 14. | Satisfaction on the arc stability at very low current ranges by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 15. | Satisfaction on the arc stability at very high welding speeds by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| | **Reliability** | **5** | **4** | **3** | **2** | **1** |
| 16. | Satisfaction on the positional repeatability of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| 17. | Satisfaction on Operational Software (OS) of robot controller of arc welding robots of Uni Arc Co., Ltd. [UNAC] | | | | | |
| 18. | Satisfaction on current and voltage precisely controlled and supplied by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |

| | Technical Sophisticate | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|
| **19.** | Satisfaction on Off-Line teaching software (AX-OT) for arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **20.** | Satisfaction on the positioner designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **21.** | Satisfaction on the slider designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **22.** | Satisfaction on the sensor designed for arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| | **Flexibility and Adaptability in Use** | **5** | **4** | **3** | **2** | **1** |
| **23.** | Satisfaction on the changeable arm (Arm side) of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **24.** | Satisfaction on the hanging installation capability (Ceiling/ Wall type) of Manipulator of arc welding robots of Uni Arc Co., Ltd. [UNAC] | | | | | |
| **25.** | Satisfaction on the manipulator designed for moving into narrow space of arc welding robots of Uni Arc Co., Ltd. [UNAC] | | | | | |
| **26.** | Satisfaction on the built-in coaxial power cable designed for avoiding welding obstacles of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **27.** | Satisfaction on the compatibility to abundant applications of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **28.** | Satisfaction on the Software PLC Function of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **29.** | Satisfaction on Data Management with Ethernet of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **30.** | Satisfaction on Field network compatible and reduce cable runs provided by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **31.** | Satisfaction on the manipulator and robot controller to connect with various welding processes power source (Co2/ MAG/ TIG/ MIG) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **32.** | Satisfaction on the welding capability for various kinds of materials by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **33.** | Satisfaction on the welding capability for various thicknesses of materials by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **34.** | Satisfaction on the welding power source to meet various welding needs (provides 32 welding processes in pulse MAG/MIG, DC MIG, Co2/MAG) of welding power source from | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Uni Arc Co., Ltd. [UNAC] | | | | | |
| | **Size** | **5** | **4** | **3** | **2** | **1** |
| **35.** | Satisfaction on the size of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **36.** | Satisfaction on the size of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **37.** | Satisfaction on the size of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| | **Weight** | **5** | **4** | **3** | **2** | **1** |
| **38.** | Satisfaction on the weight of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **39.** | Satisfaction on the weight of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **40.** | Satisfaction on the weight of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| | **Speed** | **5** | **4** | **3** | **2** | **1** |
| **41.** | Satisfaction on the speed of manipulator (Air-cut time) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **42.** | Satisfaction on the speed of robot controller (Processing time) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **43.** | Satisfaction on the welding speed of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| | **Warranty** | **5** | **4** | **3** | **2** | **1** |
| **44.** | Satisfaction on one-year warranty period for arc welding robots from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **45.** | Satisfaction on customer technical assistance (in warranty) from Uni Arc [UNAC] company | | | | | |
| **46.** | Satisfaction on the on-site robot checking and repairing (in warranty) from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **47.** | Satisfaction on the period of arc welding robots's Spare Parts Claim from Uni Arc Co., Ltd. [UNAC] | | | | | |
| **48.** | Satisfaction on the reserved spare parts for broken arc welding robots (in warranty) from Uni Arc Co., Ltd. [UNAC] | | | | | |
| | **Durability** | **5** | **4** | **3** | **2** | **1** |
| **49.** | Satisfaction on the manipulator's durability of arc welding robots of Uni Arc [UNAC] company | | | | | |
| **50.** | Satisfaction on the controller's durability of arc welding robots of Uni Arc [UNAC] company | | | | | |
| **51.** | Satisfaction on the welding power source's durability of arc welding robots of Uni Arc Co., Ltd. [UNAC] | | | | | |

| | Durability | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|
| **52.** | Satisfaction on the robot welding consumable parts of arc welding robots of Uni Arc Co., Ltd. [UNAC] | | | | | |
| **53.** | Satisfaction on the robot welding spare parts of arc welding robots of Uni Arc Co., Ltd. [UNAC] | | | | | |

# Thank you for your participation

**APPENDIX B:** Reliability Results

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .872 | 10 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .892 | 3 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .804 | 4 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .885 | 12 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .888 | 3 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .858 | 3 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .867 | 3 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .837 | 5 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .868 | 5 |

# Reliability

**Warnings**

| |
|---|
| The space saver method is used. That is, the covariance matrix is not calculated or used in the analysis. |

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 30 | 100.0 |
| | Excluded(a) | 0 | .0 |
| | Total | 30 | 100.0 |

a Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .958 | 48 |

**APPENDIX C:** Descriptive Analysis Tables

# Frequencies

# Frequency Table

**Gender**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Male | 288 | 72.0 | 72.4 | 72.4 |
| | Female | 110 | 27.5 | 27.6 | 100.0 |
| | Total | 398 | 99.5 | 100.0 | |
| Missing | System | 2 | .5 | | |
| Total | | 400 | 100.0 | | |

**Age**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Under 22 | 52 | 13.0 | 13.0 | 13.0 |
| | 22-34 | 267 | 66.8 | 66.9 | 79.9 |
| | 35-54 | 68 | 17.0 | 17.0 | 97.0 |
| | 55-64 | 10 | 2.5 | 2.5 | 99.5 |
| | Over 64 | 2 | .5 | .5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Income**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Below 10,000 baht | 97 | 24.3 | 24.3 | 24.3 |
| | 10,000-20,000 baht | 181 | 45.3 | 45.3 | 69.5 |
| | 20,001-30,000 baht | 93 | 23.3 | 23.3 | 92.8 |
| | 30,001-40,000 baht | 24 | 6.0 | 6.0 | 98.8 |
| | 40,001-50,000 baht | 3 | .8 | .8 | 99.5 |
| | Above 50,000 baht | 2 | .5 | .5 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Education**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Below Bachelor' s Degree | 117 | 29.3 | 29.3 | 29.3 |
| | Bachelor' s Degree | 261 | 65.3 | 65.4 | 94.7 |
| | Master' s Degree | 21 | 5.3 | 5.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Department**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Administrative | 37 | 9.3 | 9.3 | 9.3 |
| | Purchasing | 69 | 17.3 | 17.3 | 26.5 |
| | Engineering | 69 | 17.3 | 17.3 | 43.8 |
| | Production | 166 | 41.5 | 41.5 | 85.3 |
| | Maintenance | 55 | 13.8 | 13.8 | 99.0 |
| | Other | 4 | 1.0 | 1.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Other**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | | 397 | 99.3 | 99.3 | 99.3 |
| | Maketty | 1 | .3 | .3 | 99.5 |
| | Owwer | 1 | .3 | .3 | 99.8 |
| | Sale | 1 | .3 | .3 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on standard manipulator's working area of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 9 | 2.3 | 2.3 | 2.3 |
| | Neutral satisfaction | 117 | 29.3 | 29.3 | 31.6 |
| | High satisfaction | 208 | 52.0 | 52.1 | 83.7 |
| | Very High satisfaction | 65 | 16.3 | 16.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on long arm manipulator type designed for increasing of working area of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 8 | 2.0 | 2.0 | 2.0 |
| | Neutral satisfaction | 133 | 33.3 | 33.3 | 35.3 |
| | High satisfaction | 212 | 53.0 | 53.1 | 88.5 |
| | Very High satisfaction | 46 | 11.5 | 11.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on new manipulator (AX-V4) designed for moving into narrow space of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 6 | 1.5 | 1.5 | 1.5 |
| | Neutral satisfaction | 134 | 33.5 | 33.6 | 35.1 |
| | High satisfaction | 205 | 51.3 | 51.4 | 86.5 |
| | Very High satisfaction | 54 | 13.5 | 13.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction Robot Motion Performance of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 145 | 36.3 | 36.4 | 38.9 |
| | High satisfaction | 190 | 47.5 | 47.7 | 86.7 |
| | Very High satisfaction | 53 | 13.3 | 13.3 | 100.0 |
| | Total | 398 | 99.5 | 100.0 | |
| Missing | System | 2 | .5 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on number of axis controlled by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 133 | 33.3 | 33.3 | 36.6 |
| | High satisfaction | 192 | 48.0 | 48.1 | 84.7 |
| | Very High satisfaction | 61 | 15.3 | 15.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on memory capacity of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 144 | 36.0 | 36.1 | 38.6 |
| | High satisfaction | 169 | 42.3 | 42.4 | 81.0 |
| | Very High satisfaction | 76 | 19.0 | 19.0 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on stable arc provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 15 | 3.8 | 3.8 | 3.8 |
| | Neutral satisfaction | 135 | 33.8 | 33.9 | 37.7 |
| | High satisfaction | 193 | 48.3 | 48.5 | 86.2 |
| | Very High satisfaction | 55 | 13.8 | 13.8 | 100.0 |
| | Total | 398 | 99.5 | 100.0 | |
| Missing | System | 2 | .5 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on low spatter provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 15 | 3.8 | 3.8 | 3.8 |
| | Neutral satisfaction | 140 | 35.0 | 35.1 | 38.8 |
| | High satisfaction | 189 | 47.3 | 47.4 | 86.2 |
| | Very High satisfaction | 55 | 13.8 | 13.8 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on are stability at very low current ranges by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 14 | 3.5 | 3.5 | 3.5 |
| | Neutral satisfaction | 153 | 38.3 | 38.3 | 41.9 |
| | High satisfaction | 171 | 42.8 | 42.9 | 84.7 |
| | Very High satisfaction | 61 | 15.3 | 15.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on arc stability at very high welding speeds by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 137 | 34.3 | 34.3 | 37.6 |
| | High satisfaction | 199 | 49.8 | 49.9 | 87.5 |
| | Very High satisfaction | 50 | 12.5 | 12.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on positional repeatability of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 161 | 40.3 | 40.4 | 42.9 |
| | High satisfaction | 191 | 47.8 | 47.9 | 90.7 |
| | Very High satisfaction | 37 | 9.3 | 9.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on Operational Software (OS) of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 166 | 41.5 | 41.6 | 44.1 |
| | High satisfaction | 174 | 43.5 | 43.6 | 87.7 |
| | Very High satisfaction | 49 | 12.3 | 12.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on current and voltage precisely controlled and supplied by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 9 | 2.3 | 2.3 | 2.3 |
| | Neutral satisfaction | 148 | 37.0 | 37.1 | 39.3 |
| | High satisfaction | 192 | 48.0 | 48.1 | 87.5 |
| | Very High satisfaction | 50 | 12.5 | 12.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on Off-Line teaching software (AX-OT) for arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 22 | 5.5 | 5.5 | 5.5 |
| | Neutral satisfaction | 169 | 42.3 | 42.4 | 47.9 |
| | High satisfaction | 143 | 35.8 | 35.8 | 83.7 |
| | Very High satisfaction | 65 | 16.3 | 16.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on positioned designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 19 | 4.8 | 4.8 | 4.8 |
| | Neutral satisfaction | 180 | 45.0 | 45.1 | 49.9 |
| | High satisfaction | 165 | 41.3 | 41.4 | 91.2 |
| | Very High satisfaction | 35 | 8.8 | 8.8 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on slider designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 18 | 4.5 | 4.5 | 4.5 |
| | Neutral satisfaction | 160 | 40.0 | 40.0 | 44.5 |
| | High satisfaction | 181 | 45.3 | 45.3 | 89.8 |
| | Very High satisfaction | 41 | 10.3 | 10.3 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on sensor designed for arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Very Low satisfaction | 1 | .3 | .3 | .3 |
| | Low satisfaction | 21 | 5.3 | 5.3 | 5.5 |
| | Neutral satisfaction | 178 | 44.5 | 44.6 | 50.1 |
| | High satisfaction | 146 | 36.5 | 36.6 | 86.7 |
| | Very High satisfaction | 53 | 13.3 | 13.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on changeable arm (Arm side) of manipulator for arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 14 | 3.5 | 3.5 | 3.5 |
| | Neutral satisfaction | 154 | 38.5 | 38.5 | 42.0 |
| | High satisfaction | 184 | 46.0 | 46.0 | 88.0 |
| | Very High satisfaction | 48 | 12.0 | 12.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on hanging installation capability (Ceiling/Wall type) of Manipulate if Arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 19 | 4.8 | 4.8 | 4.8 |
| | Neutral satisfaction | 143 | 35.8 | 35.8 | 40.5 |
| | High satisfaction | 186 | 46.5 | 46.5 | 87.0 |
| | Very High satisfaction | 52 | 13.0 | 13.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on manipulator designed for moving into narrow space of Arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 14 | 3.5 | 3.5 | 3.5 |
| | Neutral satisfaction | 130 | 32.5 | 32.6 | 36.1 |
| | High satisfaction | 209 | 52.3 | 52.4 | 88.5 |
| | Very High satisfaction | 46 | 11.5 | 11.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on built-in coaxial power cable designed for avoiding welding obstacle of Arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 145 | 36.3 | 36.3 | 38.8 |
| | High satisfaction | 191 | 47.8 | 47.8 | 86.5 |
| | Very High satisfaction | 54 | 13.5 | 13.5 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on compatible to abundant applications of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 12 | 3.0 | 3.0 | 3.0 |
| | Neutral satisfaction | 131 | 32.8 | 32.8 | 35.8 |
| | High satisfaction | 196 | 49.0 | 49.1 | 85.0 |
| | Very High satisfaction | 60 | 15.0 | 15.0 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on Software PLC Function of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 12 | 3.0 | 3.0 | 3.0 |
| | Neutral satisfaction | 154 | 38.5 | 38.5 | 41.5 |
| | High satisfaction | 177 | 44.3 | 44.3 | 85.8 |
| | Very High satisfaction | 57 | 14.3 | 14.3 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on Data Management with Ethernet of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 16 | 4.0 | 4.0 | 4.0 |
| | Neutral satisfaction | 146 | 36.5 | 36.6 | 40.6 |
| | High satisfaction | 189 | 47.3 | 47.4 | 88.0 |
| | Very High satisfaction | 48 | 12.0 | 12.0 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on Field net work compatible and reduce cable runs provided by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 148 | 37.0 | 37.1 | 40.4 |
| | High satisfaction | 184 | 46.0 | 46.1 | 86.5 |
| | Very High satisfaction | 54 | 13.5 | 13.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on manipulator and robot controller to connect with various welding processes power source (Co2/ MAG/ TIG/ MIG) of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 11 | 2.8 | 2.8 | 2.8 |
| | Neutral satisfaction | 133 | 33.3 | 33.3 | 36.0 |
| | High satisfaction | 199 | 49.8 | 49.8 | 85.8 |
| | Very High satisfaction | 57 | 14.3 | 14.3 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on welding capability for various kinds of material by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 9 | 2.3 | 2.3 | 2.3 |
| | Neutral satisfaction | 140 | 35.0 | 35.0 | 37.3 |
| | High satisfaction | 191 | 47.8 | 47.8 | 85.0 |
| | Very High satisfaction | 60 | 15.0 | 15.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on welding capability for various thicknesses of material by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 144 | 36.0 | 36.0 | 39.3 |
| | High satisfaction | 192 | 48.0 | 48.0 | 87.3 |
| | Very High satisfaction | 51 | 12.8 | 12.8 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on welding power source to meet various welding needs (provides 32 welding processes in pulse MAG/MIG, DC, MIG, Co2/ MAG) of welding power source from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 8 | 2.0 | 2.0 | 2.0 |
| | Neutral satisfaction | 151 | 37.8 | 37.8 | 39.8 |
| | High satisfaction | 174 | 43.5 | 43.5 | 83.3 |
| | Very High satisfaction | 67 | 16.8 | 16.8 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on size of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 18 | 4.5 | 4.5 | 4.5 |
| | Neutral satisfaction | 156 | 39.0 | 39.1 | 43.6 |
| | High satisfaction | 156 | 39.0 | 39.1 | 82.7 |
| | Very High satisfaction | 69 | 17.3 | 17.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on size of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 171 | 42.8 | 42.8 | 46.0 |
| | High satisfaction | 173 | 43.3 | 43.3 | 89.3 |
| | Very High satisfaction | 43 | 10.8 | 10.8 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on size of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 133 | 33.3 | 33.3 | 36.6 |
| | High satisfaction | 203 | 50.8 | 50.9 | 87.5 |
| | Very High satisfaction | 50 | 12.5 | 12.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on weight of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 45 | 11.3 | 11.3 | 11.3 |
| | Neutral satisfaction | 150 | 37.5 | 37.5 | 48.8 |
| | High satisfaction | 143 | 35.8 | 35.8 | 84.5 |
| | Very High satisfaction | 62 | 15.5 | 15.5 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on weight of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 38 | 9.5 | 9.5 | 9.5 |
| | Neutral satisfaction | 125 | 31.3 | 31.3 | 40.8 |
| | High satisfaction | 176 | 44.0 | 44.0 | 84.8 |
| | Very High satisfaction | 61 | 15.3 | 15.3 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on weight of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 20 | 5.0 | 5.0 | 5.0 |
| | Neutral satisfaction | 151 | 37.8 | 37.8 | 42.9 |
| | High satisfaction | 159 | 39.8 | 39.8 | 82.7 |
| | Very High satisfaction | 69 | 17.3 | 17.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on speed of manipulator (Air-cut time) of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 8 | 2.0 | 2.0 | 2.0 |
| | Neutral satisfaction | 165 | 41.3 | 41.3 | 43.3 |
| | High satisfaction | 167 | 41.8 | 41.8 | 85.0 |
| | Very High satisfaction | 60 | 15.0 | 15.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on speed of robot controller (Processing time) of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 5 | 1.3 | 1.3 | 1.3 |
| | Neutral satisfaction | 158 | 39.5 | 39.5 | 40.8 |
| | High satisfaction | 177 | 44.3 | 44.3 | 85.0 |
| | Very High satisfaction | 60 | 15.0 | 15.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on welding speed provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 142 | 35.5 | 35.5 | 38.0 |
| | High satisfaction | 183 | 45.8 | 45.8 | 83.8 |
| | Very High satisfaction | 65 | 16.3 | 16.3 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on 1 Year Warranty Period for arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Very Low satisfaction | 2 | .5 | .5 | .5 |
| | Low satisfaction | 20 | 5.0 | 5.0 | 5.5 |
| | Neutral satisfaction | 149 | 37.3 | 37.3 | 42.9 |
| | High satisfaction | 161 | 40.3 | 40.4 | 83.2 |
| | Very High satisfaction | 67 | 16.8 | 16.8 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on Customer Technical Assistance (in warranty) of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 143 | 35.8 | 35.8 | 39.0 |
| | High satisfaction | 184 | 46.0 | 46.0 | 85.0 |
| | Very High satisfaction | 60 | 15.0 | 15.0 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on On-site Robot checking and Repairing (in warranty) of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 16 | 4.0 | 4.0 | 4.0 |
| | Neutral satisfaction | 142 | 35.5 | 35.5 | 39.5 |
| | High satisfaction | 168 | 42.0 | 42.0 | 81.5 |
| | Very High satisfaction | 74 | 18.5 | 18.5 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on reserved spare part claim of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 17 | 4.3 | 4.3 | 4.3 |
| | Neutral satisfaction | 142 | 35.5 | 35.5 | 39.8 |
| | High satisfaction | 184 | 46.0 | 46.0 | 85.8 |
| | Very High satisfaction | 57 | 14.3 | 14.3 | 100.0 |
| | Total | 400 | 100.0 | 100.0 | |

**Satisfaction on reserved spare parts for broken down arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Very Low satisfaction | 1 | .3 | .3 | .3 |
| | Low satisfaction | 16 | 4.0 | 4.0 | 4.3 |
| | Neutral satisfaction | 134 | 33.5 | 33.7 | 37.9 |
| | High satisfaction | 172 | 43.0 | 43.2 | 81.2 |
| | Very High satisfaction | 75 | 18.8 | 18.8 | 100.0 |
| | Total | 398 | 99.5 | 100.0 | |
| Missing | System | 2 | .5 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on manipulator's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 157 | 39.3 | 39.3 | 41.9 |
| | High satisfaction | 177 | 44.3 | 44.4 | 86.2 |
| | Very High satisfaction | 55 | 13.8 | 13.8 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on robot controller's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 10 | 2.5 | 2.5 | 2.5 |
| | Neutral satisfaction | 157 | 39.3 | 39.3 | 41.9 |
| | High satisfaction | 190 | 47.5 | 47.6 | 89.5 |
| | Very High satisfaction | 42 | 10.5 | 10.5 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on welding power source's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 13 | 3.3 | 3.3 | 3.3 |
| | Neutral satisfaction | 138 | 34.5 | 34.6 | 37.8 |
| | High satisfaction | 188 | 47.0 | 47.1 | 85.0 |
| | Very High satisfaction | 60 | 15.0 | 15.0 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on robot welding consumable parts of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 9 | 2.3 | 2.3 | 2.3 |
| | Neutral satisfaction | 148 | 37.0 | 37.1 | 39.3 |
| | High satisfaction | 147 | 36.8 | 36.8 | 76.2 |
| | Very High satisfaction | 95 | 23.8 | 23.8 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

**Satisfaction on robot welding spare parts of arc welding robots from Uni Arc Co., Ltd. [UNAC]**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Low satisfaction | 15 | 3.8 | 3.8 | 3.8 |
| | Neutral satisfaction | 134 | 33.5 | 33.6 | 37.3 |
| | High satisfaction | 165 | 41.3 | 41.4 | 78.7 |
| | Very High satisfaction | 85 | 21.3 | 21.3 | 100.0 |
| | Total | 399 | 99.8 | 100.0 | |
| Missing | System | 1 | .3 | | |
| Total | | 400 | 100.0 | | |

# Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on standard manipulator's working area of are welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8246 | .71895 |
| Satisfaction on long arm manipulator type designed for increasing of working area of are welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7419 | .68069 |
| Satisfaction on new manipulator (AX-V4) designed for moving into narrow space of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7694 | .69236 |
| Satisfaction Robot Motion Performance of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 398 | 2.00 | 5.00 | 3.7186 | .72118 |
| Satisfaction on number of axis controlled by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7544 | .74673 |
| Satisfaction on memory capacity of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7794 | .77750 |
| Satisfaction on stable arc provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 398 | 2.00 | 5.00 | 3.7236 | .74374 |
| Satisfaction on low spatter provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7118 | .74661 |
| Satisfaction on are stability at very low current ranges by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6992 | .76662 |
| Satisfaction on arc stability at very high welding speeds by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7168 | .72118 |
| Valid N (listwise) | 397 | | | | |

# Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on positional repeatability of manipulator of arcwelding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6391 | .68368 |
| Satisfaction on Operational Software (OS) of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6566 | .72285 |
| Satisfaction on current and voltage precisely controlled and supplied by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7093 | .70937 |
| Valid N (listwise) | 399 | | | | |

# Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on Off-Line teaching software (AX-OT) for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6291 | .81921 |
| Satisfaction on positioned designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.5414 | .72130 |
| Satisfaction on slider designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6125 | .73053 |
| Satisfaction on sensor designed for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 1.00 | 5.00 | 3.5739 | .79504 |
| Valid N (listwise) | 397 | | | | |

# Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on changeable arm (Arm side) of manipulator for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6650 | .73083 |
| Satisfaction on hanging installation capability (Ceiling/Wall type) of Manipulate if Arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6775 | .75824 |
| Satisfaction on manipulator designed for moving into narrow space of Arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7193 | .70988 |
| Satisfaction on built-in coaxial power cable designed for avoiding welding obstacle of Arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7225 | .72236 |
| Satisfaction on compatible to abundant applications of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7619 | .73734 |
| Satisfaction on Software PLC Function of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6975 | .74658 |
| Satisfaction on Data Management with Ethernet of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6742 | .73608 |
| Satisfaction on Field net work compatible and reduce cable runs provided by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6992 | .73994 |
| Satisfaction on manipulator and robot controller to connect with various welding processes power source (Co2/ MAG/ TIG/ MIG) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7550 | .72546 |

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on welding capability for various kinds of material by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7550 | .72891 |
| Satisfaction on welding capability for various thicknesses of material by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7025 | .72823 |
| Satisfaction on welding power source to meet various welding needs (provides 32 welding processes in pulse MAG/MIG, DC, MIG, Co2/ MAG) of welding power source from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7500 | .75094 |
| Valid N (listwise) | 396 | | | | |

## Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on size of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6917 | .80682 |
| Satisfaction on size of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6150 | .71977 |
| Satisfaction on size of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7268 | .71808 |
| Valid N (listwise) | 398 | | | | |

## Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on weight of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.5550 | .88540 |
| Satisfaction on weight of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6500 | .85106 |
| Satisfaction on weight of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6942 | .81243 |
| Valid N (listwise) | 399 | | | | |

## Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on speed of manipulator (Air-cut time) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6975 | .74322 |
| Satisfaction on speed of robot controller (Processing time) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7300 | .72347 |
| Satisfaction on welding speed provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7575 | .74839 |
| Valid N (listwise) | 400 | | | | |

# Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on 1 Year Warranty Period for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 1.00 | 5.00 | 3.6792 | .82811 |
| Satisfaction on Customer Technical Assistance (in warranty) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7275 | .75144 |
| Satisfaction on On-site Robot checking and Repairing (in warranty) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7500 | .79944 |
| Satisfaction on reserved spare part claim of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7025 | .76187 |
| Satisfaction on reserved spare parts for broken down arc welding robots from Uni Arc Co., Ltd. [UNAC] | 398 | 1.00 | 5.00 | 3.7638 | .80895 |
| Valid N (listwise) | 397 | | | | |

## Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on manipulator's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6942 | .73447 |
| Satisfaction on robot controller's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6617 | .69695 |
| Satisfaction on welding power source's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7393 | .74835 |
| Satisfaction on robot welding consumable parts of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8221 | .81808 |
| Satisfaction on robot welding spare parts of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8020 | .81345 |
| Valid N (listwise) | 399 | | | | |

## Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on standard manipulator's working area of are welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8246 | .71895 |
| Satisfaction on long arm manipulator type designed for increasing of working area of are welding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7419 | .68069 |
| Satisfaction on new manipulator (AX-V4) designed for moving into narrow space of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7694 | .69236 |

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction Robot Motion Performance of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 398 | 2.00 | 5.00 | 3.7186 | .72118 |
| Satisfaction on number of axis controlled by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7544 | .74673 |
| Satisfaction on memory capacity of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7794 | .77750 |
| Satisfaction on stable arc provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 398 | 2.00 | 5.00 | 3.7236 | .74374 |
| Satisfaction on low spatter provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7118 | .74661 |
| Satisfaction on are stability at very low current ranges by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6992 | .76662 |
| Satisfaction on arc stability at very high welding speeds by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7168 | .72118 |
| Satisfaction on positional repeatability of manipulator of arcwelding robot from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6391 | .68368 |
| Satisfaction on Operational Software (OS) of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6566 | .72285 |
| Satisfaction on current and voltage precisely controlled and supplied by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7093 | .70937 |
| Satisfaction on Off-Line teaching software (AX-OT) for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6291 | .81921 |

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on positioned designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.5414 | .72130 |
| Satisfaction on slider designed for synchronized with arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6125 | .73053 |
| Satisfaction on sensor designed for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 1.00 | 5.00 | 3.5739 | .79504 |
| Satisfaction on changeable arm (Arm side) of manipulator for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6650 | .73083 |
| Satisfaction on hanging installation capability (Ceiling/Wall type) of Manipulate if Arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6775 | .75824 |
| Satisfaction on manipulator designed for moving into narrow space of Arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7193 | .70988 |
| Satisfaction on built-in coaxial power cable designed for avoiding welding obstacle of Arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7225 | .72236 |
| Satisfaction on compatible to abundant applications of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7619 | .73734 |
| Satisfaction on Software PLC Function of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6975 | .74658 |
| Satisfaction on Data Management with Ethernet of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6742 | .73608 |

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on Field net work compatible and reduce cable runs provided by robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6992 | .73994 |
| Satisfaction on manipulator and robot controller to connect with various welding processes power source (Co2/ MAG/ TIG/ MIG) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7550 | .72546 |
| Satisfaction on welding capability for various kinds of material by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7550 | .72891 |
| Satisfaction on welding capability for various thicknesses of material by power supply of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7025 | .72823 |
| Satisfaction on welding power source to meet various welding needs (provides 32 welding processes in pulse MAG/MIG, DC, MIG, Co2/ MAG) of welding power source from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7500 | .75094 |
| Satisfaction on size of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6917 | .80682 |
| Satisfaction on size of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6150 | .71977 |
| Satisfaction on size of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7268 | .71808 |
| Satisfaction on weight of manipulator of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.5550 | .88540 |
| Satisfaction on weight of robot controller of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6500 | .85106 |

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on weight of welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6942 | .81243 |
| Satisfaction on speed of manipulator (Air-cut time) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.6975 | .74322 |
| Satisfaction on speed of robot controller (Processing time) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7300 | .72347 |
| Satisfaction on welding speed provided by welding power source of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7575 | .74839 |
| Satisfaction on 1 Year Warranty Period for arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 1.00 | 5.00 | 3.6792 | .82811 |
| Satisfaction on Customer Technical Assistance (in warranty) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7275 | .75144 |
| Satisfaction on On-site Robot checking and Repairing (in warranty) of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7500 | .79944 |
| Satisfaction on reserved spare part claim of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 400 | 2.00 | 5.00 | 3.7025 | .76187 |
| Satisfaction on reserved spare parts for broken down arc welding robots from Uni Arc Co., Ltd. [UNAC] | 398 | 1.00 | 5.00 | 3.7638 | .80895 |
| Satisfaction on manipulator's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6942 | .73447 |
| Satisfaction on robot controller's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.6617 | .69695 |
| Satisfaction on welding power source's durability of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.7393 | .74835 |

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Satisfaction on robot welding consumable parts of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8221 | .81808 |
| Satisfaction on robot welding spare parts of arc welding robots from Uni Arc Co., Ltd. [UNAC] | 399 | 2.00 | 5.00 | 3.8020 | .81345 |
| Valid N (listwise) | 384 | | | | |

## Descriptives

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Performance in Operation | 397 | 2.00 | 5.00 | 3.7456 | .51199 |
| Reliability | 399 | 2.00 | 5.00 | 3.6683 | .58931 |
| Technical Sophisticate | 397 | 1.75 | 5.00 | 3.5894 | .63629 |
| Flexibility and Adaptability in use | 396 | 2.00 | 5.00 | 3.7155 | .50861 |
| Size | 398 | 2.00 | 5.00 | 3.6767 | .66026 |
| Weight | 399 | 2.00 | 5.00 | 3.6332 | .76713 |
| Speed | 400 | 2.00 | 5.00 | 3.7283 | .63988 |
| Warranty | 397 | 2.00 | 5.00 | 3.7239 | .66161 |
| Durability | 399 | 2.00 | 5.00 | 3.7439 | .62209 |
| Valid N (listwise) | 384 | | | | |

**APPENDIX D:** Hypothesis Tables

# Hypothesis 1

# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Performance in Operation | Male | 285 | 3.7881 | .50609 | .02998 |
| | Female | 110 | 3.6445 | .51306 | .04892 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Performance in Operation | Equal variances assumed | .041 | .839 | 2.517 | 393 | .012 | .14352 | .05703 | .03141 | .25564 |
| | Equal variances not assumed | | | 2.502 | 195.653 | .013 | .14352 | .05737 | .03038 | .25667 |

# Hypothesis 2
# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Reliability | Male | 287 | 3.7085 | .57380 | .03387 |
| | Female | 110 | 3.5758 | .61730 | .05886 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Reliability | Equal variances assumed | 2.761 | .097 | 2.019 | 395 | .044 | .13272 | .06573 | .00350 | .26194 |
| | Equal variances not assumed | | | 1.954 | 185.398 | .052 | .13272 | .06791 | -.00125 | .26669 |

# Hypothesis 3
# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Technical Sophisticate | Male | 286 | 3.6110 | .63498 | .03755 |
| | Female | 109 | 3.5275 | .64311 | .06160 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Technical Sophisticate | Equal variances assumed | .024 | .878 | 1.164 | 393 | .245 | .08349 | .07173 | -.05753 | .22451 |
| | Equal variances not assumed | | | 1.157 | 193.064 | .249 | .08349 | .07214 | -.05879 | .22577 |

# Hypothesis 4

# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Flexibility and Adaptability in use | Male | 285 | 3.7605 | .49344 | .02923 |
| | Female | 109 | 3.6032 | .53491 | .05123 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Flexibility and Adaptability in use | Equal variances assumed | .419 | .518 | 2.765 | 392 | .006 | .15732 | .05690 | .04546 | .26917 |
| | Equal variances not assumed | | | 2.667 | 182.392 | .008 | .15732 | .05899 | .04093 | .27370 |

# Hypothesis 5
# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Size | Male | 286 | 3.7156 | .63240 | .03739 |
| | Female | 110 | 3.5727 | .72544 | .06917 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Size | Equal variances assumed | 4.595 | .033 | 1.931 | 394 | .054 | .14289 | .07399 | -.00257 | .28835 |
| | Equal variances not assumed | | | 1.817 | 176.272 | .071 | .14289 | .07863 | -.01229 | .29807 |

# Hypothesis 6
# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Weight | Male | 288 | 3.7338 | .74570 | .04394 |
| | Female | 109 | 3.3761 | .76994 | .07375 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Weight | Equal variances assumed | .260 | .610 | 4.227 | 395 | .000 | .35765 | .08461 | .19130 | .52400 |
| | Equal variances not assumed | | | 4.166 | 189.317 | .000 | .35765 | .08584 | .18831 | .52698 |

# Hypothesis 7
# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Speed | Male | 288 | 3.7847 | .63450 | .03739 |
| | Female | 110 | 3.5818 | .63925 | .06095 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Speed | Equal variances assumed | .090 | .764 | 2.847 | 396 | .005 | .20290 | .07126 | .06280 | .34301 |
| | Equal variances not assumed | | | 2.838 | 195.928 | .005 | .20290 | .07150 | .06189 | .34392 |

# Hypothesis 8
# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Warranty | Male | 285 | 3.8028 | .64654 | .03830 |
| | Female | 110 | 3.5255 | .66573 | .06348 |



**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Warranty | Equal variances assumed | .015 | .903 | 3.790 | 393 | .000 | .27735 | .07318 | .13348 | .42122 |
| | Equal variances not assumed | | | 3.741 | 192.989 | .000 | .27735 | .07413 | .13114 | .42357 |

# Hypothesis 9
# T-Test

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Durability | Male | 287 | 3.7882 | .62265 | .03675 |
| | Female | 110 | 3.6309 | .61432 | .05857 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Durability | Equal variances assumed | .419 | .518 | 2.260 | 395 | .024 | .15724 | .06957 | .02048 | .29401 |
| | Equal variances not assumed | | | 2.274 | 199.922 | .024 | .15724 | .06915 | .02089 | .29360 |

**Hypothesis 10**
**One way ANOVA**

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 11.784 | 4 | 2.946 | 12.535 | .000 |
| Within Groups | 91.901 | 391 | .235 | | |
| Total | 103.685 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .38096* | .07413 | .000 | .2352 | .5267 |
| | 35-54 | .60637* | .08981 | .000 | .4298 | .7829 |
| | 55-64 | .66549* | .16767 | .000 | .3358 | .9951 |
| | Over 64 | .62549 | .34947 | .074 | -.0616 | 1.3126 |
| 22-34 | Under 22 | -.38096* | .07413 | .000 | -.5267 | -.2352 |
| | 35-54 | .22541* | .06590 | .001 | .0958 | .3550 |
| | 55-64 | .28453 | .15618 | .069 | -.0225 | .5916 |
| | Over 64 | .24453 | .34410 | .478 | -.4320 | .9211 |
| 35-54 | Under 22 | -.60637* | .08981 | .000 | -.7829 | -.4298 |
| | 22-34 | -.22541* | .06590 | .001 | -.3550 | -.0958 |
| | 55-64 | .05912 | .16420 | .719 | -.2637 | .3819 |
| | Over 64 | .01912 | .34782 | .956 | -.6647 | .7029 |
| 55-64 | Under 22 | -.66549* | .16767 | .000 | -.9951 | -.3358 |
| | 22-34 | -.28453 | .15618 | .069 | -.5916 | .0225 |
| | 35-54 | -.05912 | .16420 | .719 | -.3819 | .2637 |
| | Over 64 | -.04000 | .37553 | .915 | -.7783 | .6983 |
| Over 64 | Under 22 | -.62549 | .34947 | .074 | -1.3126 | .0616 |
| | 22-34 | -.24453 | .34410 | .478 | -.9211 | .4320 |
| | 35-54 | -.01912 | .34782 | .956 | -.7029 | .6647 |
| | 55-64 | .04000 | .37553 | .915 | -.6983 | .7783 |

*. The mean difference is significant at the .05 level.

# Hypothesis 11
# One way ANOVA

**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.617 | 4 | 2.654 | 8.174 | .000 |
| Within Groups | 127.604 | 393 | .325 | | |
| Total | 138.221 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .44660* | .08640 | .000 | .2767 | .6165 |
| | 35-54 | .54751* | .10497 | .000 | .3411 | .7539 |
| | 55-64 | .54359* | .19676 | .006 | .1568 | .9304 |
| | Over 64 | .57692 | .41060 | .161 | -.2303 | 1.3842 |
| 22-34 | Under 22 | -.44660* | .08640 | .000 | -.6165 | -.2767 |
| | 35-54 | .10091 | .07743 | .193 | -.0513 | .2531 |
| | 55-64 | .09699 | .18355 | .597 | -.2639 | .4579 |
| | Over 64 | .13033 | .40443 | .747 | -.6648 | .9255 |
| 35-54 | Under 22 | -.54751* | .10497 | .000 | -.7539 | -.3411 |
| | 22-34 | -.10091 | .07743 | .193 | -.2531 | .0513 |
| | 55-64 | -.00392 | .19299 | .984 | -.3833 | .3755 |
| | Over 64 | .02941 | .40880 | .943 | -.7743 | .8331 |
| 55-64 | Under 22 | -.54359* | .19676 | .006 | -.9304 | -.1568 |
| | 22-34 | -.09699 | .18355 | .597 | -.4579 | .2639 |
| | 35-54 | .00392 | .19299 | .984 | -.3755 | .3833 |
| | Over 64 | .03333 | .44138 | .940 | -.8344 | .9011 |
| Over 64 | Under 22 | -.57692 | .41060 | .161 | -1.3842 | .2303 |
| | 22-34 | -.13033 | .40443 | .747 | -.9255 | .6648 |
| | 35-54 | -.02941 | .40880 | .943 | -.8331 | .7743 |
| | 55-64 | -.03333 | .44138 | .940 | -.9011 | .8344 |

*. The mean difference is significant at the .05 level.

# Hypothesis 12
# One way ANOVA

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 9.080 | 4 | 2.270 | 5.869 | .000 |
| Within Groups | 151.238 | 391 | .387 | | |
| Total | 160.318 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Under 22 | 22-34 | .38227* | .09430 | .000 | .1969 | .5677 |
| | 35-54 | .54181* | .11532 | .000 | .3151 | .7685 |
| | 55-64 | .32212 | .21475 | .134 | -.1001 | .7443 |
| | Over 64 | .44712 | .44815 | .319 | -.4340 | 1.3282 |
| 22-34 | Under 22 | -.38227* | .09430 | .000 | -.5677 | -.1969 |
| | 35-54 | .15955 | .08553 | .063 | -.0086 | .3277 |
| | 55-64 | -.06015 | .20033 | .764 | -.4540 | .3337 |
| | Over 64 | .06485 | .44142 | .883 | -.8030 | .9327 |
| 35-54 | Under 22 | -.54181* | .11532 | .000 | -.7685 | -.3151 |
| | 22-34 | -.15955 | .08553 | .063 | -.3277 | .0086 |
| | 55-64 | -.21970 | .21105 | .299 | -.6346 | .1952 |
| | Over 64 | -.09470 | .44638 | .832 | -.9723 | .7829 |
| 55-64 | Under 22 | -.32212 | .21475 | .134 | -.7443 | .1001 |
| | 22-34 | .06015 | .20033 | .764 | -.3337 | .4540 |
| | 35-54 | .21970 | .21105 | .299 | -.1952 | .6346 |
| | Over 64 | .12500 | .48175 | .795 | -.8221 | 1.0721 |
| Over 64 | Under 22 | -.44712 | .44815 | .319 | -1.3282 | .4340 |
| | 22-34 | -.06485 | .44142 | .883 | -.9327 | .8030 |
| | 35-54 | .09470 | .44638 | .832 | -.7829 | .9723 |
| | 55-64 | -.12500 | .48175 | .795 | -1.0721 | .8221 |

*. The mean difference is significant at the .05 level.

## Hypothesis 13
## One way ANOVA

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 8.181 | 4 | 2.045 | 8.487 | .000 |
| Within Groups | 93.983 | 390 | .241 | | |
| Total | 102.164 | 394 | | | |

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Under 22 | 22-34 | .30172* | .07448 | .000 | .1553 | .4481 |
| | 35-54 | .52509* | .09072 | .000 | .3467 | .7035 |
| | 55-64 | .33429* | .16951 | .049 | .0010 | .6676 |
| | Over 64 | .51763 | .35373 | .144 | -.1778 | 1.2131 |
| 22-34 | Under 22 | -.30172* | .07448 | .000 | -.4481 | -.1553 |
| | 35-54 | .22337* | .06715 | .001 | .0913 | .3554 |
| | 55-64 | .03258 | .15815 | .837 | -.2784 | .3435 |
| | Over 64 | .21591 | .34843 | .536 | -.4691 | .9009 |
| 35-54 | Under 22 | -.52509* | .09072 | .000 | -.7035 | -.3467 |
| | 22-34 | -.22337* | .06715 | .001 | -.3554 | -.0913 |
| | 55-64 | -.19080 | .16642 | .252 | -.5180 | .1364 |
| | Over 64 | -.00746 | .35226 | .983 | -.7000 | .6851 |
| 55-64 | Under 22 | -.33429* | .16951 | .049 | -.6676 | -.0010 |
| | 22-34 | -.03258 | .15815 | .837 | -.3435 | .2784 |
| | 35-54 | .19080 | .16642 | .252 | -.1364 | .5180 |
| | Over 64 | .18333 | .38025 | .630 | -.5643 | .9309 |
| Over 64 | Under 22 | -.51763 | .35373 | .144 | -1.2131 | .1778 |
| | 22-34 | -.21591 | .34843 | .536 | -.9009 | .4691 |
| | 35-54 | .00746 | .35226 | .983 | -.6851 | .7000 |
| | 55-64 | -.18333 | .38025 | .630 | -.9309 | .5643 |

*. The mean difference is significant at the .05 level.

# Hypothesis 14
# One way ANOVA

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 15.521 | 4 | 3.880 | 9.655 | .000 |
| Within Groups | 157.550 | 392 | .402 | | |
| Total | 173.071 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .49964* | .09615 | .000 | .3106 | .6887 |
| | 35-54 | .66214* | .11679 | .000 | .4325 | .8918 |
| | 55-64 | .74744* | .21891 | .001 | .3171 | 1.1778 |
| | Over 64 | .98077* | .45682 | .032 | .0826 | 1.8789 |
| 22-34 | Under 22 | -.49964* | .09615 | .000 | -.6887 | -.3106 |
| | 35-54 | .16250 | .08618 | .060 | -.0069 | .3319 |
| | 55-64 | .24780 | .20422 | .226 | -.1537 | .6493 |
| | Over 64 | .48113 | .44997 | .286 | -.4035 | 1.3658 |
| 35-54 | Under 22 | -.66214* | .11679 | .000 | -.8918 | -.4325 |
| | 22-34 | -.16250 | .08618 | .060 | -.3319 | .0069 |
| | 55-64 | .08529 | .21471 | .691 | -.3368 | .5074 |
| | Over 64 | .31863 | .45483 | .484 | -.5756 | 1.2128 |
| 55-64 | Under 22 | -.74744* | .21891 | .001 | -1.1778 | -.3171 |
| | 22-34 | -.24780 | .20422 | .226 | -.6493 | .1537 |
| | 35-54 | -.08529 | .21471 | .691 | -.5074 | .3368 |
| | Over 64 | .23333 | .49107 | .635 | -.7321 | 1.1988 |
| Over 64 | Under 22 | -.98077* | .45682 | .032 | -1.8789 | -.0826 |
| | 22-34 | -.48113 | .44997 | .286 | -1.3658 | .4035 |
| | 35-54 | -.31863 | .45483 | .484 | -1.2128 | .5756 |
| | 55-64 | -.23333 | .49107 | .635 | -1.1988 | .7321 |

*. The mean difference is significant at the .05 level.

## Hypothesis 15
## One way ANOVA

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 29.051 | 4 | 7.263 | 13.918 | .000 |
| Within Groups | 205.080 | 393 | .522 | | |
| Total | 234.131 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .41389* | .11039 | .000 | .1969 | .6309 |
| | 35-54 | .91667* | .13381 | .000 | .6536 | 1.1797 |
| | 55-64 | .93137* | .24983 | .000 | .4402 | 1.4225 |
| | Over 64 | 1.26471* | .52072 | .016 | .2410 | 2.2884 |
| 22-34 | Under 22 | -.41389* | .11039 | .000 | -.6309 | -.1969 |
| | 35-54 | .50277* | .09812 | .000 | .3099 | .6957 |
| | 55-64 | .51748* | .23268 | .027 | .0600 | .9749 |
| | Over 64 | .85081 | .51271 | .098 | -.1572 | 1.8588 |
| 35-54 | Under 22 | -.91667* | .13381 | .000 | -1.1797 | -.6536 |
| | 22-34 | -.50277* | .09812 | .000 | -.6957 | -.3099 |
| | 55-64 | .01471 | .24466 | .952 | -.4663 | .4957 |
| | Over 64 | .34804 | .51826 | .502 | -.6709 | 1.3669 |
| 55-64 | Under 22 | -.93137* | .24983 | .000 | -1.4225 | -.4402 |
| | 22-34 | -.51748* | .23268 | .027 | -.9749 | -.0600 |
| | 35-54 | -.01471 | .24466 | .952 | -.4957 | .4663 |
| | Over 64 | .33333 | .55955 | .552 | -.7668 | 1.4334 |
| Over 64 | Under 22 | -1.26471* | .52072 | .016 | -2.2884 | -.2410 |
| | 22-34 | -.85081 | .51271 | .098 | -1.8588 | .1572 |
| | 35-54 | -.34804 | .51826 | .502 | -1.3669 | .6709 |
| | 55-64 | -.33333 | .55955 | .552 | -1.4334 | .7668 |

*. The mean difference is significant at the .05 level.

# Hypothesis 16
# One way ANOVA

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 17.494 | 4 | 4.374 | 11.813 | .000 |
| Within Groups | 145.870 | 394 | .370 | | |
| Total | 163.364 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .55570* | .09223 | .000 | .3744 | .7370 |
| | 35-54 | .70928* | .11209 | .000 | .4889 | .9296 |
| | 55-64 | .77692* | .21010 | .000 | .3639 | 1.1900 |
| | Over 64 | .57692 | .43844 | .189 | -.2851 | 1.4389 |
| 22-34 | Under 22 | -.55570* | .09223 | .000 | -.7370 | -.3744 |
| | 35-54 | .15358 | .08265 | .064 | -.0089 | .3161 |
| | 55-64 | .22122 | .19598 | .260 | -.1641 | .6065 |
| | Over 64 | .02122 | .43186 | .961 | -.8278 | .8703 |
| 35-54 | Under 22 | -.70928* | .11209 | .000 | -.9296 | -.4889 |
| | 22-34 | -.15358 | .08265 | .064 | -.3161 | .0089 |
| | 55-64 | .06765 | .20608 | .743 | -.3375 | .4728 |
| | Over 64 | -.13235 | .43653 | .762 | -.9906 | .7259 |
| 55-64 | Under 22 | -.77692* | .21010 | .000 | -1.1900 | -.3639 |
| | 22-34 | -.22122 | .19598 | .260 | -.6065 | .1641 |
| | 35-54 | -.06765 | .20608 | .743 | -.4728 | .3375 |
| | Over 64 | -.20000 | .47131 | .672 | -1.1266 | .7266 |
| Over 64 | Under 22 | -.57692 | .43844 | .189 | -1.4389 | .2851 |
| | 22-34 | -.02122 | .43186 | .961 | -.8703 | .8278 |
| | 35-54 | .13235 | .43653 | .762 | -.7259 | .9906 |
| | 55-64 | .20000 | .47131 | .672 | -.7266 | 1.1266 |

*. The mean difference is significant at the .05 level.

# Hypothesis 17
# One way ANOVA

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 19.622 | 4 | 4.906 | 12.486 | .000 |
| Within Groups | 153.615 | 391 | .393 | | |
| Total | 173.237 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .41597* | .09510 | .000 | .2290 | .6029 |
| | 35-54 | .72149* | .11547 | .000 | .4945 | .9485 |
| | 55-64 | .77385* | .21643 | .000 | .3483 | 1.1994 |
| | Over 64 | 1.65385* | .45166 | .000 | .7659 | 2.5418 |
| 22-34 | Under 22 | -.41597* | .09510 | .000 | -.6029 | -.2290 |
| | 35-54 | .30553* | .08524 | .000 | .1379 | .4731 |
| | 55-64 | .35788 | .20193 | .077 | -.0391 | .7549 |
| | Over 64 | 1.23788* | .44489 | .006 | .3632 | 2.1126 |
| 35-54 | Under 22 | -.72149* | .11547 | .000 | -.9485 | -.4945 |
| | 22-34 | -.30553* | .08524 | .000 | -.4731 | -.1379 |
| | 55-64 | .05235 | .21229 | .805 | -.3650 | .4697 |
| | Over 64 | .93235* | .44968 | .039 | .0482 | 1.8165 |
| 55-64 | Under 22 | -.77385* | .21643 | .000 | -1.1994 | -.3483 |
| | 22-34 | -.35788 | .20193 | .077 | -.7549 | .0391 |
| | 35-54 | -.05235 | .21229 | .805 | -.4697 | .3650 |
| | Over 64 | .88000 | .48552 | .071 | -.0746 | 1.8346 |
| Over 64 | Under 22 | -1.65385* | .45166 | .000 | -2.5418 | -.7659 |
| | 22-34 | -1.23788* | .44489 | .006 | -2.1126 | -.3632 |
| | 35-54 | -.93235* | .44968 | .039 | -1.8165 | -.0482 |
| | 55-64 | -.88000 | .48552 | .071 | -1.8346 | .0746 |

*. The mean difference is significant at the .05 level.

## Hypothesis 18
## One way ANOVA

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 16.702 | 4 | 4.176 | 11.952 | .000 |
| Within Groups | 137.299 | 393 | .349 | | |
| Total | 154.002 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Age | (J) Age | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Under 22 | 22-34 | .42626* | .08959 | .000 | .2501 | .6024 |
| | 35-54 | .70144* | .10924 | .000 | .4867 | .9162 |
| | 55-64 | .75308* | .20409 | .000 | .3518 | 1.1543 |
| | Over 64 | 1.17308* | .42591 | .006 | .3357 | 2.0104 |
| 22-34 | Under 22 | -.42626* | .08959 | .000 | -.6024 | -.2501 |
| | 35-54 | .27517* | .08076 | .001 | .1164 | .4340 |
| | 55-64 | .32682 | .19038 | .087 | -.0475 | .7011 |
| | Over 64 | .74682 | .41951 | .076 | -.0779 | 1.5716 |
| 35-54 | Under 22 | -.70144* | .10924 | .000 | -.9162 | -.4867 |
| | 22-34 | -.27517* | .08076 | .001 | -.4340 | -.1164 |
| | 55-64 | .05164 | .20038 | .797 | -.3423 | .4456 |
| | Over 64 | .47164 | .42414 | .267 | -.3622 | 1.3055 |
| 55-64 | Under 22 | -.75308* | .20409 | .000 | -1.1543 | -.3518 |
| | 22-34 | -.32682 | .19038 | .087 | -.7011 | .0475 |
| | 35-54 | -.05164 | .20038 | .797 | -.4456 | .3423 |
| | Over 64 | .42000 | .45784 | .360 | -.4801 | 1.3201 |
| Over 64 | Under 22 | -1.17308* | .42591 | .006 | -2.0104 | -.3357 |
| | 22-34 | -.74682 | .41951 | .076 | -1.5716 | .0779 |
| | 35-54 | -.47164 | .42414 | .267 | -1.3055 | .3622 |
| | 55-64 | -.42000 | .45784 | .360 | -1.3201 | .4801 |

*. The mean difference is significant at the .05 level.

# Hypothesis 19
# One way ANOVA

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 16.943 | 5 | 3.389 | 15.253 | .000 |
| Within Groups | 86.862 | 391 | .222 | | |
| Total | 103.805 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .26954* | .05951 | .000 | .1525 | .3865 |
| | 20,001-30,000 baht | .55179* | .06896 | .000 | .4162 | .6874 |
| | 30,001-40,000 baht | .55833* | .10757 | .000 | .3469 | .7698 |
| | 40,001-50,000 baht | .70417* | .27634 | .011 | .1609 | 1.2475 |
| | Above 50,000 baht | .68750* | .33674 | .042 | .0255 | 1.3495 |
| 10,000-20,000 baht | Below 10,000 baht | -.26954* | .05951 | .000 | -.3865 | -.1525 |
| | 20,001-30,000 baht | .28224* | .06057 | .000 | .1632 | .4013 |
| | 30,001-40,000 baht | .28879* | .10239 | .005 | .0875 | .4901 |
| | 40,001-50,000 baht | .43462 | .27437 | .114 | -.1048 | .9740 |
| | Above 50,000 baht | .41796 | .33512 | .213 | -.2409 | 1.0768 |
| 20,001-30,000 baht | Below 10,000 baht | -.55179* | .06896 | .000 | -.6874 | -.4162 |
| | 10,000-20,000 baht | -.28224* | .06057 | .000 | -.4013 | -.1632 |
| | 30,001-40,000 baht | .00655 | .10816 | .952 | -.2061 | .2192 |
| | 40,001-50,000 baht | .15238 | .27657 | .582 | -.3914 | .6961 |
| | Above 50,000 baht | .13571 | .33692 | .687 | -.5267 | .7981 |
| 30,001-40,000 baht | Below 10,000 baht | -.55833* | .10757 | .000 | -.7698 | -.3469 |
| | 10,000-20,000 baht | -.28879* | .10239 | .005 | -.4901 | -.0875 |
| | 20,001-30,000 baht | -.00655 | .10816 | .952 | -.2192 | .2061 |
| | 40,001-50,000 baht | .14583 | .28863 | .614 | -.4216 | .7133 |
| | Above 50,000 baht | .12917 | .34689 | .710 | -.5528 | .8112 |
| 40,001-50,000 baht | Below 10,000 baht | -.70417* | .27634 | .011 | -1.2475 | -.1609 |
| | 10,000-20,000 baht | -.43462 | .27437 | .114 | -.9740 | .1048 |
| | 20,001-30,000 baht | -.15238 | .27657 | .582 | -.6961 | .3914 |
| | 30,001-40,000 baht | -.14583 | .28863 | .614 | -.7133 | .4216 |
| | Above 50,000 baht | -.01667 | .43026 | .969 | -.8626 | .8293 |
| Above 50,000 baht | Below 10,000 baht | -.68750* | .33674 | .042 | -1.3495 | -.0255 |
| | 10,000-20,000 baht | -.41796 | .33512 | .213 | -1.0768 | .2409 |
| | 20,001-30,000 baht | -.13571 | .33692 | .687 | -.7981 | .5267 |
| | 30,001-40,000 baht | -.12917 | .34689 | .710 | -.8112 | .5528 |
| | 40,001-50,000 baht | .01667 | .43026 | .969 | -.8293 | .8626 |

*. The mean difference is significant at the .05 level.

# Hypothesis 20
# One way ANOVA

**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.626 | 5 | 2.125 | 6.546 | .000 |
| Within Groups | 127.595 | 393 | .325 | | |
| Total | 138.221 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .21735* | .07170 | .003 | .0764 | .3583 |
| | 20,001-30,000 baht | .38604* | .08292 | .000 | .2230 | .5491 |
| | 30,001-40,000 baht | .56357* | .12990 | .000 | .3082 | .8190 |
| | 40,001-50,000 baht | .56357 | .33402 | .092 | -.0931 | 1.2203 |
| | Above 50,000 baht | .56357 | .40704 | .167 | -.2367 | 1.3638 |
| 10,000-20,000 baht | Below 10,000 baht | -.21735* | .07170 | .003 | -.3583 | -.0764 |
| | 20,001-30,000 baht | .16869* | .07296 | .021 | .0253 | .3121 |
| | 30,001-40,000 baht | .34622* | .12378 | .005 | .1029 | .5896 |
| | 40,001-50,000 baht | .34622 | .33169 | .297 | -.3059 | .9983 |
| | Above 50,000 baht | .34622 | .40513 | .393 | -.4503 | 1.1427 |
| 20,001-30,000 baht | Below 10,000 baht | -.38604* | .08292 | .000 | -.5491 | -.2230 |
| | 10,000-20,000 baht | -.16869* | .07296 | .021 | -.3121 | -.0253 |
| | 30,001-40,000 baht | .17754 | .13060 | .175 | -.0792 | .4343 |
| | 40,001-50,000 baht | .17754 | .33429 | .596 | -.4797 | .8348 |
| | Above 50,000 baht | .17754 | .40726 | .663 | -.6232 | .9782 |
| 30,001-40,000 baht | Below 10,000 baht | -.56357* | .12990 | .000 | -.8190 | -.3082 |
| | 10,000-20,000 baht | -.34622* | .12378 | .005 | -.5896 | -.1029 |
| | 20,001-30,000 baht | -.17754 | .13060 | .175 | -.4343 | .0792 |
| | 40,001-50,000 baht | .00000 | .34893 | 1.000 | -.6860 | .6860 |
| | Above 50,000 baht | .00000 | .41936 | 1.000 | -.8245 | .8245 |
| 40,001-50,000 baht | Below 10,000 baht | -.56357 | .33402 | .092 | -1.2203 | .0931 |
| | 10,000-20,000 baht | -.34622 | .33169 | .297 | -.9983 | .3059 |
| | 20,001-30,000 baht | -.17754 | .33429 | .596 | -.8348 | .4797 |
| | 30,001-40,000 baht | .00000 | .34893 | 1.000 | -.6860 | .6860 |
| | Above 50,000 baht | .00000 | .52015 | 1.000 | -1.0226 | 1.0226 |
| Above 50,000 baht | Below 10,000 baht | -.56357 | .40704 | .167 | -1.3638 | .2367 |
| | 10,000-20,000 baht | -.34622 | .40513 | .393 | -1.1427 | .4503 |
| | 20,001-30,000 baht | -.17754 | .40726 | .663 | -.9782 | .6232 |
| | 30,001-40,000 baht | .00000 | .41936 | 1.000 | -.8245 | .8245 |
| | 40,001-50,000 baht | .00000 | .52015 | 1.000 | -1.0226 | 1.0226 |

*. The mean difference is significant at the .05 level.

# Hypothesis 21
# One way ANOVA

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 9.682 | 5 | 1.936 | 5.026 | .000 |
| Within Groups | 150.643 | 391 | .385 | | |
| Total | 160.326 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .15903* | .07845 | .043 | .0048 | .3133 |
| | 20,001-30,000 baht | .36727* | .09031 | .000 | .1897 | .5448 |
| | 30,001-40,000 baht | .50951* | .14410 | .000 | .2262 | .7928 |
| | 40,001-50,000 baht | .03125 | .36392 | .932 | -.6842 | .7467 |
| | Above 50,000 baht | .78125 | .44345 | .079 | -.0906 | 1.6531 |
| 10,000-20,000 baht | Below 10,000 baht | -.15903* | .07845 | .043 | -.3133 | -.0048 |
| | 20,001-30,000 baht | .20824* | .07927 | .009 | .0524 | .3641 |
| | 30,001-40,000 baht | .35048* | .13745 | .011 | .0803 | .6207 |
| | 40,001-50,000 baht | -.12778 | .36134 | .724 | -.8382 | .5826 |
| | Above 50,000 baht | .62222 | .44134 | .159 | -.2455 | 1.4899 |
| 20,001-30,000 baht | Below 10,000 baht | -.36727* | .09031 | .000 | -.5448 | -.1897 |
| | 10,000-20,000 baht | -.20824* | .07927 | .009 | -.3641 | -.0524 |
| | 30,001-40,000 baht | .14224 | .14455 | .326 | -.1419 | .4264 |
| | 40,001-50,000 baht | -.33602 | .36410 | .357 | -1.0519 | .3798 |
| | Above 50,000 baht | .41398 | .44360 | .351 | -.4582 | 1.2861 |
| 30,001-40,000 baht | Below 10,000 baht | -.50951* | .14410 | .000 | -.7928 | -.2262 |
| | 10,000-20,000 baht | -.35048* | .13745 | .011 | -.6207 | -.0803 |
| | 20,001-30,000 baht | -.14224 | .14455 | .326 | -.4264 | .1419 |
| | 40,001-50,000 baht | -.47826 | .38102 | .210 | -1.2274 | .2708 |
| | Above 50,000 baht | .27174 | .45759 | .553 | -.6279 | 1.1714 |
| 40,001-50,000 baht | Below 10,000 baht | -.03125 | .36392 | .932 | -.7467 | .6842 |
| | 10,000-20,000 baht | .12778 | .36134 | .724 | -.5826 | .8382 |
| | 20,001-30,000 baht | .33602 | .36410 | .357 | -.3798 | 1.0519 |
| | 30,001-40,000 baht | .47826 | .38102 | .210 | -.2708 | 1.2274 |
| | Above 50,000 baht | .75000 | .56663 | .186 | -.3640 | 1.8640 |
| Above 50,000 baht | Below 10,000 baht | -.78125 | .44345 | .079 | -1.6531 | .0906 |
| | 10,000-20,000 baht | -.62222 | .44134 | .159 | -1.4899 | .2455 |
| | 20,001-30,000 baht | -.41398 | .44360 | .351 | -1.2861 | .4582 |
| | 30,001-40,000 baht | -.27174 | .45759 | .553 | -1.1714 | .6279 |
| | 40,001-50,000 baht | -.75000 | .56663 | .186 | -1.8640 | .3640 |

*. The mean difference is significant at the .05 level.

# Hypothesis 22
# One way ANOVA

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 14.496 | 5 | 2.899 | 12.895 | .000 |
| Within Groups | 87.685 | 390 | .225 | | |
| Total | 102.181 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .20392* | .06004 | .001 | .0859 | .3220 |
| | 20,001-30,000 baht | .42798* | .06899 | .000 | .2923 | .5636 |
| | 30,001-40,000 baht | .64931* | .10821 | .000 | .4366 | .8621 |
| | 40,001-50,000 baht | .31597 | .27800 | .256 | -.2306 | .8625 |
| | Above 50,000 baht | 1.07986* | .33876 | .002 | .4138 | 1.7459 |
| 10,000-20,000 baht | Below 10,000 baht | -.20392* | .06004 | .001 | -.3220 | -.0859 |
| | 20,001-30,000 baht | .22405* | .06067 | .000 | .1048 | .3433 |
| | 30,001-40,000 baht | .44538* | .10311 | .000 | .2427 | .6481 |
| | 40,001-50,000 baht | .11205 | .27606 | .685 | -.4307 | .6548 |
| | Above 50,000 baht | .87594* | .33716 | .010 | .2130 | 1.5388 |
| 20,001-30,000 baht | Below 10,000 baht | -.42798* | .06899 | .000 | -.5636 | -.2923 |
| | 10,000-20,000 baht | -.22405* | .06067 | .000 | -.3433 | -.1048 |
| | 30,001-40,000 baht | .22133* | .10856 | .042 | .0079 | .4348 |
| | 40,001-50,000 baht | -.11201 | .27814 | .687 | -.6588 | .4348 |
| | Above 50,000 baht | .65188 | .33887 | .055 | -.0144 | 1.3181 |
| 30,001-40,000 baht | Below 10,000 baht | -.64931* | .10821 | .000 | -.8621 | -.4366 |
| | 10,000-20,000 baht | -.44538* | .10311 | .000 | -.6481 | -.2427 |
| | 20,001-30,000 baht | -.22133* | .10856 | .042 | -.4348 | -.0079 |
| | 40,001-50,000 baht | -.33333 | .29037 | .252 | -.9042 | .2375 |
| | Above 50,000 baht | .43056 | .34898 | .218 | -.2556 | 1.1167 |
| 40,001-50,000 baht | Below 10,000 baht | -.31597 | .27800 | .256 | -.8625 | .2306 |
| | 10,000-20,000 baht | -.11205 | .27606 | .685 | -.6548 | .4307 |
| | 20,001-30,000 baht | .11201 | .27814 | .687 | -.4348 | .6588 |
| | 30,001-40,000 baht | .33333 | .29037 | .252 | -.2375 | .9042 |
| | Above 50,000 baht | .76389 | .43285 | .078 | -.0871 | 1.6149 |
| Above 50,000 baht | Below 10,000 baht | -1.07986* | .33876 | .002 | -1.7459 | -.4138 |
| | 10,000-20,000 baht | -.87594* | .33716 | .010 | -1.5388 | -.2130 |
| | 20,001-30,000 baht | -.65188 | .33887 | .055 | -1.3181 | .0144 |
| | 30,001-40,000 baht | -.43056 | .34898 | .218 | -1.1167 | .2556 |
| | 40,001-50,000 baht | -.76389 | .43285 | .078 | -1.6149 | .0871 |

*. The mean difference is significant at the .05 level.

# Hypothesis 23
# One way ANOVA

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 19.037 | 5 | 3.807 | 9.690 | .000 |
| Within Groups | 154.034 | 392 | .393 | | |
| Total | 173.071 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .29769* | .07922 | .000 | .1419 | .4534 |
| | 20,001-30,000 baht | .49530* | .09120 | .000 | .3160 | .6746 |
| | 30,001-40,000 baht | .64583* | .14306 | .000 | .3646 | .9271 |
| | 40,001-50,000 baht | .64583 | .36752 | .080 | -.0767 | 1.3684 |
| | Above 50,000 baht | 1.64583* | .44784 | .000 | .7654 | 2.5263 |
| 10,000-20,000 baht | Below 10,000 baht | -.29769* | .07922 | .000 | -.4534 | -.1419 |
| | 20,001-30,000 baht | .19761* | .08005 | .014 | .0402 | .3550 |
| | 30,001-40,000 baht | .34815* | .13622 | .011 | .0803 | .6160 |
| | 40,001-50,000 baht | .34815 | .36492 | .341 | -.3693 | 1.0656 |
| | Above 50,000 baht | 1.34815* | .44571 | .003 | .4719 | 2.2244 |
| 20,001-30,000 baht | Below 10,000 baht | -.49530* | .09120 | .000 | -.6746 | -.3160 |
| | 10,000-20,000 baht | -.19761* | .08005 | .014 | -.3550 | -.0402 |
| | 30,001-40,000 baht | .15054 | .14352 | .295 | -.1316 | .4327 |
| | 40,001-50,000 baht | .15054 | .36770 | .682 | -.5724 | .8735 |
| | Above 50,000 baht | 1.15054* | .44799 | .011 | .2698 | 2.0313 |
| 30,001-40,000 baht | Below 10,000 baht | -.64583* | .14306 | .000 | -.9271 | -.3646 |
| | 10,000-20,000 baht | -.34815* | .13622 | .011 | -.6160 | -.0803 |
| | 20,001-30,000 baht | -.15054 | .14352 | .295 | -.4327 | .1316 |
| | 40,001-50,000 baht | .00000 | .38387 | 1.000 | -.7547 | .7547 |
| | Above 50,000 baht | 1.00000* | .46135 | .031 | .0930 | 1.9070 |
| 40,001-50,000 baht | Below 10,000 baht | -.64583 | .36752 | .080 | -1.3684 | .0767 |
| | 10,000-20,000 baht | -.34815 | .36492 | .341 | -1.0656 | .3693 |
| | 20,001-30,000 baht | -.15054 | .36770 | .682 | -.8735 | .5724 |
| | 30,001-40,000 baht | .00000 | .38387 | 1.000 | -.7547 | .7547 |
| | Above 50,000 baht | 1.00000 | .57223 | .081 | -.1250 | 2.1250 |
| Above 50,000 baht | Below 10,000 baht | -1.64583* | .44784 | .000 | -2.5263 | -.7654 |
| | 10,000-20,000 baht | -1.34815* | .44571 | .003 | -2.2244 | -.4719 |
| | 20,001-30,000 baht | -1.15054* | .44799 | .011 | -2.0313 | -.2698 |
| | 30,001-40,000 baht | -1.00000* | .46135 | .031 | -1.9070 | -.0930 |
| | 40,001-50,000 baht | -1.00000 | .57223 | .081 | -2.1250 | .1250 |

*. The mean difference is significant at the .05 level.

# Hypothesis 24
# One way ANOVA

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 29.676 | 5 | 5.935 | 11.403 | .000 |
| Within Groups | 204.545 | 393 | .520 | | |
| Total | 234.221 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .32086* | .09109 | .000 | .1418 | .4999 |
| | 20,001-30,000 baht | .65972* | .10497 | .000 | .4534 | .8661 |
| | 30,001-40,000 baht | .82639* | .16464 | .000 | .5027 | 1.1501 |
| | 40,001-50,000 baht | .32639 | .42298 | .441 | -.5052 | 1.1580 |
| | Above 50,000 baht | 1.65972* | .51542 | .001 | .6464 | 2.6730 |
| 10,000-20,000 baht | Below 10,000 baht | -.32086* | .09109 | .000 | -.4999 | -.1418 |
| | 20,001-30,000 baht | .33886* | .09204 | .000 | .1579 | .5198 |
| | 30,001-40,000 baht | .50552* | .15672 | .001 | .1974 | .8136 |
| | 40,001-50,000 baht | .00552 | .41996 | .990 | -.8201 | .8312 |
| | Above 50,000 baht | 1.33886* | .51294 | .009 | .3304 | 2.3473 |
| 20,001-30,000 baht | Below 10,000 baht | -.65972* | .10497 | .000 | -.8661 | -.4534 |
| | 10,000-20,000 baht | -.33886* | .09204 | .000 | -.5198 | -.1579 |
| | 30,001-40,000 baht | .16667 | .16518 | .314 | -.1581 | .4914 |
| | 40,001-50,000 baht | -.33333 | .42319 | .431 | -1.1653 | .4987 |
| | Above 50,000 baht | 1.00000 | .51559 | .053 | -.0137 | 2.0137 |
| 30,001-40,000 baht | Below 10,000 baht | -.82639* | .16464 | .000 | -1.1501 | -.5027 |
| | 10,000-20,000 baht | -.50552* | .15672 | .001 | -.8136 | -.1974 |
| | 20,001-30,000 baht | -.16667 | .16518 | .314 | -.4914 | .1581 |
| | 40,001-50,000 baht | -.50000 | .44179 | .258 | -1.3686 | .3686 |
| | Above 50,000 baht | .83333 | .53096 | .117 | -.2106 | 1.8772 |
| 40,001-50,000 baht | Below 10,000 baht | -.32639 | .42298 | .441 | -1.1580 | .5052 |
| | 10,000-20,000 baht | -.00552 | .41996 | .990 | -.8312 | .8201 |
| | 20,001-30,000 baht | .33333 | .42319 | .431 | -.4987 | 1.1653 |
| | 30,001-40,000 baht | .50000 | .44179 | .258 | -.3686 | 1.3686 |
| | Above 50,000 baht | 1.33333* | .65858 | .044 | .0386 | 2.6281 |
| Above 50,000 baht | Below 10,000 baht | -1.65972* | .51542 | .001 | -2.6730 | -.6464 |
| | 10,000-20,000 baht | -1.33886* | .51294 | .009 | -2.3473 | -.3304 |
| | 20,001-30,000 baht | -1.00000 | .51559 | .053 | -2.0137 | .0137 |
| | 30,001-40,000 baht | -.83333 | .53096 | .117 | -1.8772 | .2106 |
| | 40,001-50,000 baht | -1.33333* | .65858 | .044 | -2.6281 | -.0386 |

*. The mean difference is significant at the .05 level.

# Hypothesis 25
# One way ANOVA

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 18.616 | 5 | 3.723 | 10.134 | .000 |
| Within Groups | 144.752 | 394 | .367 | | |
| Total | 163.368 | 399 | | | |

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .36682* | .07627 | .000 | .2169 | .5168 |
| | 20,001-30,000 baht | .57396* | .08797 | .000 | .4010 | .7469 |
| | 30,001-40,000 baht | .59994* | .13819 | .000 | .3283 | .8716 |
| | 40,001-50,000 baht | .62772 | .35532 | .078 | -.0708 | 1.3263 |
| | Above 50,000 baht | .73883 | .43299 | .089 | -.1124 | 1.5901 |
| 10,000-20,000 baht | Below 10,000 baht | -.36682* | .07627 | .000 | -.5168 | -.2169 |
| | 20,001-30,000 baht | .20713* | .07733 | .008 | .0551 | .3592 |
| | 30,001-40,000 baht | .23312 | .13167 | .077 | -.0258 | .4920 |
| | 40,001-50,000 baht | .26090 | .35284 | .460 | -.4328 | .9546 |
| | Above 50,000 baht | .37201 | .43096 | .389 | -.4753 | 1.2193 |
| 20,001-30,000 baht | Below 10,000 baht | -.57396* | .08797 | .000 | -.7469 | -.4010 |
| | 10,000-20,000 baht | -.20713* | .07733 | .008 | -.3592 | -.0551 |
| | 30,001-40,000 baht | .02599 | .13877 | .852 | -.2468 | .2988 |
| | 40,001-50,000 baht | .05376 | .35555 | .880 | -.6452 | .7528 |
| | Above 50,000 baht | .16487 | .43318 | .704 | -.6868 | 1.0165 |
| 30,001-40,000 baht | Below 10,000 baht | -.59994* | .13819 | .000 | -.8716 | -.3283 |
| | 10,000-20,000 baht | -.23312 | .13167 | .077 | -.4920 | .0258 |
| | 20,001-30,000 baht | -.02599 | .13877 | .852 | -.2988 | .2468 |
| | 40,001-50,000 baht | .02778 | .37118 | .940 | -.7020 | .7575 |
| | Above 50,000 baht | .13889 | .44610 | .756 | -.7381 | 1.0159 |
| 40,001-50,000 baht | Below 10,000 baht | -.62772 | .35532 | .078 | -1.3263 | .0708 |
| | 10,000-20,000 baht | -.26090 | .35284 | .460 | -.9546 | .4328 |
| | 20,001-30,000 baht | -.05376 | .35555 | .880 | -.7528 | .6452 |
| | 30,001-40,000 baht | -.02778 | .37118 | .940 | -.7575 | .7020 |
| | Above 50,000 baht | .11111 | .55332 | .841 | -.9767 | 1.1989 |
| Above 50,000 baht | Below 10,000 baht | -.73883 | .43299 | .089 | -1.5901 | .1124 |
| | 10,000-20,000 baht | -.37201 | .43096 | .389 | -1.2193 | .4753 |
| | 20,001-30,000 baht | -.16487 | .43318 | .704 | -1.0165 | .6868 |
| | 30,001-40,000 baht | -.13889 | .44610 | .756 | -1.0159 | .7381 |
| | 40,001-50,000 baht | -.11111 | .55332 | .841 | -1.1989 | .9767 |

*. The mean difference is significant at the .05 level.

# Hypothesis 26
# One way ANOVA

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 27.736 | 5 | 5.547 | 14.896 | .000 |
| Within Groups | 145.606 | 391 | .372 | | |
| Total | 173.343 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| | | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
| Below 10,000 baht | 10,000-20,000 baht | .38235* | .07679 | .000 | .2314 | .5333 |
| | 20,001-30,000 baht | .66944* | .08931 | .000 | .4938 | .8450 |
| | 30,001-40,000 baht | .73222* | .13912 | .000 | .4587 | 1.0057 |
| | 40,001-50,000 baht | .64055 | .35773 | .074 | -.0628 | 1.3439 |
| | Above 50,000 baht | 1.60722* | .43593 | .000 | .7502 | 2.4643 |
| 10,000-20,000 baht | Below 10,000 baht | -.38235* | .07679 | .000 | -.5333 | -.2314 |
| | 20,001-30,000 baht | .28708* | .07871 | .000 | .1323 | .4418 |
| | 30,001-40,000 baht | .34986* | .13257 | .009 | .0892 | .6105 |
| | 40,001-50,000 baht | .25820 | .35523 | .468 | -.4402 | .9566 |
| | Above 50,000 baht | 1.22486* | .43388 | .005 | .3718 | 2.0779 |
| 20,001-30,000 baht | Below 10,000 baht | -.66944* | .08931 | .000 | -.8450 | -.4938 |
| | 10,000-20,000 baht | -.28708* | .07871 | .000 | -.4418 | -.1323 |
| | 30,001-40,000 baht | .06278 | .14019 | .655 | -.2128 | .3384 |
| | 40,001-50,000 baht | -.02889 | .35815 | .936 | -.7330 | .6752 |
| | Above 50,000 baht | .93778* | .43627 | .032 | .0800 | 1.7955 |
| 30,001-40,000 baht | Below 10,000 baht | -.73222* | .13912 | .000 | -1.0057 | -.4587 |
| | 10,000-20,000 baht | -.34986* | .13257 | .009 | -.6105 | -.0892 |
| | 20,001-30,000 baht | -.06278 | .14019 | .655 | -.3384 | .2128 |
| | 40,001-50,000 baht | -.09167 | .37370 | .806 | -.8264 | .6430 |
| | Above 50,000 baht | .87500 | .44913 | .052 | -.0080 | 1.7580 |
| 40,001-50,000 baht | Below 10,000 baht | -.64055 | .35773 | .074 | -1.3439 | .0628 |
| | 10,000-20,000 baht | -.25820 | .35523 | .468 | -.9566 | .4402 |
| | 20,001-30,000 baht | .02889 | .35815 | .936 | -.6752 | .7330 |
| | 30,001-40,000 baht | .09167 | .37370 | .806 | -.6430 | .8264 |
| | Above 50,000 baht | .96667 | .55707 | .083 | -.1286 | 2.0619 |
| Above 50,000 baht | Below 10,000 baht | -1.60722* | .43593 | .000 | -2.4643 | -.7502 |
| | 10,000-20,000 baht | -1.22486* | .43388 | .005 | -2.0779 | -.3718 |
| | 20,001-30,000 baht | -.93778* | .43627 | .032 | -1.7955 | -.0800 |
| | 30,001-40,000 baht | -.87500 | .44913 | .052 | -1.7580 | .0080 |
| | 40,001-50,000 baht | -.96667 | .55707 | .083 | -2.0619 | .1286 |

*. The mean difference is significant at the .05 level.

# Hypothesis 27
# One way ANOVA

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 22.172 | 5 | 4.434 | 13.217 | .000 |
| Within Groups | 131.851 | 393 | .335 | | |
| Total | 154.022 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Income | (J) Income | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below 10,000 baht | 10,000-20,000 baht | .29709* | .07296 | .000 | .1537 | .4405 |
| | 20,001-30,000 baht | .56060* | .08406 | .000 | .3953 | .7259 |
| | 30,001-40,000 baht | .79931* | .13205 | .000 | .5397 | 1.0589 |
| | 40,001-50,000 baht | .53265 | .33955 | .118 | -.1349 | 1.2002 |
| | Above 50,000 baht | 1.06598* | .41377 | .010 | .2525 | 1.8795 |
| 10,000-20,000 baht | Below 10,000 baht | -.29709* | .07296 | .000 | -.4405 | -.1537 |
| | 20,001-30,000 baht | .26351* | .07397 | .000 | .1181 | .4089 |
| | 30,001-40,000 baht | .50222* | .12587 | .000 | .2548 | .7497 |
| | 40,001-50,000 baht | .23556 | .33719 | .485 | -.4274 | .8985 |
| | Above 50,000 baht | .76889 | .41184 | .063 | -.0408 | 1.5786 |
| 20,001-30,000 baht | Below 10,000 baht | -.56060* | .08406 | .000 | -.7259 | -.3953 |
| | 10,000-20,000 baht | -.26351* | .07397 | .000 | -.4089 | -.1181 |
| | 30,001-40,000 baht | .23871 | .13261 | .073 | -.0220 | .4994 |
| | 40,001-50,000 baht | -.02796 | .33977 | .934 | -.6959 | .6400 |
| | Above 50,000 baht | .50538 | .41395 | .223 | -.3085 | 1.3192 |
| 30,001-40,000 baht | Below 10,000 baht | -.79931* | .13205 | .000 | -1.0589 | -.5397 |
| | 10,000-20,000 baht | -.50222* | .12587 | .000 | -.7497 | -.2548 |
| | 20,001-30,000 baht | -.23871 | .13261 | .073 | -.4994 | .0220 |
| | 40,001-50,000 baht | -.26667 | .35470 | .453 | -.9640 | .4307 |
| | Above 50,000 baht | .26667 | .42630 | .532 | -.5714 | 1.1048 |
| 40,001-50,000 baht | Below 10,000 baht | -.53265 | .33955 | .118 | -1.2002 | .1349 |
| | 10,000-20,000 baht | -.23556 | .33719 | .485 | -.8985 | .4274 |
| | 20,001-30,000 baht | .02796 | .33977 | .934 | -.6400 | .6959 |
| | 30,001-40,000 baht | .26667 | .35470 | .453 | -.4307 | .9640 |
| | Above 50,000 baht | .53333 | .52876 | .314 | -.5062 | 1.5729 |
| Above 50,000 baht | Below 10,000 baht | -1.06598* | .41377 | .010 | -1.8795 | -.2525 |
| | 10,000-20,000 baht | -.76889 | .41184 | .063 | -1.5786 | .0408 |
| | 20,001-30,000 baht | -.50538 | .41395 | .223 | -1.3192 | .3085 |
| | 30,001-40,000 baht | -.26667 | .42630 | .532 | -1.1048 | .5714 |
| | 40,001-50,000 baht | -.53333 | .52876 | .314 | -1.5729 | .5062 |

*. The mean difference is significant at the .05 level.

## Hypothesis 28
## One way ANOVA

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 7.542 | 2 | 3.771 | 15.446 | .000 |
| Within Groups | 95.954 | 393 | .244 | | |
| Total | 103.497 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor's Degree | Bachelor's Degree | .27251* | .05520 | .000 | .1640 | .3810 |
| | Master's Degree | .47122* | .11718 | .000 | .2408 | .7016 |
| Bachelor's Degree | Below Bachelor's Degree | -.27251* | .05520 | .000 | -.3810 | -.1640 |
| | Master's Degree | .19871 | .11211 | .077 | -.0217 | .4191 |
| Master's Degree | Below Bachelor's Degree | -.47122* | .11718 | .000 | -.7016 | -.2408 |
| | Bachelor's Degree | -.19871 | .11211 | .077 | -.4191 | .0217 |

*. The mean difference is significant at the .05 level.

## Hypothesis 29
## One way ANOVA

**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.953 | 2 | 2.976 | 8.896 | .000 |
| Within Groups | 132.158 | 395 | .335 | | |
| Total | 138.111 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor's Degree | Bachelor's Degree | .24516* | .06439 | .000 | .1186 | .3718 |
| | Master's Degree | .40456* | .13708 | .003 | .1351 | .6741 |
| Bachelor's Degree | Below Bachelor's Degree | -.24516* | .06439 | .000 | -.3718 | -.1186 |
| | Master's Degree | .15940 | .13122 | .225 | -.0986 | .4174 |
| Master's Degree | Below Bachelor's Degree | -.40456* | .13708 | .003 | -.6741 | -.1351 |
| | Bachelor's Degree | -.15940 | .13122 | .225 | -.4174 | .0986 |

*. The mean difference is significant at the .05 level.

# Hypothesis 30
# One way ANOVA

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 3.243 | 2 | 1.621 | 4.068 | .018 |
| Within Groups | 156.645 | 393 | .399 | | |
| Total | 159.888 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor' s Degree | Bachelor' s Degree | .20144* | .07066 | .005 | .0625 | .3404 |
| | Master' s Degree | .15326 | .15296 | .317 | -.1475 | .4540 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.20144* | .07066 | .005 | -.3404 | -.0625 |
| | Master' s Degree | -.04818 | .14648 | .742 | -.3362 | .2398 |
| Master' s Degree | Below Bachelor' s Degree | -.15326 | .15296 | .317 | -.4540 | .1475 |
| | Bachelor' s Degree | .04818 | .14648 | .742 | -.2398 | .3362 |

*. The mean difference is significant at the .05 level.

# Hypothesis 31
# One way ANOVA

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 4.956 | 2 | 2.478 | 10.041 | .000 |
| Within Groups | 96.733 | 392 | .247 | | |
| Total | 101.688 | 394 | | | |

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor' s Degree | Bachelor' s Degree | .20596* | .05553 | .000 | .0968 | .3151 |
| | Master' s Degree | .42228* | .11781 | .000 | .1907 | .6539 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.20596* | .05553 | .000 | -.3151 | -.0968 |
| | Master' s Degree | .21632 | .11273 | .056 | -.0053 | .4379 |
| Master' s Degree | Below Bachelor' s Degree | -.42228* | .11781 | .000 | -.6539 | -.1907 |
| | Bachelor' s Degree | -.21632 | .11273 | .056 | -.4379 | .0053 |

*. The mean difference is significant at the .05 level.

# Hypothesis 32
# One way ANOVA

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 8.942 | 2 | 4.471 | 10.761 | .000 |
| Within Groups | 163.697 | 394 | .415 | | |
| Total | 172.639 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor' s Degree | Bachelor' s Degree | .30698* | .07180 | .000 | .1658 | .4481 |
| | Master' s Degree | .47171* | .15276 | .002 | .1714 | .7720 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.30698* | .07180 | .000 | -.4481 | -.1658 |
| | Master' s Degree | .16474 | .14625 | .261 | -.1228 | .4523 |
| Master' s Degree | Below Bachelor' s Degree | -.47171* | .15276 | .002 | -.7720 | -.1714 |
| | Bachelor' s Degree | -.16474 | .14625 | .261 | -.4523 | .1228 |

*. The mean difference is significant at the .05 level.

# Hypothesis 33
# One way ANOVA

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.066 | 2 | 2.533 | 4.376 | .013 |
| Within Groups | 228.663 | 395 | .579 | | |
| Total | 233.730 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor' s Degree | Bachelor' s Degree | .23755* | .08490 | .005 | .0706 | .4045 |
| | Master' s Degree | .32841 | .18044 | .070 | -.0263 | .6831 |
| Bachelor' s Degree | Below Bachelor' s Degree | -.23755* | .08490 | .005 | -.4045 | -.0706 |
| | Master' s Degree | .09086 | .17258 | .599 | -.2484 | .4302 |
| Master' s Degree | Below Bachelor' s Degree | -.32841 | .18044 | .070 | -.6831 | .0263 |
| | Bachelor' s Degree | -.09086 | .17258 | .599 | -.4302 | .2484 |

*. The mean difference is significant at the .05 level.

# Hypothesis 34
# One way ANOVA

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.450 | 2 | 5.225 | 13.564 | .000 |
| Within Groups | 152.551 | 396 | .385 | | |
| Total | 163.001 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor's Degree | Bachelor's Degree | .34090* | .06905 | .000 | .2051 | .4767 |
| | Master's Degree | .46642* | .14709 | .002 | .1772 | .7556 |
| Bachelor's Degree | Below Bachelor's Degree | -.34090* | .06905 | .000 | -.4767 | -.2051 |
| | Master's Degree | .12552 | .14078 | .373 | -.1513 | .4023 |
| Master's Degree | Below Bachelor's Degree | -.46642* | .14709 | .002 | -.7556 | -.1772 |
| | Bachelor's Degree | -.12552 | .14078 | .373 | -.4023 | .1513 |

*. The mean difference is significant at the .05 level.

# Hypothesis 35
# One way ANOVA

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 8.893 | 2 | 4.446 | 10.656 | .000 |
| Within Groups | 163.992 | 393 | .417 | | |
| Total | 172.884 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor's Degree | Bachelor's Degree | .31568* | .07196 | .000 | .1742 | .4571 |
| | Master's Degree | .43043* | .15630 | .006 | .1231 | .7377 |
| Bachelor's Degree | Below Bachelor's Degree | -.31568* | .07196 | .000 | -.4571 | -.1742 |
| | Master's Degree | .11475 | .14992 | .444 | -.1800 | .4095 |
| Master's Degree | Below Bachelor's Degree | -.43043* | .15630 | .006 | -.7377 | -.1231 |
| | Bachelor's Degree | -.11475 | .14992 | .444 | -.4095 | .1800 |

*. The mean difference is significant at the .05 level.

**Hypothesis 36**
**One way ANOVA**

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 10.531 | 2 | 5.266 | 14.539 | .000 |
| Within Groups | 143.060 | 395 | .362 | | |
| Total | 153.591 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Education | (J) Education | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Below Bachelor's Degree | Bachelor's Degree | .31068* | .06700 | .000 | .1790 | .4424 |
| | Master's Degree | .58559* | .14263 | .000 | .3052 | .8660 |
| Bachelor's Degree | Below Bachelor's Degree | -.31068* | .06700 | .000 | -.4424 | -.1790 |
| | Master's Degree | .27491* | .13653 | .045 | .0065 | .5433 |
| Master's Degree | Below Bachelor's Degree | -.58559* | .14263 | .000 | -.8660 | -.3052 |
| | Bachelor's Degree | -.27491* | .13653 | .045 | -.5433 | -.0065 |

*. The mean difference is significant at the .05 level.

# Hypothesis 37
# One way ANOVA

**ANOVA**

Performance in Operation

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 4.989 | 5 | .998 | 3.948 | .002 |
| Within Groups | 98.816 | 391 | .253 | | |
| Total | 103.805 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Performance in Operation
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .18720 | .10270 | .069 | -.0147 | .3891 |
| | Engineering | .13055 | .10244 | .203 | -.0708 | .3319 |
| | Production | -.07584 | .09139 | .407 | -.2555 | .1038 |
| | Maintenance | .03876 | .10770 | .719 | -.1730 | .2505 |
| | Other | .45338 | .26460 | .087 | -.0668 | .9736 |
| Purchasing | Administraive | -.18720 | .10270 | .069 | -.3891 | .0147 |
| | Engineering | -.05665 | .08590 | .510 | -.2255 | .1122 |
| | Production | -.26304* | .07238 | .000 | -.4053 | -.1207 |
| | Maintenance | -.14845 | .09211 | .108 | -.3295 | .0327 |
| | Other | .26618 | .25865 | .304 | -.2423 | .7747 |
| Engineering | Administraive | -.13055 | .10244 | .203 | -.3319 | .0708 |
| | Purchasing | .05665 | .08590 | .510 | -.1122 | .2255 |
| | Production | -.20639* | .07201 | .004 | -.3480 | -.0648 |
| | Maintenance | -.09180 | .09182 | .318 | -.2723 | .0887 |
| | Other | .32283 | .25854 | .213 | -.1855 | .8311 |
| Production | Administraive | .07584 | .09139 | .407 | -.1038 | .2555 |
| | Purchasing | .26304* | .07238 | .000 | .1207 | .4053 |
| | Engineering | .20639* | .07201 | .004 | .0648 | .3480 |
| | Maintenance | .11459 | .07931 | .149 | -.0413 | .2705 |
| | Other | .52922* | .25437 | .038 | .0291 | 1.0293 |
| Maintenance | Administraive | -.03876 | .10770 | .719 | -.2505 | .1730 |
| | Purchasing | .14845 | .09211 | .108 | -.0327 | .3295 |
| | Engineering | .09180 | .09182 | .318 | -.0887 | .2723 |
| | Production | -.11459 | .07931 | .149 | -.2705 | .0413 |
| | Other | .41462 | .26067 | .113 | -.0979 | .9271 |
| Other | Administraive | -.45338 | .26460 | .087 | -.9736 | .0668 |
| | Purchasing | -.26618 | .25865 | .304 | -.7747 | .2423 |
| | Engineering | -.32283 | .25854 | .213 | -.8311 | .1855 |
| | Production | -.52922* | .25437 | .038 | -1.0293 | -.0291 |
| | Maintenance | -.41462 | .26067 | .113 | -.9271 | .0979 |

*. The mean difference is significant at the .05 level.

# Hypothesis 38
# One way ANOVA

**ANOVA**

Reliability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1.255 | 5 | .251 | .720 | .609 |
| Within Groups | 136.966 | 393 | .349 | | |
| Total | 138.221 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Reliability
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .17753 | .12060 | .142 | -.0596 | .4146 |
| | Engineering | .13292 | .12029 | .270 | -.1036 | .3694 |
| | Production | .07299 | .10733 | .497 | -.1380 | .2840 |
| | Maintenance | .07486 | .12552 | .551 | -.1719 | .3216 |
| | Other | .34910 | .31072 | .262 | -.2618 | .9600 |
| Purchasing | Administraive | -.17753 | .12060 | .142 | -.4146 | .0596 |
| | Engineering | -.04461 | .10088 | .659 | -.2429 | .1537 |
| | Production | -.10454 | .08500 | .219 | -.2716 | .0626 |
| | Maintenance | -.10267 | .10706 | .338 | -.3132 | .1078 |
| | Other | .17157 | .30373 | .572 | -.4256 | .7687 |
| Engineering | Administraive | -.13292 | .12029 | .270 | -.3694 | .1036 |
| | Purchasing | .04461 | .10088 | .659 | -.1537 | .2429 |
| | Production | -.05992 | .08456 | .479 | -.2262 | .1063 |
| | Maintenance | -.05806 | .10671 | .587 | -.2679 | .1517 |
| | Other | .21618 | .30361 | .477 | -.3807 | .8131 |
| Production | Administraive | -.07299 | .10733 | .497 | -.2840 | .1380 |
| | Purchasing | .10454 | .08500 | .219 | -.0626 | .2716 |
| | Engineering | .05992 | .08456 | .479 | -.1063 | .2262 |
| | Maintenance | .00186 | .09185 | .984 | -.1787 | .1824 |
| | Other | .27610 | .29871 | .356 | -.3112 | .8634 |
| Maintenance | Administraive | -.07486 | .12552 | .551 | -.3216 | .1719 |
| | Purchasing | .10267 | .10706 | .338 | -.1078 | .3132 |
| | Engineering | .05806 | .10671 | .587 | -.1517 | .2679 |
| | Production | -.00186 | .09185 | .984 | -.1824 | .1787 |
| | Other | .27424 | .30572 | .370 | -.3268 | .8753 |
| Other | Administraive | -.34910 | .31072 | .262 | -.9600 | .2618 |
| | Purchasing | -.17157 | .30373 | .572 | -.7687 | .4256 |
| | Engineering | -.21618 | .30361 | .477 | -.8131 | .3807 |
| | Production | -.27610 | .29871 | .356 | -.8634 | .3112 |
| | Maintenance | -.27424 | .30572 | .370 | -.8753 | .3268 |

# Hypothesis 39
# One way ANOVA

**ANOVA**

Technical Sophisticate

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.192 | 5 | 1.038 | 2.617 | .024 |
| Within Groups | 155.133 | 391 | .397 | | |
| Total | 160.326 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Technical Sophisticate
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .20707 | .12868 | .108 | -.0459 | .4601 |
| | Engineering | .06982 | .12835 | .587 | -.1825 | .3222 |
| | Production | .21982 | .11458 | .056 | -.0054 | .4451 |
| | Maintenance | .00038 | .13443 | .998 | -.2639 | .2647 |
| | Other | .79899* | .33153 | .016 | .1472 | 1.4508 |
| Purchasing | Administraive | -.20707 | .12868 | .108 | -.4601 | .0459 |
| | Engineering | -.13725 | .10763 | .203 | -.3489 | .0744 |
| | Production | .01275 | .09077 | .888 | -.1657 | .1912 |
| | Maintenance | -.20670 | .11481 | .073 | -.4324 | .0190 |
| | Other | .59191 | .32408 | .069 | -.0452 | 1.2291 |
| Engineering | Administraive | -.06982 | .12835 | .587 | -.3222 | .1825 |
| | Purchasing | .13725 | .10763 | .203 | -.0744 | .3489 |
| | Production | .15000 | .09030 | .098 | -.0275 | .3275 |
| | Maintenance | -.06944 | .11444 | .544 | -.2944 | .1556 |
| | Other | .72917* | .32394 | .025 | .0923 | 1.3661 |
| Production | Administraive | -.21982 | .11458 | .056 | -.4451 | .0054 |
| | Purchasing | -.01275 | .09077 | .888 | -.1912 | .1657 |
| | Engineering | -.15000 | .09030 | .098 | -.3275 | .0275 |
| | Maintenance | -.21944* | .09875 | .027 | -.4136 | -.0253 |
| | Other | .57917 | .31874 | .070 | -.0475 | 1.2058 |
| Maintenance | Administraive | -.00038 | .13443 | .998 | -.2647 | .2639 |
| | Purchasing | .20670 | .11481 | .073 | -.0190 | .4324 |
| | Engineering | .06944 | .11444 | .544 | -.1556 | .2944 |
| | Production | .21944* | .09875 | .027 | .0253 | .4136 |
| | Other | .79861* | .32640 | .015 | .1569 | 1.4403 |
| Other | Administraive | -.79899* | .33153 | .016 | -1.4508 | -.1472 |
| | Purchasing | -.59191 | .32408 | .069 | -1.2291 | .0452 |
| | Engineering | -.72917* | .32394 | .025 | -1.3661 | -.0923 |
| | Production | -.57917 | .31874 | .070 | -1.2058 | .0475 |
| | Maintenance | -.79861* | .32640 | .015 | -1.4403 | -.1569 |

*. The mean difference is significant at the .05 level.

# Hypothesis 40
# One way ANOVA

**ANOVA**

Flexibility and Adaptability in use

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.416 | 5 | 1.083 | 4.366 | .001 |
| Within Groups | 96.765 | 390 | .248 | | |
| Total | 102.181 | 395 | | | |

**Multiple Comparisons**

Dependent Variable: Flexibility and Adaptability in use
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .16024 | .10150 | .115 | -.0393 | .3598 |
| | Engineering | .06212 | .10202 | .543 | -.1385 | .2627 |
| | Production | -.06985 | .09061 | .441 | -.2480 | .1083 |
| | Maintenance | .04121 | .10630 | .698 | -.1678 | .2502 |
| | Other | .82207* | .26217 | .002 | .3066 | 1.3375 |
| Purchasing | Administraive | -.16024 | .10150 | .115 | -.3598 | .0393 |
| | Engineering | -.09811 | .08543 | .252 | -.2661 | .0699 |
| | Production | -.23008* | .07141 | .001 | -.3705 | -.0897 |
| | Maintenance | -.11903 | .09050 | .189 | -.2970 | .0589 |
| | Other | .66184* | .25617 | .010 | .1582 | 1.1655 |
| Engineering | Administraive | -.06212 | .10202 | .543 | -.2627 | .1385 |
| | Purchasing | .09811 | .08543 | .252 | -.0699 | .2661 |
| | Production | -.13197 | .07216 | .068 | -.2738 | .0099 |
| | Maintenance | -.02091 | .09109 | .819 | -.2000 | .1582 |
| | Other | .75995* | .25638 | .003 | .2559 | 1.2640 |
| Production | Administraive | .06985 | .09061 | .441 | -.1083 | .2480 |
| | Purchasing | .23008* | .07141 | .001 | .0897 | .3705 |
| | Engineering | .13197 | .07216 | .068 | -.0099 | .2738 |
| | Maintenance | .11105 | .07809 | .156 | -.0425 | .2646 |
| | Other | .89192* | .25206 | .000 | .3964 | 1.3875 |
| Maintenance | Administraive | -.04121 | .10630 | .698 | -.2502 | .1678 |
| | Purchasing | .11903 | .09050 | .189 | -.0589 | .2970 |
| | Engineering | .02091 | .09109 | .819 | -.1582 | .2000 |
| | Production | -.11105 | .07809 | .156 | -.2646 | .0425 |
| | Other | .78086* | .25812 | .003 | .2734 | 1.2883 |
| Other | Administraive | -.82207* | .26217 | .002 | -1.3375 | -.3066 |
| | Purchasing | -.66184* | .25617 | .010 | -1.1655 | -.1582 |
| | Engineering | -.75995* | .25638 | .003 | -1.2640 | -.2559 |
| | Production | -.89192* | .25206 | .000 | -1.3875 | -.3964 |
| | Maintenance | -.78086* | .25812 | .003 | -1.2883 | -.2734 |

*. The mean difference is significant at the .05 level.

# Hypothesis 41
# One way ANOVA

**ANOVA**

Size

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 5.151 | 5 | 1.030 | 2.405 | .036 |
| Within Groups | 167.920 | 392 | .428 | | |
| Total | 173.071 | 397 | | | |

**Multiple Comparisons**

Dependent Variable: Size
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .09557 | .13336 | .474 | -.1666 | .3578 |
| | Engineering | .15571 | .13406 | .246 | -.1079 | .4193 |
| | Production | .02686 | .11899 | .821 | -.2071 | .2608 |
| | Maintenance | .04472 | .13916 | .748 | -.2289 | .3183 |
| | Other | 1.08108* | .34448 | .002 | .4038 | 1.7583 |
| Purchasing | Administraive | -.09557 | .13336 | .474 | -.3578 | .1666 |
| | Engineering | .06013 | .11226 | .592 | -.1606 | .2808 |
| | Production | -.06871 | .09375 | .464 | -.2530 | .1156 |
| | Maintenance | -.05086 | .11831 | .668 | -.2835 | .1817 |
| | Other | .98551* | .33660 | .004 | .3237 | 1.6473 |
| Engineering | Administraive | -.15571 | .13406 | .246 | -.4193 | .1079 |
| | Purchasing | -.06013 | .11226 | .592 | -.2808 | .1606 |
| | Production | -.12884 | .09473 | .175 | -.3151 | .0574 |
| | Maintenance | -.11099 | .11909 | .352 | -.3451 | .1231 |
| | Other | .92537* | .33688 | .006 | .2631 | 1.5877 |
| Production | Administraive | -.02686 | .11899 | .821 | -.2608 | .2071 |
| | Purchasing | .06871 | .09375 | .464 | -.1156 | .2530 |
| | Engineering | .12884 | .09473 | .175 | -.0574 | .3151 |
| | Maintenance | .01785 | .10183 | .861 | -.1823 | .2181 |
| | Other | 1.05422* | .33117 | .002 | .4031 | 1.7053 |
| Maintenance | Administraive | -.04472 | .13916 | .748 | -.3183 | .2289 |
| | Purchasing | .05086 | .11831 | .668 | -.1817 | .2835 |
| | Engineering | .11099 | .11909 | .352 | -.1231 | .3451 |
| | Production | -.01785 | .10183 | .861 | -.2181 | .1823 |
| | Other | 1.03636* | .33894 | .002 | .3700 | 1.7027 |
| Other | Administraive | -1.08108* | .34448 | .002 | -1.7583 | -.4038 |
| | Purchasing | -.98551* | .33660 | .004 | -1.6473 | -.3237 |
| | Engineering | -.92537* | .33688 | .006 | -1.5877 | -.2631 |
| | Production | -1.05422* | .33117 | .002 | -1.7053 | -.4031 |
| | Maintenance | -1.03636* | .33894 | .002 | -1.7027 | -.3700 |

*. The mean difference is significant at the .05 level.

# Hypothesis 42
# One way ANOVA

**ANOVA**

Weight

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 19.120 | 5 | 3.824 | 6.987 | .000 |
| Within Groups | 215.101 | 393 | .547 | | |
| Total | 234.221 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Weight
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | -.00371 | .15113 | .980 | -.3008 | .2934 |
| | Engineering | .05653 | .15075 | .708 | -.2398 | .3529 |
| | Production | -.36693* | .13450 | .007 | -.6314 | -.1025 |
| | Maintenance | -.10139 | .15730 | .520 | -.4107 | .2079 |
| | Other | 1.06982* | .38939 | .006 | .3043 | 1.8354 |
| Purchasing | Administraive | .00371 | .15113 | .980 | -.2934 | .3008 |
| | Engineering | .06024 | .12642 | .634 | -.1883 | .3088 |
| | Production | -.36322* | .10652 | .001 | -.5726 | -.1538 |
| | Maintenance | -.09768 | .13417 | .467 | -.3615 | .1661 |
| | Other | 1.07353* | .38063 | .005 | .3252 | 1.8219 |
| Engineering | Administraive | -.05653 | .15075 | .708 | -.3529 | .2398 |
| | Purchasing | -.06024 | .12642 | .634 | -.3088 | .1883 |
| | Production | -.42346* | .10597 | .000 | -.6318 | -.2151 |
| | Maintenance | -.15793 | .13373 | .238 | -.4208 | .1050 |
| | Other | 1.01329* | .38048 | .008 | .2653 | 1.7613 |
| Production | Administraive | .36693* | .13450 | .007 | .1025 | .6314 |
| | Purchasing | .36322* | .10652 | .001 | .1538 | .5726 |
| | Engineering | .42346* | .10597 | .000 | .2151 | .6318 |
| | Maintenance | .26553* | .11510 | .022 | .0392 | .4918 |
| | Other | 1.43675* | .37434 | .000 | .7008 | 2.1727 |
| Maintenance | Administraive | .10139 | .15730 | .520 | -.2079 | .4107 |
| | Purchasing | .09768 | .13417 | .467 | -.1661 | .3615 |
| | Engineering | .15793 | .13373 | .238 | -.1050 | .4208 |
| | Production | -.26553* | .11510 | .022 | -.4918 | -.0392 |
| | Other | 1.17121* | .38312 | .002 | .4180 | 1.9244 |
| Other | Administraive | -1.06982* | .38939 | .006 | -1.8354 | -.3043 |
| | Purchasing | -1.07353* | .38063 | .005 | -1.8219 | -.3252 |
| | Engineering | -1.01329* | .38048 | .008 | -1.7613 | -.2653 |
| | Production | -1.43675* | .37434 | .000 | -2.1727 | -.7008 |
| | Maintenance | -1.17121* | .38312 | .002 | -1.9244 | -.4180 |

*. The mean difference is significant at the .05 level.

# Hypothesis 43
# One way ANOVA

**ANOVA**

Speed

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 4.178 | 5 | .836 | 2.068 | .069 |
| Within Groups | 159.189 | 394 | .404 | | |
| Total | 163.368 | 399 | | | |

**Multiple Comparisons**

Dependent Variable: Speed
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .11751 | .12952 | .365 | -.1371 | .3721 |
| | Engineering | .04505 | .12952 | .728 | -.2096 | .2997 |
| | Production | -.10757 | .11556 | .353 | -.3348 | .1196 |
| | Maintenance | -.03980 | .13515 | .769 | -.3055 | .2259 |
| | Other | .54505 | .33456 | .104 | -.1127 | 1.2028 |
| Purchasing | Administraive | -.11751 | .12952 | .365 | -.3721 | .1371 |
| | Engineering | -.07246 | .10822 | .503 | -.2852 | .1403 |
| | Production | -.22507* | .09105 | .014 | -.4041 | -.0461 |
| | Maintenance | -.15731 | .11490 | .172 | -.3832 | .0686 |
| | Other | .42754 | .32690 | .192 | -.2152 | 1.0702 |
| Engineering | Administraive | -.04505 | .12952 | .728 | -.2997 | .2096 |
| | Purchasing | .07246 | .10822 | .503 | -.1403 | .2852 |
| | Production | -.15261 | .09105 | .094 | -.3316 | .0264 |
| | Maintenance | -.08485 | .11490 | .461 | -.3107 | .1410 |
| | Other | .50000 | .32690 | .127 | -.1427 | 1.1427 |
| Production | Administraive | .10757 | .11556 | .353 | -.1196 | .3348 |
| | Purchasing | .22507* | .09105 | .014 | .0461 | .4041 |
| | Engineering | .15261 | .09105 | .094 | -.0264 | .3316 |
| | Maintenance | .06776 | .09889 | .494 | -.1267 | .2622 |
| | Other | .65261* | .32162 | .043 | .0203 | 1.2849 |
| Maintenance | Administraive | .03980 | .13515 | .769 | -.2259 | .3055 |
| | Purchasing | .15731 | .11490 | .172 | -.0686 | .3832 |
| | Engineering | .08485 | .11490 | .461 | -.1410 | .3107 |
| | Production | -.06776 | .09889 | .494 | -.2622 | .1267 |
| | Other | .58485 | .32917 | .076 | -.0623 | 1.2320 |
| Other | Administraive | -.54505 | .33456 | .104 | -1.2028 | .1127 |
| | Purchasing | -.42754 | .32690 | .192 | -1.0702 | .2152 |
| | Engineering | -.50000 | .32690 | .127 | -1.1427 | .1427 |
| | Production | -.65261* | .32162 | .043 | -1.2849 | -.0203 |
| | Maintenance | -.58485 | .32917 | .076 | -1.2320 | .0623 |

*. The mean difference is significant at the .05 level.

# Hypothesis 44
# One way ANOVA

**ANOVA**

Warranty

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 16.541 | 5 | 3.308 | 8.249 | .000 |
| Within Groups | 156.801 | 391 | .401 | | |
| Total | 173.343 | 396 | | | |

**Multiple Comparisons**

Dependent Variable: Warranty
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .20219 | .12904 | .118 | -.0515 | .4559 |
| | Engineering | .17611 | .12904 | .173 | -.0776 | .4298 |
| | Production | -.19876 | .11519 | .085 | -.4252 | .0277 |
| | Maintenance | .08822 | .13567 | .516 | -.1785 | .3549 |
| | Other | 1.07973* | .33331 | .001 | .4244 | 1.7350 |
| Purchasing | Administraive | -.20219 | .12904 | .118 | -.4559 | .0515 |
| | Engineering | -.02609 | .10781 | .809 | -.2381 | .1859 |
| | Production | -.40095* | .09079 | .000 | -.5794 | -.2225 |
| | Maintenance | -.11397 | .11567 | .325 | -.3414 | .1134 |
| | Other | .87754* | .32568 | .007 | .2372 | 1.5178 |
| Engineering | Administraive | -.17611 | .12904 | .173 | -.4298 | .0776 |
| | Purchasing | .02609 | .10781 | .809 | -.1859 | .2381 |
| | Production | -.37486* | .09079 | .000 | -.5534 | -.1964 |
| | Maintenance | -.08789 | .11567 | .448 | -.3153 | .1395 |
| | Other | .90362* | .32568 | .006 | .2633 | 1.5439 |
| Production | Administraive | .19876 | .11519 | .085 | -.0277 | .4252 |
| | Purchasing | .40095* | .09079 | .000 | .2225 | .5794 |
| | Engineering | .37486* | .09079 | .000 | .1964 | .5534 |
| | Maintenance | .28698* | .09999 | .004 | .0904 | .4836 |
| | Other | 1.27848* | .32045 | .000 | .6485 | 1.9085 |
| Maintenance | Administraive | -.08822 | .13567 | .516 | -.3549 | .1785 |
| | Purchasing | .11397 | .11567 | .325 | -.1134 | .3414 |
| | Engineering | .08789 | .11567 | .448 | -.1395 | .3153 |
| | Production | -.28698* | .09999 | .004 | -.4836 | -.0904 |
| | Other | .99151* | .32836 | .003 | .3459 | 1.6371 |
| Other | Administraive | -1.07973* | .33331 | .001 | -1.7350 | -.4244 |
| | Purchasing | -.87754* | .32568 | .007 | -1.5178 | -.2372 |
| | Engineering | -.90362* | .32568 | .006 | -1.5439 | -.2633 |
| | Production | -1.27848* | .32045 | .000 | -1.9085 | -.6485 |
| | Maintenance | -.99151* | .32836 | .003 | -1.6371 | -.3459 |

*. The mean difference is significant at the .05 level.

# Hypothesis 45
# One way ANOVA

**ANOVA**

Durability

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 9.447 | 5 | 1.889 | 5.136 | .000 |
| Within Groups | 144.576 | 393 | .368 | | |
| Total | 154.022 | 398 | | | |

**Multiple Comparisons**

Dependent Variable: Durability
LSD

| (I) Department | (J) Department | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|---|
| Administraive | Purchasing | .25734* | .12359 | .038 | .0144 | .5003 |
| | Engineering | .24865* | .12391 | .045 | .0050 | .4922 |
| | Production | -.02485 | .11027 | .822 | -.2416 | .1919 |
| | Maintenance | .13229 | .12896 | .306 | -.1213 | .3858 |
| | Other | .99865* | .31924 | .002 | .3710 | 1.6263 |
| Purchasing | Administraive | -.25734* | .12359 | .038 | -.5003 | -.0144 |
| | Engineering | -.00870 | .10364 | .933 | -.2125 | .1951 |
| | Production | -.28219* | .08688 | .001 | -.4530 | -.1114 |
| | Maintenance | -.12506 | .10964 | .255 | -.3406 | .0905 |
| | Other | .74130* | .31193 | .018 | .1280 | 1.3546 |
| Engineering | Administraive | -.24865* | .12391 | .045 | -.4922 | -.0050 |
| | Purchasing | .00870 | .10364 | .933 | -.1951 | .2125 |
| | Production | -.27349* | .08733 | .002 | -.4452 | -.1018 |
| | Maintenance | -.11636 | .10999 | .291 | -.3326 | .0999 |
| | Other | .75000* | .31206 | .017 | .1365 | 1.3635 |
| Production | Administraive | .02485 | .11027 | .822 | -.1919 | .2416 |
| | Purchasing | .28219* | .08688 | .001 | .1114 | .4530 |
| | Engineering | .27349* | .08733 | .002 | .1018 | .4452 |
| | Maintenance | .15713 | .09437 | .097 | -.0284 | .3427 |
| | Other | 1.02349* | .30690 | .001 | .4201 | 1.6269 |
| Maintenance | Administraive | -.13229 | .12896 | .306 | -.3858 | .1213 |
| | Purchasing | .12506 | .10964 | .255 | -.0905 | .3406 |
| | Engineering | .11636 | .10999 | .291 | -.0999 | .3326 |
| | Production | -.15713 | .09437 | .097 | -.3427 | .0284 |
| | Other | .86636* | .31410 | .006 | .2488 | 1.4839 |
| Other | Administraive | -.99865* | .31924 | .002 | -1.6263 | -.3710 |
| | Purchasing | -.74130* | .31193 | .018 | -1.3546 | -.1280 |
| | Engineering | -.75000* | .31206 | .017 | -1.3635 | -.1365 |
| | Production | -1.02349* | .30690 | .001 | -1.6269 | -.4201 |
| | Maintenance | -.86636* | .31410 | .006 | -1.4839 | -.2488 |

*. The mean difference is significant at the .05 level.