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Role of Consumer Behavior in Quality Standard of Gold

(Purity Or Fineness)

دور سلوك المستهلك في معيار جودة الذهب (العيار / النقاوة)

Case Study : Local Gold Market - Sudan

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بسم الله الرحمن الرحيم

(وءاتاكم من كل ما سألتموه وان تعدو نعمت الله لا تحصوها ان الانسان لظلوم كفار)

صدق الله العظيم

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Dedication

To my teachers and Colleagues, I couldn't have done this research without you. Thank you for all your support along the way.

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ABSTRACT

Gold mining has taken a significant position in the contribution to the local economy, due to the high value of gold. And increasing of production locally in the last years, it's also considered a source of trade and alternative for saving money. The goal of this thesis, is to study the local gold market , where gold in the form of jewelry and bullions is traded . The focus of the study is to identify role of gold jewelry consumers and gold bullions traders behavior in quality standard of gold (purity or fineness) in the gold market. The research draws attention to various technical methods to determine gold bullions and gold jewelry, and ability of making use of these methods in gold trading and manufacturing process. The research aims to investigate obstacles and fears of gold bullions traders and gold jewelry consumers that are related to purity (fineness) to give suggestions to eliminate them, increasing customer's satisfaction of gold jewelry and increasing confidence among gold bullions traders. The study was used quantitative research methodologies to collect data, including two questionnaires: one was distributed to gold jewelry consumers and second to gold bullions traders. Sample size was 50 respondent of gold bullions traders in the local gold market (Khartoum -Sudan), and 40 respondent of gold jewelry consumers in different areas in the capital Khartoum. Besides quantitative research study was used laboratory experiments represented by using spectroscopy analysis method, in addition to collected data from Sudan Gold Refinery Co.Ltd. (Khartoum-Sudan) containing analysis results of gold bullions. The study concluded that: purity (fineness) has a great influence on behaviors of gold jewelry consumers and gold bullions traders, gold jewelry manufactured externally is prefered to consumers due to its purity and design, consumers consider reselling gold jewelry

unsatisfactory. In addition to gold bullions traders have a low level of confidence towards validity of purity that are issued by gold laboratories in the local market and that can lead to financial risk. The study provided suggestions can be applied to promote and prosperity of gold trade in the local market.

الخلاصة

أخذ تعدين الذهب موقعا مهما في الاقتصاد المحلي، وذلك نظرا للقمية العالية لمعدن الذهب وزيادة الانتاج المحلي في السنوات الأخيرة ، كما يعتبر الذهب مصدرا لحفظ المال والاستثمار. يهدف البحث الي دراسة السوق المحلي للذهب حيث تتم عمليات البيع والشراء للذهب المشغول (ذهب المجوهرات) وسبائك الذهب الخام التي يتم انتاجها من خلال عملية التعدين. يهدف البحث الي معرفة دور سلوك تجار سبائك الذهب الخام ومستهلكي ذهب المجوهرات في تحديد مقياس جودة الذهب الخام والمشغول (العيار او النقاوة)، ، كما يتناول البحث الي طرق التحليل المختلفة لتحديد عيار أو نقاوة الذهب في اشكاله المختلفة والاستفادة منها في عمليات البيع والشراء وتصنيع الذهب المشغول. وللوصول لأهداف البحث اتبع البحث الدراسات الميدانية باستخدام استبيانات تم توزيعها علي تجار سبائك الذهب في السوق المحلي للذهب بالخرطوم بالاضافة الي استبيان اخر تم توزيعه علي مستهلكي الذهب في انحاء مختلفة من العاصمة الخرطوم. وقد كان حجم المستجيبين من تجار سبائك الذهب الخام 50 مستجيب، اما بالنسبة لمستهلكي ذهب المجوهرات فقد كان 40 مستجيب، بالاضافة الي استخدام الاستبيان استخدمت الدراسة التحليل الطيفي وذلك لمعرفة جودة الذهب المشغول المتداول في السوق المحلي بالاضافة الي نوعية المعادن المصاحبة ، كما تناول البحث نتائج تحليل عينات لسبائك ذهب تم تحليلها في معامل شركة مصفاة السودان للذهب بالخرطوم حيث تم تحليلها باستخدام التحليل الطيفي و التحليل الكيميائي الوزني لعكس اهمية صحة العيار (نقاوة الذهب) وهوية المعادن المصاحبة .خلص البحث الي وجود الي معوقات ومخاوف لدي مستهلكي الذهب المشغول وتجار سبائك الذهب الخام، كما وجد البحث من خلال الدراسات الميدانية ان الذهب المشغول المصنع خارجيا هو الأفضل لدي المستهلكين نسبة الي النقاوة والتصاميم، كما ان مستهلكي الذهب المشغول يعتبرون ان اعادة بيعه (الكسر) غير مرضية في السوق المحلي. اما بالنسبة لتجار سبائك الذهب فلديهم مخاوف ناتجة من عدم صحة العيار يمكن ان تؤدي الي خسائر مالية الي جانب انخفاض مستوي الثقة بين التجار عند البيع والشراء ناتجة من عدم الثقة في نتائج العيارات الصادرة من معامل تحليل الذهب في السوق المحلي. اختتم البحث بوضع توصيات ومقترحات يمكن ان تساهم في رضاء المستهلكين والتجار وازدهار تجارة الذهب في السوق المحلي.

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CHAPTER I: INTRODUCTION

Gold is a unique precious metal with which mankind has had a long and intimate relation and has considered gold as a symbol of purity, luxury, wealth, status, beauty, affection, good fortune etc., Due to its high value, strong price and strong physical specifications.

Gold has always been considered as a safe mode of investment, equivalent to liquid cash and as risk collateral. Gold considers one of the most popular metals for investment, besides using it in jewelry manufacturing in particular and industry in general a worldwide.

In Sudan, gold production has increased dramatically in the last years through traditional mining of individuals and regular mining companies, subsequently growth of gold trade in the local market.

Process of purchasing and selling gold anywhere is governed by the following factors: price, weight, purity or fineness and design as case of gold jewelry.

Gold trade in the local market can be divided into two sectors:

• Gold jewelry trade.

Gold jewelry trade depends on number of factors, and they are: price, weight, purity (fineness) and design , for the local market large quantities are imported and small amounts are manufactured locally. Gold jewelry has different colors, it has a yellow color which is purest form of gold and when its alloyed with other elements such as silver, nickel, palladium it retains the yellowish color, besides the rose gold and that when gold is alloyed with a

high percentage of cupper and the white color to give white gold its brilliant shiny white luster and that throw plating the gold with a layer of rhodium and rhodium elements is a shiny white metal.

• Gold bullions trade (scrap gold).

Gold bullions are traded in the local market are produced through traditional mining by the individuals, and it has various degrees of fineness (purity) and the process of trading also depends on set of factors and they are: price, weight and fineness (purity).   Purity or fineness can also refer to it by karat, as percentage of pure gold in alloy of scrap gold and gold jewelry decrease, subsequently the price of metal decrease.

The study targets the local gold market in order to identify influence of purity or fineness on the purchasing and selling behaviors of gold jewelry consumers and scrap gold traders, In addition to study quality and features of gold traded in the local market in its various forms to enable making use of them.

The study   aims to achieve   high   level of customer satisfaction and confidence among gold traders, besides promoting gold bullions and gold jewelry trade in the local market.

Below are defined some general terms used in this research:

Consumer: is an individual who purchases products or services for his own or his family's personal use (Vihalem 70).

Consumer behavior: is the study of how customers buy, what they buy, when they buy and why they buy. It attempts to understand the buyer decision making process, both individually and in groups. It studies characteristics of individual consumers such as demographics, psychographics, and behavioral variables in an attempt to understand people's wants. It also tries to assess influences on the consumer from groups such as family, friends, reference groups, and society in general (Consumer behavior: Wikipedia). Consumer purchasing behavior covers all activities and decisions which relate to choosing products, purchasing and post-purchasing use. (Mauring 98).

Purchasing process: is a sequence of actions distinguished to purchase initiation, information search, alternative evaluation and buying (Mauring 139).

Purity (fineness) of gold: refers to the ratio by weight of the primary gold metal to any added base metals or impurities. In addition the gold content can be measured in terms of karats ("k" or "kt"), pure gold referred to as 24k gold .When this pure gold is alloyed with other metals, such as silver, copper, or

nickel the gold percentage decrease to18kt is 18/24 or 75% pure gold is 14/24 or 58.3% pure gold.

Fineness: the proportion of precious metal in an alloy expressed as parts per 1000.

Alloy: a solid mixture of two or more chemical elements, including at least one metal. In the case of gold, it is mixed with a baser metal or metals to lower the purity influence the color or add durability.

Assay: the testing of gold or silver to determine its fineness or purity.

Bullion: the generic word for gold and silver in bar or ingot form.

Precious Metals metal of great value: being gold, silver, platinum and other platinum group metals.

1.2 STATEMENT OF THE PROBLEM

The consumer behavior in gold market could be influenced by a number of factors like whether the seller is a branded jeweller or small dealer, name and reputation of the jeweller, purity of gold, its price, occasions when gold is purchased, gold as an investment option, influence of advertisements, occupation and income of the consumers etc.

Through work of the researcher in field of purchasing and refining gold, the researcher observed a strong challenges related to the process of buying and selling gold jewelry and gold bullions in the local gold market. One these challenges is purity (fineness) and it has a great influence on consumer and trader behavior in the local gold market.

This study is intended to identify the extent of influence of purity (fineness) on the consumer behavior in the local gold market to fulfill high level of satisfaction and confidence among gold bullions and traders and gold jewelry consumers.

On the other hand thesis will address quality of consumed gold (jewelry) and specifications of gold produced locally (scrap bullions) in order to promote the quality of gold jewelry trade and making use of this specification in trading and manufacturing process of gold jewelry, besides analyzing different dimensions of consumer and trader behaviors in the local gold market.

1.3 OBJECTIVES OF THE STUDY

The primary objective of the study is to make an evaluation of the impact of purity (fineness) on consumer and trader behavior in the local gold market of Khartoum:

- To assess the influence of purity (fineness) on the consumer and trader behavior in the local gold market of Khartoum.

- To understand the consumer behavior towards the manufactured gold (jewelry) locally and externally.

-To find the level of customer satisfaction towards process of purchasing and reselling gold jewelry in the local market.

- To find level of confidence towards trading of gold bullions in the local market.

-To explore specifications and quality of gold jewelry and bullions which are traded in the local market.

-To draw attention to various techniques to detect and analyzing gold in its different forms.

- To give suggestions to increase monitoring, controlling and organizing of gold by the authorities bodies.

- To offer necessary suggestion based on findings.

1.4 HYPOTHESES

To achieve the objectives of research, the following hypotheses were formulated and tested:

H_{01}: The purity (fineness) of gold has no significant influence on the purchase and sell behavior of the consumers and traders of gold jewelry and bullions.

H_{02}: The manufactured gold jewelry locally and externally has no significant influence on the purchase and selling behavior of the consumers and traders of gold jewelry and bullions.

H_{03}: The monitoring, controlling and organizing of the local gold market have no significance in gold trade in the local market.

H_{04}: The consumer behavior has no significance in gold trade in the local market.

CHAPTER II: LITERTURE REVIEW

2.1 Consumer Behavior:

Consumer behavior consists of tangible and intangible dimensions which include goods or services, mental processes, beliefs and values. In addition, consumer behavior refers to an individual's involvement and decision processes in using products and services. Individual decisions on buying goods and services involve answering questions on what, where, when, how (Engel et al., 1982) Individual decisions on purchasing also involve consideration of the individual's ideas and experiences on satisfying his/her needs and desires (Kotler, 1999).

Understanding Consumer Behavior.

Understanding consumer behavior is an opportunity for businesses to predict demand and find ways to serve the customer better. This approach to buying needs to emphasize motivation on hedonic responses and symbolic meaning which affect people's intention to buy goods and services. Consumer decision making involves external factors that influence consumer behavior such as cultural, social, and physiological environments. The research focused on the reference group and its personal value which directly and indirectly affect consumer behavior. Although culture is the deepest influence on consumer behavior, every person also uses his/her instincts to make decisions (Kotler et al., 2002).

2.2 Retailing Mix (Product, Price, Place, Promotion, Personal, and Presentation).

Retailing mix is an important factor in the jewelry market. However, the way to build perception is through providing customers with information they need to make decisions. In the luxury items (such as jewelry) market, some research has shown that when potential consumers do not know a lot about the product, providing information on the product becomes necessary (Mitchmanand Mazze, 2006). In the gold ornaments market, providing a level of quality can be used to build trust between consumer and seller (Sanguanpiyapana and Jasper, 2009).

Product:

In case of gold jewelry the shape, line, and all the visible qualities of the product that represent the brand in order to attract customers .People who are fashion conscious are attracted to designs that have attractive styles. Packaging, product design, merchandise display, etc. can stimulate a sale immediately (Verplanken and Herabadi, 2001).

Quality:

Customers tend to trust sales representatives rather than buying channels (Jokinen,2011).

In gold jewelry markets customers look for good prices, desing and and validity of purity or fineness .In Thailand gold ornament stores need to be certified and registered with the Ministry of Commerce, Thailand and Gold Trader Association, Thailand. However, there are also other standards that

need to be upheld to gain consumer trust such as all gold ornaments need to be at 96.5% gold purity.

Price:

Price is a main factor for a buyer when selecting a product (Kotler, 2000). Buyers always compare the price of previous purchases with future purchases. According to Kotler (2000), pricing structure has five basic categories: price discount and allowance, promotional pricing, geographical pricing, discriminatory pricing, and product-mix pricing. In gold ornaments, the buyers are price sensitive and like to bargain for discounts (Aiello et al., 2009).

Price palys a big role in process of buying and selling gold jewelry and bullions,and changing in gold prices considers an aspect of gaining profit or loosing.

Place:

Companies make products available to consumers where consumers are most likely to buy. Furthermore, distributors, wholesalers, and retailers are involved in distribution networks which serve to make purchases more convenient for customers (Kotler, 2000). Jewelry customers normallybuy jewelry at the traditional stand-alone shops along the main roads (Aiello et al., 2009).

In gold markets the good reputation and trust are important in place where gold is traded besides there differences in prices between centers and regions which encourage the traders and customers to tend the centers to find the good prices that fulfill their expectations.

Promotion:

Promotion involves all activities which companies employ to communicate to the market (Kotler, 2000). These activities include any form of transforming information of products and services to engage potential customers (Walters and Bergiel, 1989). In order to create an interest in a new product, promotional tactics can be applied in order to maintain positive brand images and increase purchasing intention (Aiello et al. 2009). Marketing communication mix has five measure tools: advertising, sales promotion, public relations, personal selling, and direct marketing (Kotler, 2000).
Gold jewelry trade can be promted throw new desingns offered to the customers.

Sales Representatives:

Sale representatives have a significant effect on customers' perception (Hill,2007), today big retailers have trained their sales staff to be able to explain the materials and quality of the products in order to influence customers. This increases the importance of the role of sales representatives. Trust is the most important factor for customers when deciding to purchase or not to purchase (Jokinen, 2011). According to a study on customers' purchasing experiences, customers want to feel and touch the product, get customers' purchasing experiences, customers want to feel and touch the product, get information about the product, and be able to ask the seller questions. The seller should provide customers good experiences by being helpful (Arnold et al., 2005).

Store Atmosphere:

The environment of the store has a significant impact on customers.The store atmosphere can stimulate customers, and thus, customers are more receptive with a better chance of impulse buying (Donovan and Rossiter, 1994). When customers are excited, it reduces the possibility of their thinking before acting. The stimulation in the shop can be increased by sounds (Holbrookand Anand, 1990), aromas (Mattila and Wirtz, 2008), or colors (Valdez and Mehrabian, 1994). Building a harmonious atmosphere and environment in the store can help increase sale volumes (Laakso 2004, p.57).

2.3 Consumer Buying Behavior (Gold Jewelry).

The studies addressed consumer buying behavior for gold jewelry, which aimed to find out the impact of high price on the purchase of gold. Quantitative research technique was followed in this research and the research applied in India.
The target segment was the consumers who bought jewelry in the preceding year (2012) and likely to buy soon.

The information that was released from this study were as following:

- The most important source of awareness was the newspapers for getting information about various jewelry brands.
- Perception of jewelry was the majority of the Indians seeks dual benefits of buying gold, as an investment coupled with a functional adomment .
- More than half of respondents to the research look for 22karat purity which shows customer are quite on what to expect from purity point of view, 32% of respondents look for 18 karat

purity which indicates that there a market for 18 karat gold jewelry too, and few customers look for14 karat gold due to the rising of gold prices.

One of studies undertakes an analysis of the specialties of consumer behavior in the gold jewelry market of Kerala (India). The focus of the study is to identify the various factors which influence the consumer behavior in gold market of the state. The analysis specially focuses on factors like customer behavior towards branded jewelers and small dealers of gold, the influence of aspects like name, reputation and shop ambiance of the sellers, purity of gold, price of gold, the influence of advertisements of gold etc. on the consumer behavior. The study indicates that consumers have a significant positive inclination towards the branded jewelers as compared to the small dealers of gold. The behavior of the customers are influenced by the name, reputation and shop ambiance of the sellers, the purity of gold etc. The influence of the price of gold on the consumers is subjective and is dependent on their occupation and income. Though advertisements are helpful in positioning the jeweller in the market, they not making any significant influence on their purchase behavior of the consumers of gold (Dr. Jojo K Joseph 2014).

2.4 Customer Satisfaction

The paper was provided to analyse consumer attitudes towards satisfaction level of gold jewellery purchase in and around pollachi taluk (India).

India is the largest customer of gold in the world, followed by China and Japan. India consumes nearly 800 tons of gold that accounts for 20 percent of world Gold consumption, of which nearly 600 tones go into making jewellery. In India, gold jewellery is a store of value, a symbol of wealth and status and a fundamental part of many rituals. In the last decade, 75 percent of gold demand in India has taken the form of jewellery. More than two-thirds of that demand comes from the country's rural population, where a deep affinity for gold goes hand in hand with practical considerations of the portability and security of jewellery as an investment. Indian society is a study in diversity. The study diversity among consumers, among marketers, among customs, among nations,even among consumer behaviour, satisfaction and theoretical perspectives. Apart from the prevailing diversity in our society, there also are many similarities. In this present decade, market have gained better understanding of the importance of customer satisfaction and adopted it as a high priority operational goal. The aim of the paper Our aim was to obtain a theoretically and empirically grounded knowledge against this research, and thus helps the jewellery marketers learn in depth the ways to enhance customer satisfaction.(N.Buvanesh Kumar, M.kunguma Thiviya 2015).

2.5 Exploration of Consumer

To explore consumer practices towards gold jewelry, one of thesis explores consumers' practices and experiences in relation to consumption of gold and gold jewelry. It focuses on the underlying motivations of consumers, the uses of gold and gold jewelry, and examines the practices and meanings that emerge as a result of these uses. Data were collected in this research through qualitative research methods. The participants include twenty-four female consumers and four industry representatives. Age, income, and use of gold jewelry/coin constitute the main criteria in selection of the consumers. The findings indicate three main uses for gold and gold jewelry: Gift-giving, ornamentation, and investment. Both utilitarian and symbolic motives are identified in giving gold jewelry/coins as a gift. Whereas previous research focuses on the symbolic aspects of the gift, the findings suggest that there are utilitarian aspects as well. The practices and experiences related to the use as ornamentation illustrate the relation of gold jewelry to fashion, highlight the item's significance for sense of self, and reveal patterns of complementarity with the product category of clothing. The exploration of the use of investment uncovers the dual function of gold jewelry, and indicates the interaction between ornamentation and investment. The study was concluded with a discussion of the contributions, limitations, and implications for future research on the topic. (Burkac Ertimur 2003).

2.6 Hallmarking

Hallmarking: means the accurate determination and official recording of the proportionate content of precious metal in precious metal. Hallmarks are thus official marks used in any countries as a guarantee of purity or fineness of precious metal.

In the UK hallmarking has a long history, dating back nearly 700 years, and representing the earliest form of consumer protection. The consumer benefits in many ways.

Hallmarks are making stamped on gold, silver and platinum articles. A hallmark means that the article has been independently tested and guarantees that it conforms to legal standards of purity (fineness). These tests are carried out only by fire assay office, of which there are four in the (The Assay Office-Birmingham-UK).

2.6.1 Developing Indian Hallmarking.

The study has been provided in last years related to Hallmarking in India, which considers one of the largest countries in consumption the gold around the word.

This study provided By World Gold Council to assess the current state of Hallmarking in India. The World Gold Council is the market development organization for the gold industry. It is purpose to stimulate and sustain demand for gold, provide industry leadership, and be the global authority on the gold market. Based in the UK, with operations in India, the Far East and the US, the World Gold Council is an association whose members comprise the world's leading gold mining companies.

The study addressed the Indian market holistically and it consulted extensively with both industry experts and other stakeholders from across the supply chain. Insights were gained from subject matter experts, including the Bureau of Indian Standards (BIS) and the management. consulting firm Oliver Wyman. And it also compared the Indian hallmarking system with best practices in other countries.

The study compromised the following :

- Outlined the importance of quality assurance.

- Assessed the current state of hallmarking in India, looking at policy, process, penetration, economic drivers and governance.

- Considered lessons from other countries.

- Set out a roadmap for the future.

2.7 Gold Bullions:

Gold Bullion is traded much like a commodity. It is traded in the form or coins or bars and denominated in troy ounces. The coins and bars are produced and sold by refining companies and various government and private mints. They are 90-100% pure gold and are usually traded in a range of plus or minus 7% of the spot price depending upon quantity and the brand of bullion gold.

The "spot price" of gold is similar to a stock price and refers to the price set by world markets where gold is purchased and sold in very large quantities, mainly on paper in the futures market. Some widely traded forms of bullion gold are American Eagles, American Buffalos, South African Krugerrands, Canadian Maple Leaves, Chinese Pandas, Pamp

Credit Suisse bars, etc. Different brands of gold trade at slightly different prices. For example it is often asked why 1 oz American gold eagles generally sell for $10-30 more than Krugerrands. The answer is supply and demand. Generally people prefer the American gold eagles because of the classic design and people like that Eagles are made by the U.S. mint. The market dictates that generally people will only buy Krugerrands if they are priced favorably compared to the Eagles, even though they both contain one ounce of gold.

Scrap gold jewelry is priced differently because it has a lower purity and needs to go through the processes of being melted and assayed, and then reformed into tradable gold. When discussing gold jewelry the term "karat" is often used. Karat, abbreviated "kt" refers to the purity of the gold. U.S. Gold jewelry and scrap gold is usually 10kt, 14kt, or 18kt. Jewelry from Asian countries is usually between 18kt to 24kt. 24kt is 100% pure gold, 14kt is 14/24 or 58% pure gold and so on. Jewelry will almost always be marked with a small hallmark "10kt", "14kt" etc, indicating the karat of the gold. Sometimes the item will be marked with a number indicating the purity of gold, such as .415 or .585, etc. If the item is marked .925 it indicates that the item is gold plated sterling silver. We also buy sterling jewelry and silver is worth much less than gold. Items marked 1/20th 10kt GF or 10kt GF or any kt "GF" or GP are just gold plated and do not contain enough gold to be of value. If an item is not marked, the item is probably just gold plated. If an item is gold, the maker usually wants to advertise it with a mark.

Typical honest dealer purchase prices of scrap jewelry are generally 60-80% of the melt value, depending upon quantity and purity of the items. That would include the dealer's profit margin, carrying costs, and refining

costs. The dealer also incurs risk in that the kt stamp on gold jewelry is not always accurate.

When selling scrap gold jewelry it is highly recommended to do business with a reputable firm in the community who is accountable for their business practices, rather than dealing with companies and individuals who are here today and gone tomorrow, or sending gold through the mail to a company advertising on TV. A minimal amount of research on the Internet reveals that almost all such companies pay very little for the gold and have questionable business practices.(JIM'S Coins and Stamps).

2.8 Gold Jewerly Manufacturing:

Jewellery manufacturing requires much skill and time to get it right. It's an art form that needs the combination of technique and concentration to stroke the metal in a precise way to give it the finish needed. Intricate designs could sometimes take months to even years to perfect, which is why designer jewellery incorporating heavy designs with foliage and minute details come at a price.

2.8.1 Hand Made Jewellery

Hand made jewellery is made even to this date. The "Karigars" as they are known in India make an entire piece of jewellery by hand with little help from modern day techniques, the perfect amalgamation of the old and the new. They sit patiently moulding each gold bar from a bar to the final form by constantly heating and cooling, which gradually gives shape to the metal.

2.8.2 Jewellery Making Using Gold Casting Process

Casting is one of the most popular methods these days by which jewellery is manufactured. Almost 80% of our jewellery is manufactured using this technique and thus we will be explaining this topic very elaborately in one of our upcoming posts. This involves large machines and Plaster of Paris or rubber, which helps in shaping the metal being used this is in our case gold or silver. Each design is hand selected by our director after which we pass these designs to our in house CAD/CAM specialists. It starts with our jewellery designers designing the jewellery on a 3D CAD (computer aided designing) software that allows them to transform their design into a computer file. This computer file (or a 3D design as you may call it) is then magically turned into a wax jewellery (the jewellery is made of wax material) with the help of something we call a 3D printer. Yes, right, jewellery making is that advanced these days.

2.8.3 Die Striking

Die Striking is another method used to manufacture jewellery. Perfect for lightweight and thin pieces of jewellery, that you will never feel it tugging at your skin. Sheets of precious metal are punched into shape by large dies that have an image or name already inscribed onto it. This is relatively an easy method to manufacture jewellery items.

2.8.4 Electroforming and Electroplating

Electroforming techniques uses electrically charged liquids with a precious metal infused within it to layer metal on a wax model, which can then be melted away. This technique uses layer over layer that eventually can give any desired thickness. Electroplating uses the same technique although just

leaves thin layers which are measured in microns over a jewellery piece. This gives the piece a layer that can protect it from tarnish or damage.(kubox Jewerly Blog, 2015).

2.9 Gold Jewellery Alloys

Pure (24 carat) gold is a deep yellow colour (an orange shade of yellow) and is soft and very malleable. The coloured carat gold alloys range in gold content from 8 to 22 carats (33.3% - 91.6% gold) and can be obtained in a range of colour shades: green (actually a green shade of yellow), pale yellow, yellow, deep yellow, pink/rose and red. There are also white golds and even unusual coloured golds such as 'purple gold'. They all have different mechanical properties such as strength, hardness and malleability (ductility) and some alloys can be heat treated to maximise strength and hardness. There are gold alloys that are optimised for different manufacturing routes such as lost wax (investment) casting and stamping.

How can colour be varied and why do different gold alloys (an alloy is a mixture of two or more pure metals) have different mechanical and other properties? To answer these questions in depth requires a good technical knowledge of metallurgy. However, it is possible to give some simplified answers.

2.9.1 The Coloured Carat Gold

Almost all conventional, coloured carat golds are based on gold-silver-copper alloys, often with minor alloying additions. All three metals have the same crystal structure (face centred cubic, FCC) and so are compatible with each other over a large range of compositions. Typical minor additions include deoxidisers such as zinc and silicon, grain refiners such as iridium and cobalt and possibly metals such as nickel to strengthen the

alloy. Larger zinc additions (about 1-2%) can improve melt fluidity and hence 'castability' in lost wax casting, as can silicon, resulting in better filling of the mould and better reproduction of surface detail. Even larger zinc additions (up to 10%) can improve malleability of certain carat golds, particularly 14 carat and lower, used for making jewellery by stamping from sheet. Additions of low melting point metals such as zinc, tin, cadmium and indium lower melting ranges and hence are used to make carat gold solders.

2.9.2 Colour

Gold is yellow and copper is red, the only two coloured pure metals. All other metals are white or grey in colour. The addition of a red colour to yellow, as every school child knows, makes the yellow pinker and eventually red. The addition of a white makes the yellow colour paler and eventually white. This principle of mixing colours is the same in carat golds. Adding copper to gold makes it redder and adding silver, zinc and any other metal makes gold paler. Thus, we can understand that lower carat golds, because we can add more alloying metals, can have a wider range of colours than the higher carat golds.

Thus at 22 carat (91.6% gold), we can only add a maximum of 8.4% of alloying metals and hence can only obtain yellow to pink/rose shades. At 18 carat (75.0% gold) and lower, we can add 25% or more alloying metals and hence get colours ranging from green through yellow to red, depending on the copper: silver plus zinc ratio. Thus at any given caratage we can vary the colour by varying the copper: silver plus zinc ratio. This can be demonstrated in the following table:

Type	Gold % wt	Silver %	Copper %	Colour
22 ct	91.6	8.4	-	Yellow
	91.6	5.5	2.8	Yellow
	91.6	3.2	5.1	Deep yellow
	91.6	-	8.4	Pink/rose
18 ct	75.0	25.0	-	Green-yellow
	75.0	16.0	9.0	Pale yellow, 2N
	75.0	12.5	12.5	Yellow, 3N
	75.0	9.0	16.0	Pink, 4N
	75.0	4.5	20.5	Red, 5N
14 ct	58.5	41.5	-	Pale green
	58.5	30.0	11.5	Yellow
	58.5	9.0	32.5	Red
9 ct	37.5	62.5	-	White
	37.5	55.0	7.5	Pale yellow
	37.5	42.5	20.0	Yellow
	37.5	31.25	31.25	Rich yellow
	37.5	20.0	42.5	Pink
	37.5	7.5	55.0	Red

2.9.3 Properties

Alloying additions affect other physical properties as seen in the next table:

Physical Properties of Typical Gold Alloys

Carat	Composition %		Colour	Density g/cm3	Melting Range °C
	Silver	Copper			
24	-	-	Yellow	19.32	1064
22	5.5	2.8	Yellow	17.9	995-1020
	3.2	5.1	Dark yellow	17.8	964-982
21	4.5	8.0	Yellow-pink	16.8	940-964
	1.75	10.75	Pink	16.8	928-952
	-	12.5	Red	16.7	926-940
18	16.0	9.0	Pale yellow	15.6	895-920
	12.5	12.5	Yellow	15.45	885-895
	9.0	16.0	Pink	15.3	880-885
	4.5	20.0	Red	15.15	890-895

As caratage reduces, the melting range and alloy density are lowered. But at any given caratage (gold content), the actual values vary according to the relative silver and copper contents.

As well as affecting physical properties, alloying additions to gold generally increase the strength and hardness, with some reduction in malleability / ductility. The silver atom is slightly larger than that of gold, so alloying gold with silver gives a moderate improvement in strength and hardness. The copper atom is significantly smaller than that of gold and so it has a greater effect on strengthening gold than silver, as it distorts the gold crystal lattice more. Thus reducing caratage from 24 carats through 22 ct and 21 ct down to 18 carat gold results in stronger and harder alloys, as can be seen in Table 3. Beyond 18 ct down to 10, 9 and 8 carats does not have much further effect.(World Gold Council).

2.10 Fire Assay or Cupellation.

One of papers presented and discussed one of the methods of technical analysis of gold by (M.A.McGuire).And the method is called Fire Assay.
Fire assaying is defined as a branch of quantitative chemical analysis, which is applied in determining the precious metal, content of ores, metallurgical products, and scrap materials.

The method is a pyro metallurgical technique which separates the metal to be determined from the impurities and gangue present in the sample.
This is accomplished by employing dry reagents and heat in a selective fusion process.

The study addressed history of fire assaying, and method have been used for many centuries in England and France. In addition to, the study mentioned that it was used in previous times for the assay of base metals such as lead, bismuth, tin and copper.

The study provided objectives of fire assaying and one of them is representing the true value of precious metals in a given amount of material and basis of buying and selling various materials as gold.

2.11 Determination of gold in gold jewelry alloys -Cupellation method.

Determination of gold in gold jewelers alloys by using cupellation method, Considers one of guides focused on the international Standard specifies a cupellation method (fire assay) for the determination of gold in gold jewelry alloys, whereas the gold content of the alloys should preferably between 333 and 999 parts per thousands.

 The procedure is applicable specifically to gold alloys incorporating silver, copper and zinc.

Some modifications are indicated where elements as Nickel and/or palladium are present.

This method is intended to be used as the reference method for the determination of fineness in alloys.

2.12 XRF Testing For Hallmarking.

The paper was provided in LBMA (London Bullions Metals Association) assaying and refining conference by Goldsmith's Company Assay Office. The provided paper addresses testing for the Hallmarking by using X-rays florescence instrument**.**

The paper provided by Gold Smith's Company The paper focused on instruments of X-rays fluorescence in the process of determination gold whereas addressed number of important points as:

- Parameters influencing precision in XRF

- XRF standards.

- Combined undertrained.

- Direction of Measurements

CHAPTER III: METHODOLOGY

In order to reach goals of this study, two types of research methodologies are followed and they are: quantitative research and laboratory experiments.

3.1 Quantitative Research:

The quantitative research is selected to study target respondents because it is an appropriated approach to measure the construct and hypotheses (Sekaran and Bougie, 2009).

The quantitative methodology is used to discover behaviors of gold jewelry consumers and gold bullions traders in order to understand impact of purity or fineness on their behaviors of purchasing and selling process, besides their satisfaction about detection and accuracy of purity or fineness of gold jewelry and process of analyzing gold bullions in the local gold market.

The purpose of questionnaire also is to investigate the obstacles and fears of traders and consumers in the local market.

Quantitative research was conducted to find out what are the general trends and beliefs of gold bullion traders and consumers of gold jewelry that are associated with verification from purity or fineness of gold bullions or jewelry when buying or selling.

The study used quantitative research methodology including a questionnaire of:
- Gold bullions traders.
- Gold jewelry consumers.

3.1.1 Quantitative Research of Gold Bullions Traders:

Study Area: The local gold market (Khartoum-Sudan), where gold is traded in form of bullions and Sudan Gold Refinery (Khartoum-Sudan), where gold is received from mining companies.

Study Population: Gold bullions traders and representatives of mining companies in Sudan.

Selection Criteria: Traders of gold bullions and representatives of mining companies who in charge in buying, selling and producing gold bullions.

Inclusion Criteria: Gold traders and representatives of mining companies are willing to participate in the study.

Exclusion Criteria: Laboratories employees in the local gold market.

Sampling Technique:

Sample size: 50 questionnaires were distributed via hardcopy to respondents who trading gold bullions in the local gold market (Khartoum) and representatives of mining companies.

Questionnaire Distribution: The questionnaires were distributed and collected within two weeks.

Data Collection: Data Collected from distributed questionnaire.

Reliability and Validity of the questionnaire: To ensure reliability and validity of the questionnaire; the questionnaire was developed from previous literature in Section two.

Research Questions: The most prominent questions were:

* Purity a highly important when buying or selling gold bullions.
* When buying gold bars (known purity) there's no technical analysis is performed but only depending on trust from seller.
* Preferably determine gold bullion purity by using:
 X-ray instruments (laser) due to speed.
 X-ray instruments (laser) due to accuracy.
 Chemical analysis refers to speed.
 Chemical analysis refers to accuracy.
* Workers in Laboratories in the local market need more and rehabilitation.
* Laboratories and individuals who work on analyzing gold bullions in the local market need more control, organizing and supervision.

Study Tools: The study first tried to find out the demographic information about gold bullions traders, and second; understanding their behavior in buying and selling gold bullions associated with purity or finesse.

Data Analysis: Data has been analyzed by using Statistical Package for Social Sciences (SPSS) program software version 20.0 to test the constructs. The measurements for this research include descriptive analysis.

3.1.2 Quantitative Research of Gold Jewelry Consumers:

Study Area: Gold jewelry consumers who live in different areas of the capital (Khartoum – Sudan).

Study Population: Consumers of gold jewelry who purchase and sell gold jewelry from the local gold market.

Selection Criteria: Traders who in charge in buying and selling gold bullions.

Inclusion Criteria: Gold jewelry consumers are willing to participate in the study.

Exclusion Criteria: Gold jewelry traders and manufactures in the local gold market are unwilling to participate.

Sampling Technique:

Sample size: 40 questionnaires were distributed via hardcopy to respondents who consume gold jewelry in the local gold market (Khartoum).

Questionnaire Distribution: The questionnaires were distributed and collected within three weeks.

Data Collection: Data Collected from distributed questionnaire and eliminating the uncompleted of them.

Reliability and Validity of the questionnaire: To ensure reliability and validity of the questionnaire; the questionnaire was developed from previous literature in Section two.

Research Questions: The prominent questions are:

* The purpose of buying gold jewelry is personal use or saving money.
* Purity is a highly importance when buying gold jewelry.
* Purity can be defined by the hallmarking or by trust from seller
* There is apprehension when purchasing gold jewelry can result from non-validity of purity.

* Gold jewelry manufactured externally preferred due to its shape and design.

* Reselling used gold jewelry is considered unsatisfactory in the local market.

Study Tools: The study first tried to find out the demographic information about gold jewelry consumers, and second; understanding their behavior in buying and selling gold jewelry associated with purity or finesse.

Data Analysis: The Data has been analyzed by using Statistical Package for Social Sciences (SPSS) program software version 20.0 to test the constructs. The measurements for this research include descriptive analysis.

3.2 Laboratory Experiments:

There are basically three techniques for the determination of gold, gravimetry, titremetry and instrumental techniques, besides these techniques there are some other techniques like spot test acid testing kit, electronic gold testers and touchstone testing.

The laboratory experiment was followed in this section is an instrumental techniques representative by using (XRF) X-ray fluorescence spectrometry technique.

The purpose of using XRF technique in this methodology because it an easy way to boost customer confidence and ensure dealer reliability and suggested in this research to eliminate obstacles and aspects of fear at gold jewelry consumers that in relation with purity or fineness. In addition to investigate the trace metals that are used in manufacturing gold jewelry and these elements identify quality of gold jewelry in the local market.

X-rays fluorescence technique provides high value of gold, because quantifying its fineness and purity is more critical. Whether consumer buys and sells gold jewelry, he needs a fast, highly accurate method to determine karat (gold content) for quality control and pricing as shown in literature chapter two.

3.2.1 (XRF) X-ray Fluorescence Spectrometry Technique.

XRF (X-ray fluorescence) is a non-destructive analytical technique used to determine the elemental composition of materials. XRF analyzers determine the chemistry of a sample by measuring the fluorescent (or secondary) X-ray emitted from a sample when it is excited by a primary X-ray source. Each of the elements present in a sample produces a set of characteristic fluorescent X-rays ("a fingerprint") that is unique for that specific element, which is why XRF spectroscopy is an excellent technology for qualitative and quantitative analysis of material composition.
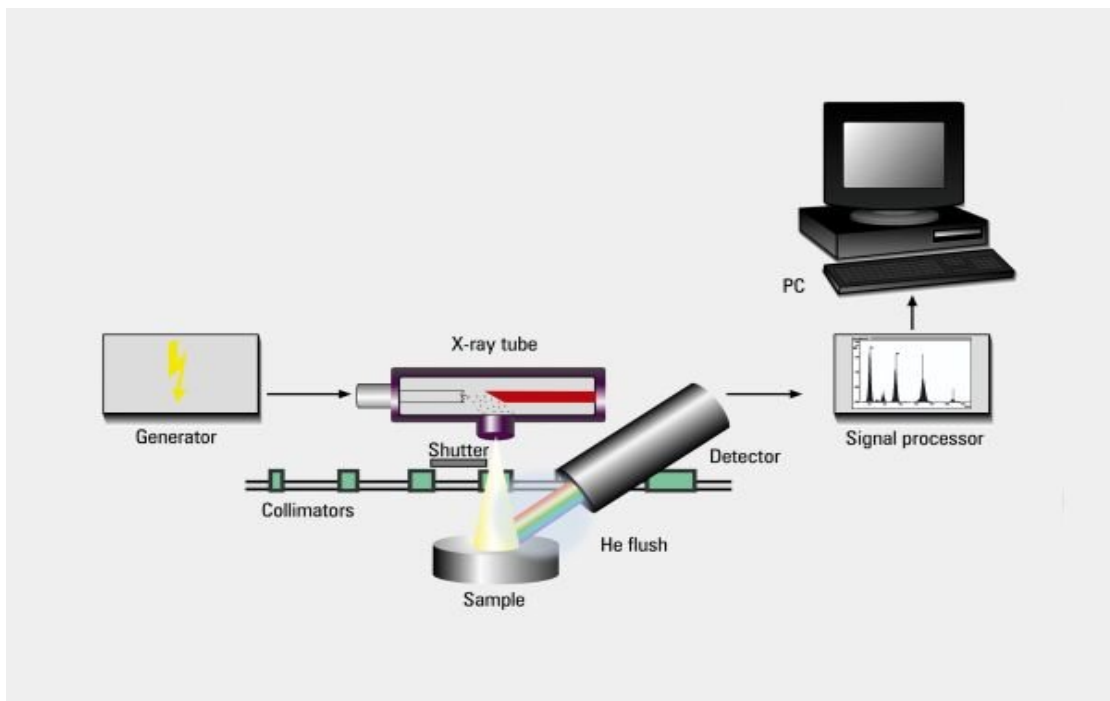
Basic principles of (XRF) X-ray fluorescence spectrometry.

XRF X-rays Fluorescence Instrument:

Spectro MIDEX MID 03 analyzer was used to conduct experiments; is an easy-to-use, cost-effective method to obtain alloy chemistry and karat classification with one nondestructive and nonintrusive test.
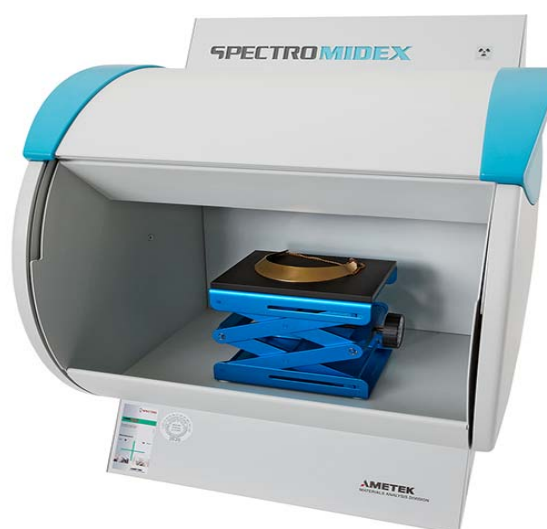
XRF X-rays Flourescense – Spectro MIDEX MID03

The analysis was performed at laboratories of SGR (Sudan Gold Refinery Co.Ltd)   and various Samples of gold jewelry were collected from consumers and has been analyzed .

Scope:

Determination of gold in gold jewelry content accurately and detect from trace metals combined with gold jewelry by using X-rays fluorescence instrument (Spectro MIDEX MID 03).

Sample Preparation:

Disk sander for putting piece of jewelry.

Sample Area:

Small spots and rapid mapping of large surfaces (up 233×160mm, 9.2×6.3).

Calibration:

Element	Average	Stat.Error*	SD
Cu in %	10.09	0.02	0.005
Zn in %	1.199	0.007	0.013
Pb in %	6.47	0.032	0.036
Ag in %	26.88	0.07	0.054
Au in %	55.35	0.07	0.066

Standardization:

	Unit	Ref.Value	Targer	min	max	Calibration
Au	%	99.99	99.99	100	100	100
Other	%	<LOD	<LOD	<LOD	<	<

Parameters for Precision in XRF:

- Measuring Distance
- Collimator
- Test area: 0.2mm to 2.0mm
- Measuring Time: 60 seconds
- Positioning.
-             Focusing.

3.2.2 Determination of gold in gold bullion alloys by using Cupellation or Fire Assay Method.

Data Collected from determination of gold in gold bullions alloys by using cupellation or fire assay method.

Cupellation (Fire Assay) Method.

The procedure is applicable specifically to gold alloys incorporating silver, copper and other metals, which considers the most appropriate, acceptable and accurate method in gold analysis.

The laboratories that perform gold assay consider the fire assay method the most preferred technique.

In the fire assay so many steps are involved from alloying to final determination and there is a chance of loss of gold during analysis.

The fire assay method is time consuming and required expertise to perform the test.

The method intended to be used in the research methodology to draw the attention for the importance of purity or fineness; which is one of the basics for buying and selling gold.

The purposes of data collected are to show quality, reliability and confidence level of the process of determination gold in scrap gold bullions by using fire assay or cupellation method.

The data collected from laboratories of Sudan Gold Refinery Co. Ltd, where gold bullions are received from mining companies gold traders in the local gold market to implement the purchasing process.

The data collected represent samples have been analyzed by using fire assay or cupellation and the method is accredited at Sudan gold refinery and also is followed by Sudanese Standards and Metrology Organization besides analysis by using X-rays fluorescence technique.

CHAPTER V: RESULTS AND DISCUSSION

The researche was based on quantitative questionnaires and laboratory experiments..

4.1. Questionnaire Analysis:

The questionnaire is divided into two segments:

4.1.1 Gold traders of gold bullions.

4.1.2 Gold consumers of jewelry.

Statistical methods are used:

To achieve the objectives of the study and to verify hypotheses, statistical methods were used the following:

1 - Charts.

2 - Frequency distribution of the answers.

3 - Percentages.

4 - Alpha equation, to calculate the reliability coefficient.

5 - Median.

6 - Chi-square test for the significance of differences between the answers.

To get results as accurate as possible, has been used SPSS statistical software, which indicates a shortcut to Statistical Package for Social Sciences.

4.1.1 Traders of gold bullions.
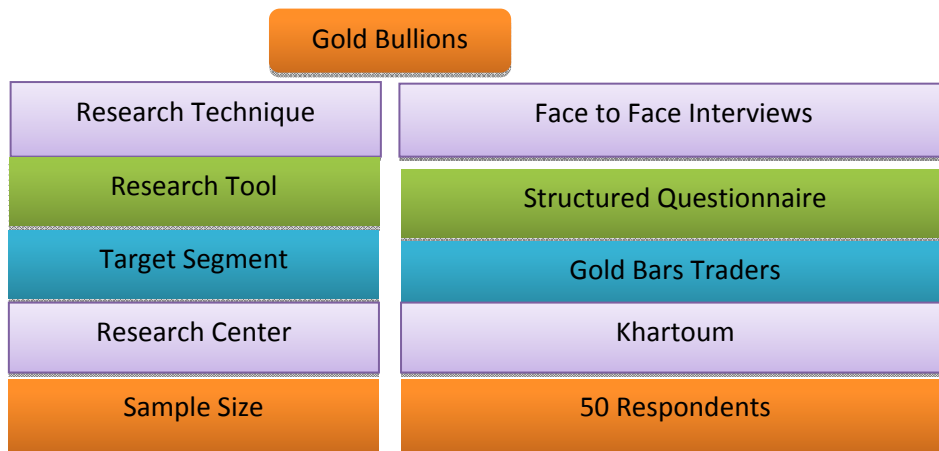
Questionnaire first tried to find out the demographic of gold bullions traders, in addition to understanding their behavior in buying and selling gold associated with purity or finesse.

Demographic Profile of Gold Bullions Traders:

Descriptive variables of study

Firstly: General Information:-

1- Ages:-

Table (4.1) Ages of gold bullions traders

Age	Frequency	Percentage
Less than 30 years	12	24%
From 30 to 40 years	31	62%
From 41 to 50 years	3	6%
From 51 to 60 years	2	4%
More than 60 years	2	4%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
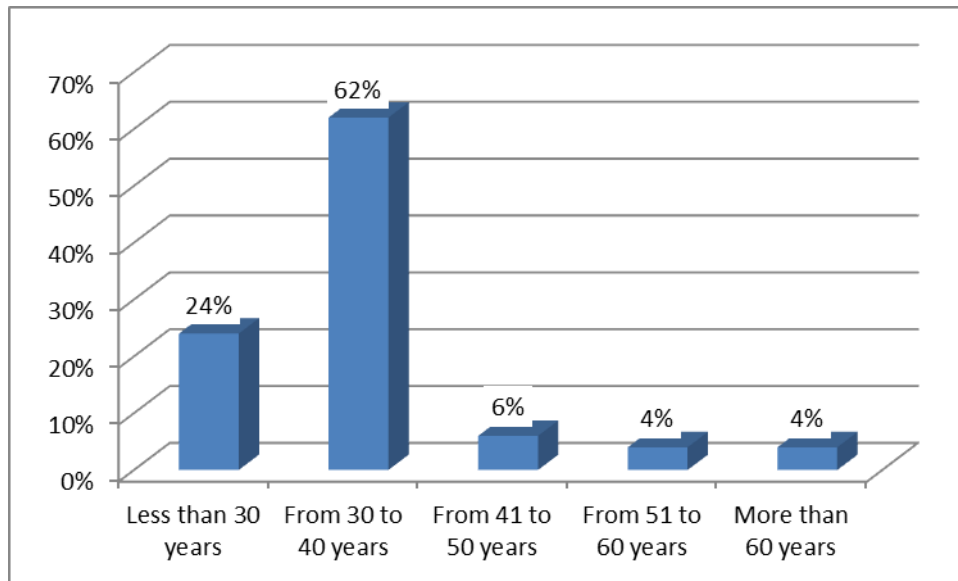
Table (4.1) Ages of Gold Bullions Traders

From table (4.1) and figure (4.1) we note that the age of most individuals study are (from 30 to 40 years) by (31) and with (62%), followed by whom ages is (less than 30 years) by (12) with (24%), while the total number of (from 41 to 50 years) (3) by (6%).

2- **Qualifications :-**

Table (4.2) Qualifications of Gold Bullions Traders

Qualification	Frequency	Percentage
Higher School or less	16	32%
Diploma	24	48%
Bachelor	6	12%
Master	4	8%
PhD	0	0%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
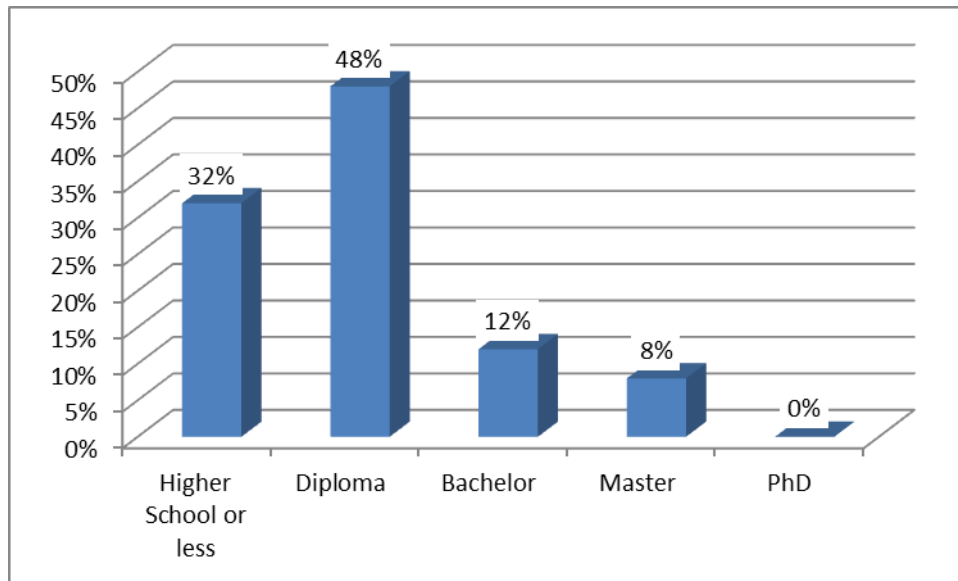
Figure (4.2) Qualifications of Gold Bullions Traders

From table (4.2) and figure (4.2) we note that the qualifications of the most individuals study are (Diploma) by (24) and with (48%), followed by whom qualification is (Higher School or less) by (16) with (32%) while the total number of whom qualification is (Bachelor) is (6) by (12%). Figure(4.1) and (4.2)show younger gold traders in the local market and their ages between 30 to 40 year, and the majority have secondary and bachelor certifications.

3-Years of Activity :-

Table (4.3) Years of Activity

Years	Frequency	Percentage
Less than 5 years	20	40%
5 – 10 years	15	30%
11 – 15 years	8	16%
16 – 20 years	3	6%
21 – 25 years	1	2%
More than 25 years	3	6%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
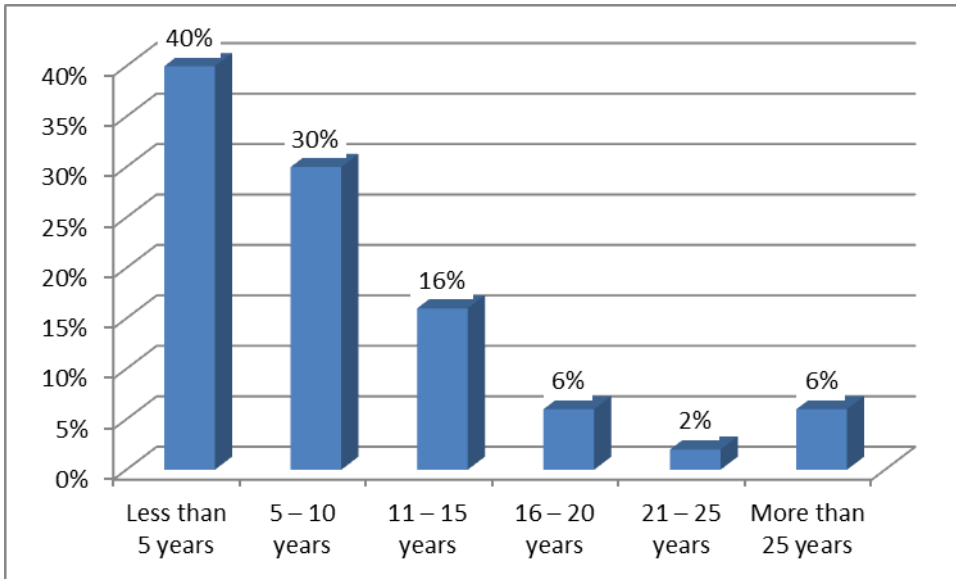
Figure (4.3) Years of Activity

From table (4.3) and figure (4.3) we note that the Years of activity of most individuals study are (Less than 5 years) by (20) and with (40%), followed by whom Years of activity is (5-10 years) by (15) with (30%) while the total number of whom Years of activity is (11 – 15 years) is (8) by (16%).

Secondly: Statements:-

Table (4.4). Impotrance of Purity or Fineness

Answer	Frequency	Percentage
Agree	48	96%
Don't know	0	0.0%
Disagree	2	4%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
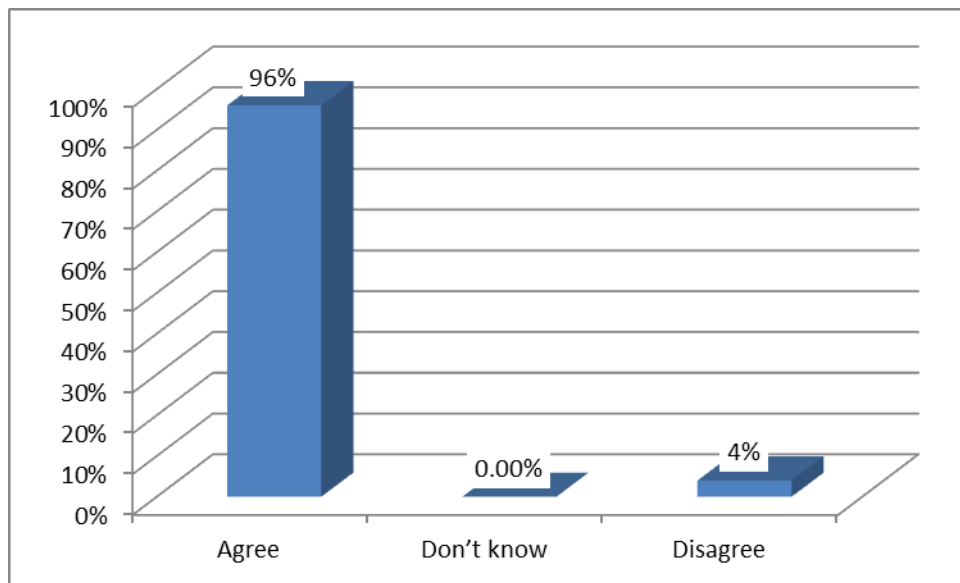
Figure (4.4). Impotrance of Purity or Fineness

From table (4.4) and figure (4.4) we note that the answer of most of the individuals study is (agree) by frequency (48) and percent (96%), while the total number of who answere is (disagree) by frequency (2) and percent (4%). Figure (4.4) shows that 96% of respondents consider purity has a great significance when buying and selling gold bullions, which means purity plays a big role in gold bullions. As literure mentioned scrap gold jewelry is priced differently because it has a lower purity and needs to go through the processes of being melted and assayed, and then reformed into tradable gold. (JIM'S Coins and Stamps).

Table (4.5). Level of Confidence when Purchasing

Answer	Frequency	Percentage
Agree	10	20%
Don't know	0	0.0%
Disagree	40	80%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
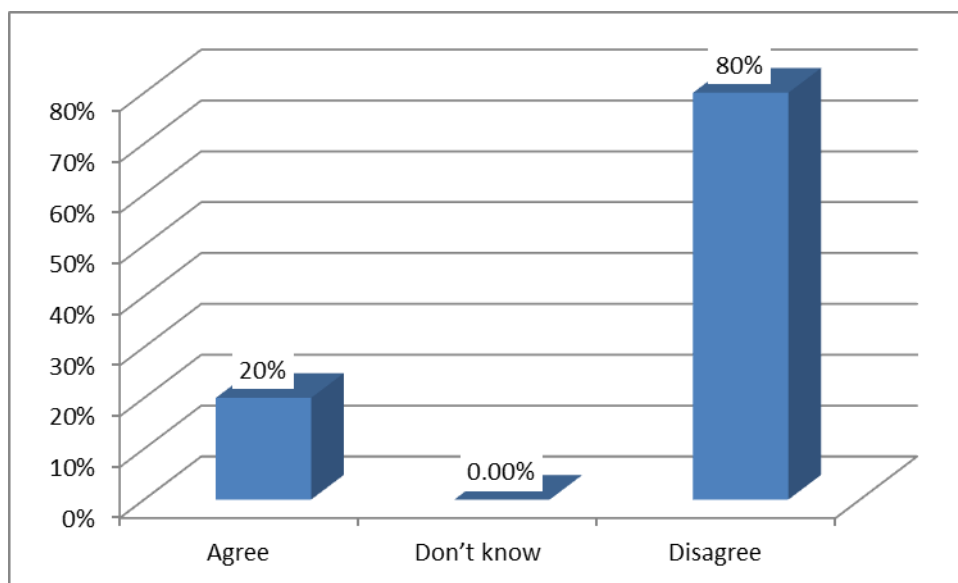
Figure (4.5). Level of Confidence when Purchasing

From table (4.5) and figure (4.5) we note that the answer of most of the individuals study is (diagree) by frequency (40) and percent (80%), , while the total number of who answer is (agree) by frequency (10) and percent (20%).

Figure (4.5) shows the level of confidence when purchasing gold bars, where majority don't trust in the results of purity and avoid purchasing which results from laboratories of local markets but others check to weight and purity. The little percentage of gold traders who trust in the purity when they purchase this segment has confidence results from long experience, the reputation of seller and trusting the laboratories. Trust is one of the most important factors for customer when deciding to purchase or not purchase (Jokinen,2011).

Table (4.6). Apprehension when Buying

Answer	Frequency	Percentage
Agree	38	76%
Don't know	0	0.0%
Disagree	12	24%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
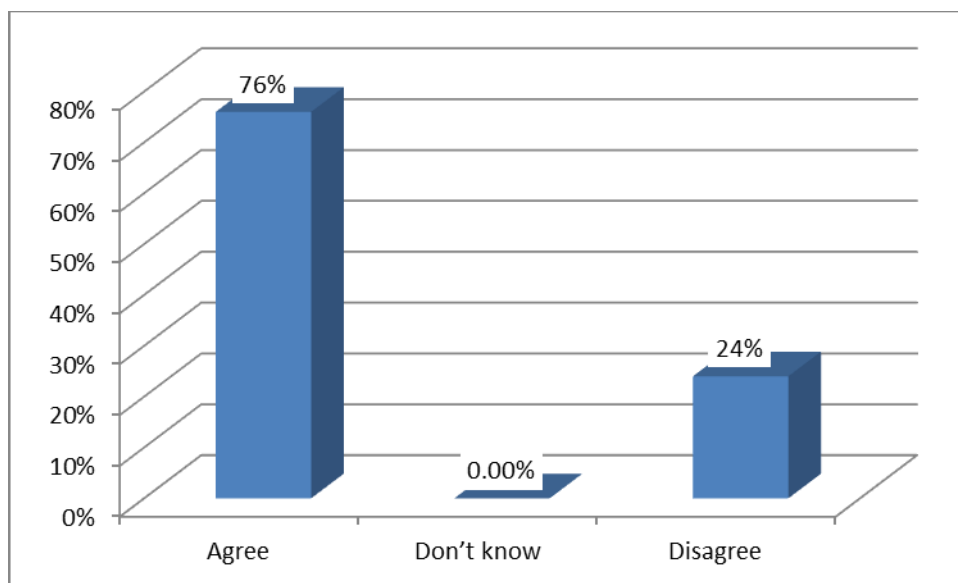
Figure (4.6). Apprehension when Buying

From table (4.6) and figure (4.6) we note that the answer of most of the individuals study is (agree) by frequency (38) and percent (76%), , while the total number of who answer is (disagree) by frequency (12) and percent (24%).Figure (4.5) 76% of respondents fear from financial loss which could result from non-validity of purity and lead to financial loss.24% of respondents don't think that there apprehension when buying and selling gold bars. Individuals purchasing also involve consideration of individual ideas and experience (kotler 1999).

Table (4.7). Qualifing Laboratories Workers.

Answer	Frequency	Percentage
Agree	48	96%
Don't know	0	0.0%
Disagree	2	4%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
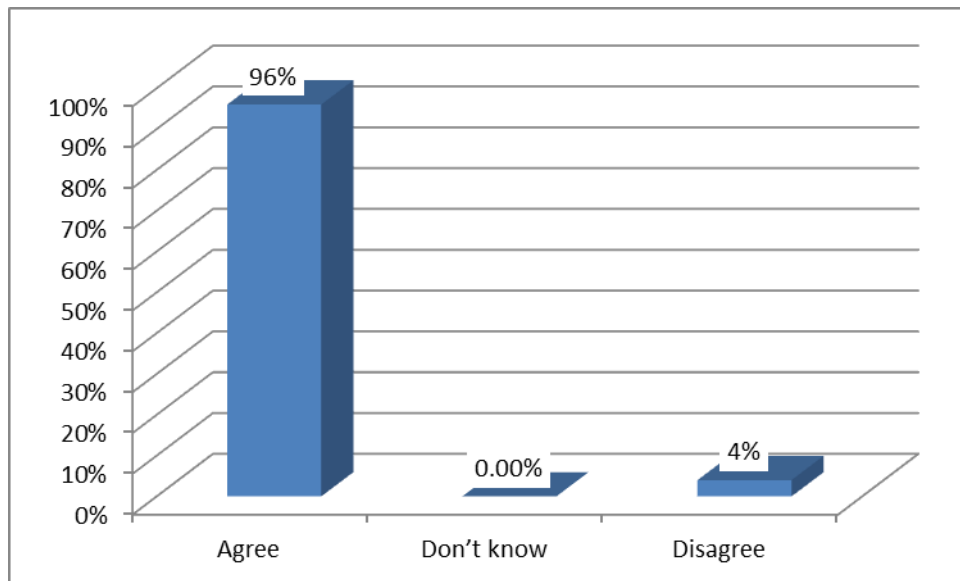
Figure (4.7): Qualifing Laboratories Workers.

From table (4.7) and figure (64.7) we note that the answer of most of the individuals study is (agree) by frequency (15) and percent (37.5%) , while the total number of who answer is (disagree) by frequency (8) and percent (20%).Figure (4.7) shows that 96% of respondents think that who work in laboratories of gold need qualifying and monitoring which reflect the importance of purity in trading of gold as we mentioned in figure (4.4).

Figure (4.8) . Control Over Laboratories in the Local Market.

Answer	Frequency	Percentage
Agree	49	98%
Don't know	0	0.0%
Disagree	1	2%
Total	50	100%

Source: prepared by researcher, using SPSS, 2017
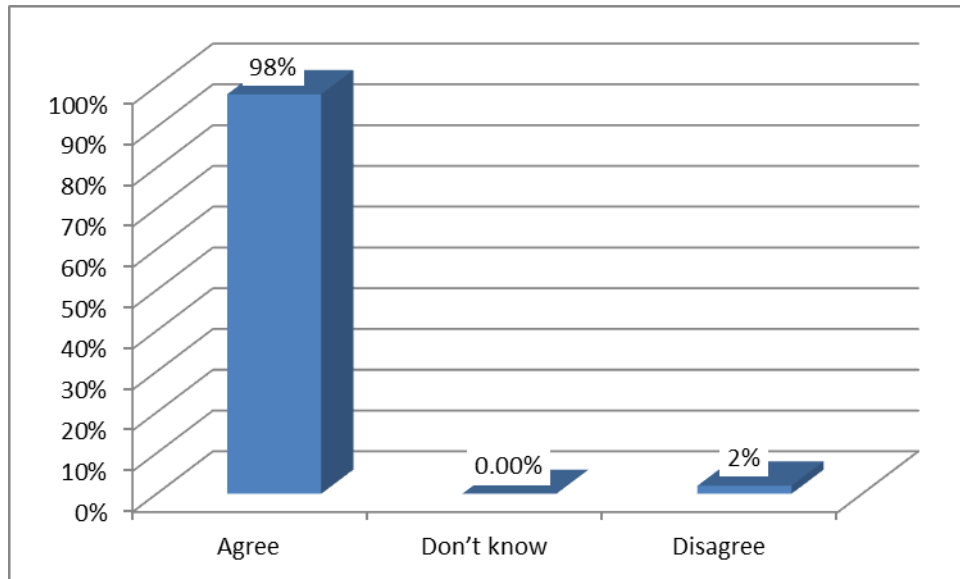
Figure (4.8) Control Over Laboratories in the Local Market.

From table (4.8) and figure (4.8) we note that the answer of most of the individuals study is (agree) by frequency (49) and percent (98%), while the total number of who answer is (disagree) by frequency (1) and percent (2%). Figure (4.7) shows that the laboratories need more monitoring and organizing by the authorities' bodies. As mentioned the literature sales or service representatives have a significant effect on custmer's perception and throw training they could be able to explain quality of service or product (Hill,2007)

- **Discussion the Phrases:**

Table (4.9): Frequency distribution of the first hypothesis phrases Answers:

Statement	Chi-square value	P-value	Median	Trend
Importance of purity or fineness	42.32	0.000	3	Agree
Level of confidence when purchasing	13.52	0.000	3	Agree
Apprehension when buying	42.32	0.000	3	Agree
Qualifing laboratories workers	46.08	0.000	3	Agree
Control over laboratories	18.00	0.000	3	Agree

Source: prepared by researchers, using SPSS, 2017

From the table above:
- The value of chi-square for the first phrase is (42.32) with (p-value=0.000 < 0.05), this indicates that there is significant differences at the level (5%) between answers of study individuals and in favor of agree.
- The value of chi-square for the second phrase is (13.52) with (p-value=0.000 < 0.05), this indicates that there is significant differences at the level (5%) between answers of study individuals and in favor of agree.
- The value of chi-square for the third phrase is (42.32) with (p-value=0.000 < 0.05), this indicates that there is significant differences at the level (5%) between answers of study individuals and in favor of agree.
- The value of chi-square for the fourth phrase is (46.08) with (p-value=0.000 < 0.05), this indicates that there is significant differences at the level (5%) between answers of study individuals and in favor of agree.
- The value of chi-square for the fifth phrase is (18.00) with (p-value=0.181 > 0.05), this indicates that there is significant differences at the level (5%) between answers of study individuals and in favor of agree.

4.1.2 Gold Jewelry Consumers:

Jewelry	
Research Technique	Face to Face Interviews
Research Tool	Structured Questionnaire
Target Segment	Jewelry Consumers
Research Center	Khartoum
Sample Size	40 Respondents
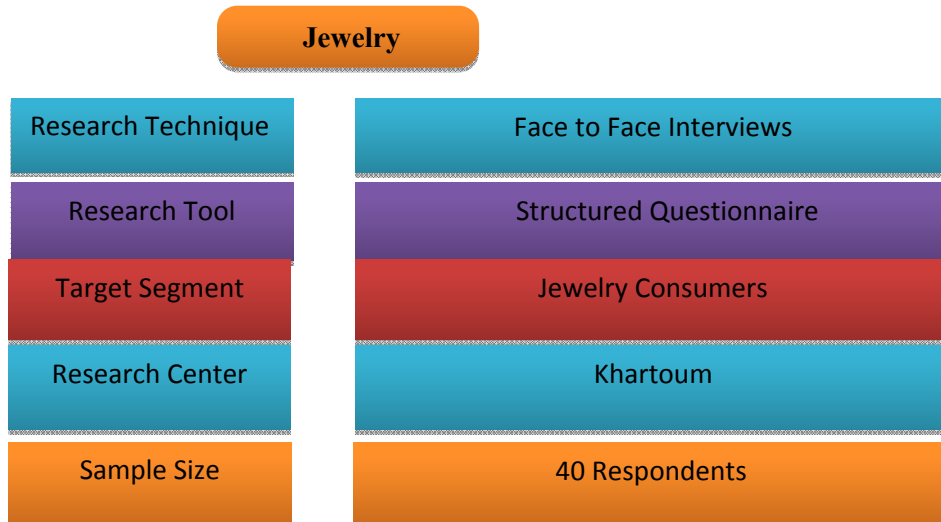
Secondly this questionnaire tried to find out the demographic of jewelry consumers, in addition to understanding their behavior in buying and selling gold jewelry associated with purity or fineness.

According to customs and traditions the young females in Sudan are the active segment in local market.

Secondly : Gold Jewelry Consumers:

Descriptive of the Variables Study:

General Information:

1-Ages:

Table (4.10). Ages of Gold Jewerly Consumers

Age	Frequency	Percentage
Less than 30 years	11	27.5%
From 30 to 40 years	11	27.5%
From 41 to 50 years	12	30%
From 51 to 60 years	5	12.5%
More than 60 years	1	2.5%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
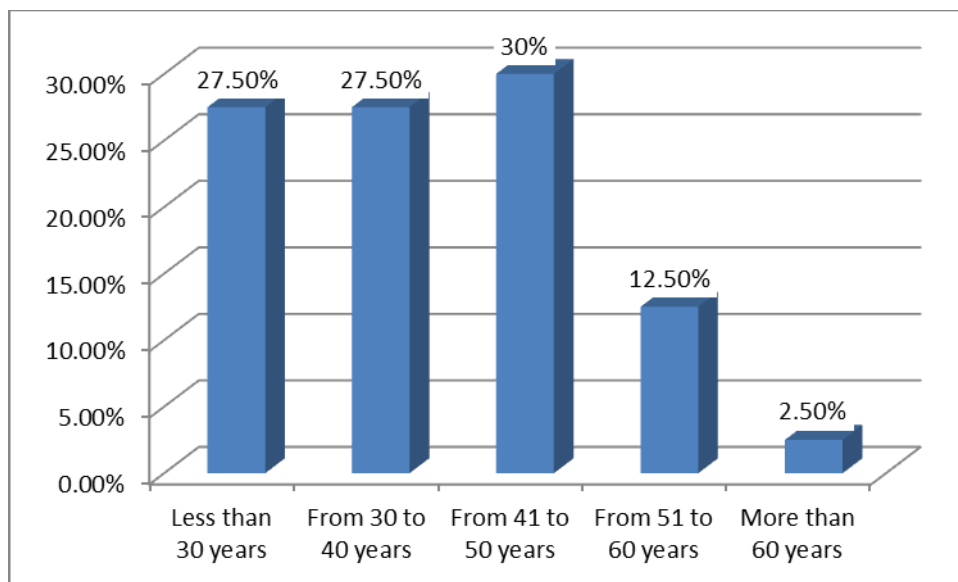
Figure (4.9) . Ages of Gold Jewerly Consumers

From table (4.10) and figure (4.9) we note that the age of most individuals study are (from 41 to 50 years) by (12) and with (30%), followed by whom

age is (less than 30 and From 30 to 40) both by (11) with (27.5%) , while the total number of (from 51 to 60 years) (5) by (12.5%).

3- Qualifications:

Table (4.11). Qualifications of Gold Jewerly Consumers.

Qualification	Frequency	Percentage
Higher School or less	14	35%
Diploma	17	42.5%
Bachelor	2	5%
Master	7	17.5%
PhD	0	0.0%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
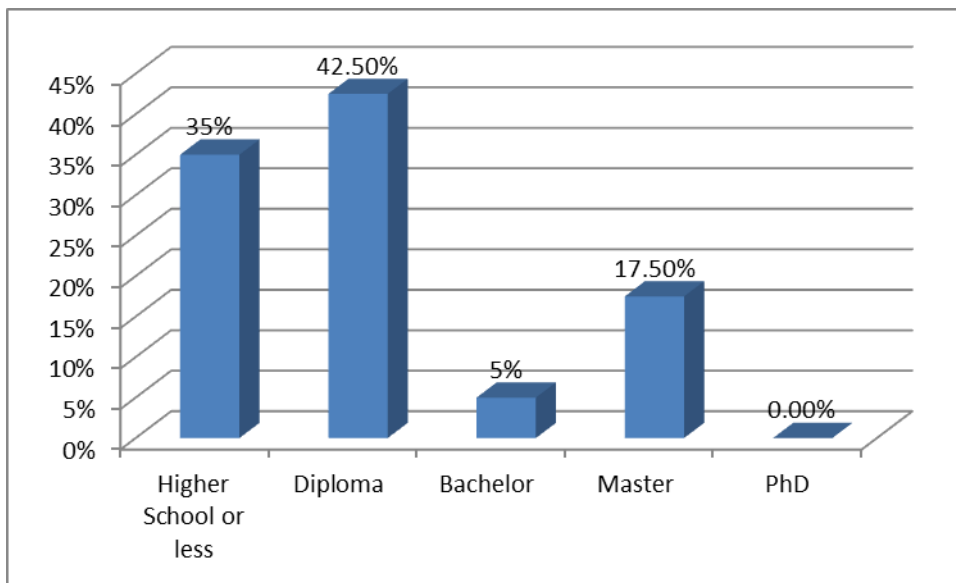
Figure(4.10). Qualifications of Gold Jewerly Consumers.

From table (4.11) and figure (4.10) we note that the qualification of the most individuals study are (Diploma) by (17) and with (42.5%), followed by whom qualification is (Higher School or less) by (14) with (35%) while the total number of whom qualification is (Master) is (7) by (17.5%).According to figures (4.9, 4.10) respondents profile was a mix of different ages and

educational levels groups, which means the inputs contained a good representation of people and data collected.

4- Years of activity:

Table (4.12). Years of Activity.

Years	Frequency	Percentage
Less than 5 years	13	32.5%
5 – 10 years	13	32.5%
11 – 15 years	4	10%
16 – 20 years	2	5%
21 – 25 years	1	2.5%
More than 25 years	7	17.5%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
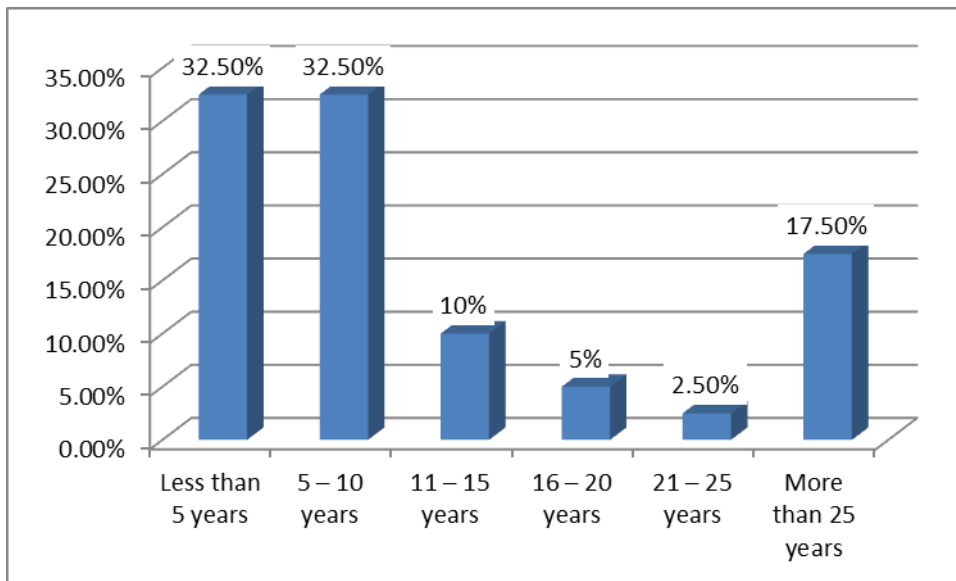
Figure (4.11). **Years of Activity.**

From table (4.12) and figure (4.11) we note that the Years of activity of most individuals study are (Less than 5 years and 5 – 10 years) both by (13) and with (32.5%), followed by whom Years of activity is (More than 25 years) by (7) with (17.5%) while the total number of whom Years of activity is (11 – 15 years) is (4) by (10%). The figure (4.10) shows that there are a big number of

respondents their period in buying and selling gold jewelry between less than five years and between 5-10 years; this means that they are modern customer in local gold market. According to customs and traditions the young females in Sudan are active segment in local market.

Table (4.13) . Importance of Purity or Fineness.

Answer	Frequency	Percentage
Agree	40	100%
Don't know	0	0.0%
Disagree	0	0.0%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
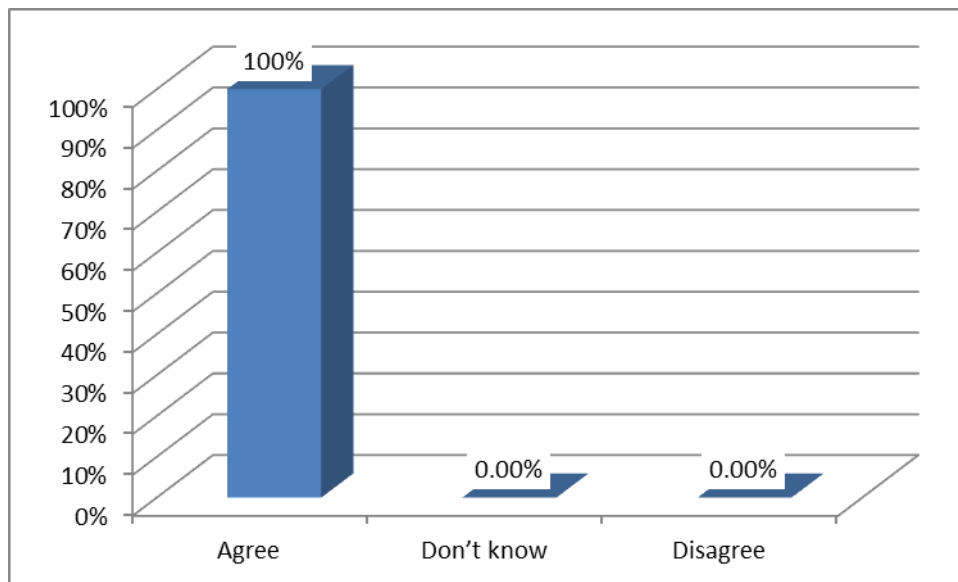
Figure (4.12) . Importance of Purity or Fineness.

From table (4.13) and figure (4.12) we note that the answer of all individuals study is (agree) by frequency (40) and percent (100%). The figure (4.13) shows the importance of purity compliance when purchasing jewelry; all the respondents consider matching the purity on the piece of jewelry is important, the most Karat traded in local market is 21 karat and sometimes 18 karat. In the gold ornaments market, providing a level of quality can be used to build trust between consumer and seller (Sanguanpiyapana and Jasper, 2009).

Table (4.14) Consumer Behavior to check about the purity.

Answer	Frequency	Percentage
Agree	26	65%
Don't know	0	0.0%
Disagree	14	35%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
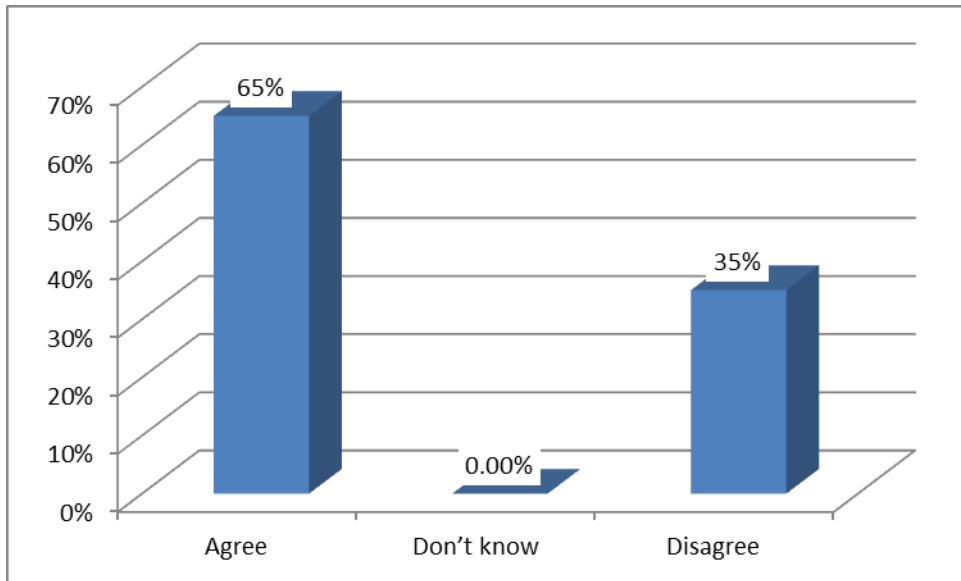
Figure (4.13). Consumer Behavior when checking about purity or fineness.

From table (4.14) and figure (4.13) we note that the answer of most of the individuals study is (agree) by frequency (26) and percent (65%), while the total number of who answer is (disagree) by frequency (14) and percent (35%). Figure (4.13) tried to find out Consumer behavior when purchasing to verification from matching the purity. Figure (4.12) shows that 65 % of respondents depends on Hallmarking on the piece of jewelry to check about purity.And 35% of respondents depend on trust from buyer but the next figure shows that there apprehension when purchasing resulted from not compliance the purity. Customers tend to trust sales representatives rather than buying

channels (Jokinen, 2011). , and hallmarking representing the earliest form of consumer protection. (The Assay Office-Birmingham-UK).

Table (4.15) . Manufactured Gold Locally and Externally.

Answer	Frequency	Percentage
Agree	35	87.5%
Don't know	0	0.0%
Disagree	5	12.5%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017

Figure (4.14). Manufactured Gold Locally and Externally.

From table (4.15) and figure (4.14) we note that the answer of most of the individuals study is (agree) by frequency (35) and percent (87.5%), , while the total number of who answer is (disagree) by frequency (5) and percent (12.5%). Figure 14 shows that consumers prefer externally manufactured and refers to design besides the quality of color for the imported gold to the local market compared to gold manufactured locally. The manufactured gold

externally distinguishes by its attractive designs and shine yellowish colors which return to the elements are added to gold alloy.

In case of gold jewelry the shape, line, and all the visible qualities of the product that represent the brand in order to attract customers(Verplanken and Herabadi, 2001).

Table (4.16). Apprehension when buying gold jewelry.

Answer	Frequency	Percentage
Agree	33	82.5%
Don't know	0	0.0%
Disagree	7	17.5%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
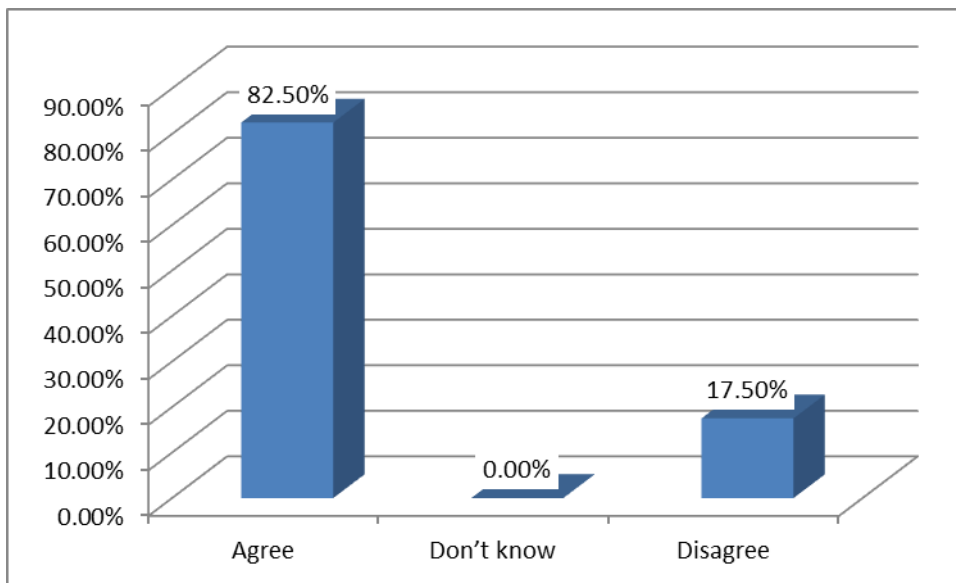
Figure (4.15). Apprehension when buying gold jewelry.

From table (4.16) and figure (4.15) we note that the answer of most of the individuals study is (agree) by frequency (33) and percent (82.5%), while the total number of who answer is (disagree) by frequency (7) and percent (17.5%). Figure (4.15) shows that the majority of gold consumer are afraid of buying jewelry which can lead to financial risk from invalidity of purity and

the and that could be avoided by increase the aware of buying and increase the quality of the selling process by jewelry traders.

Table (4.17) .Purpose of Purchasing Gold Jewelry

Answer	Frequency	Percentage
Agree	19.6	49%
Don't know	0	0.0%
Disagree	20.4	51%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017

Table (4.18) .Purpose of Purchasing Gold Jewelry

Answer	Frequency	Percentage
Agree	20.4	51%
Don't know	0	0.0%
Disagree	19.6	49%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
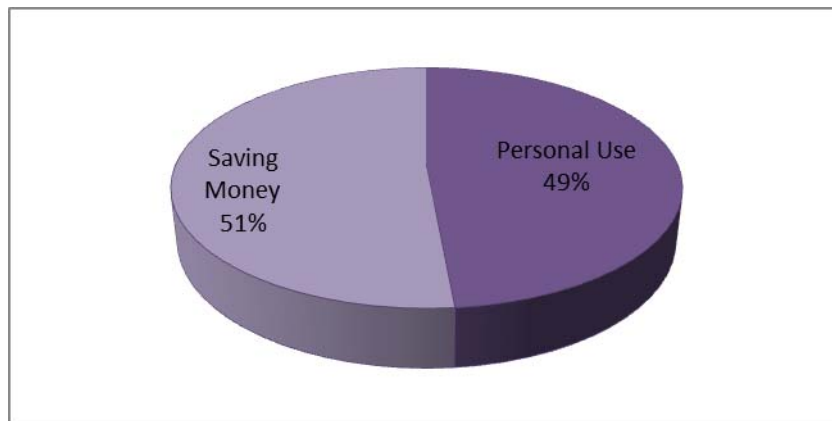
Figure (4.16) .Purpose of Purchasing Gold Jewelry (Saving money or Personal use).

Based on figure (4.16) it's interesting to note that respondents are semi equal on their purposes from owing gold jewelry.

Some of people buy gold for personal use and some for saving money taking the high value of gold and price changing. Actually the two purposes could be implemented throw giving more confidence quality to the process of jewelry trading. The exploration of the use of investment uncovers the dual function of gold jewelry, and indicates the interaction between ornamentation and investment(Burkac Ertimur 2003).

Table (4.19). Resale Gold Jewerly.

Answer	Frequency	Percentage
Agree	12	30%
Don't know	10	25%
Disagree	18	45%
Total	40	100%

Source: prepared by researcher, using SPSS, 2017
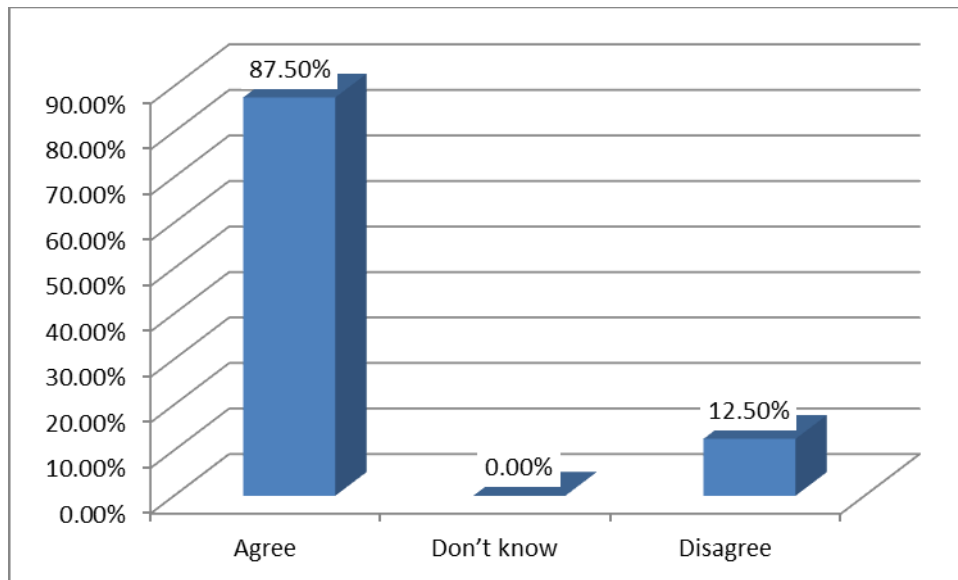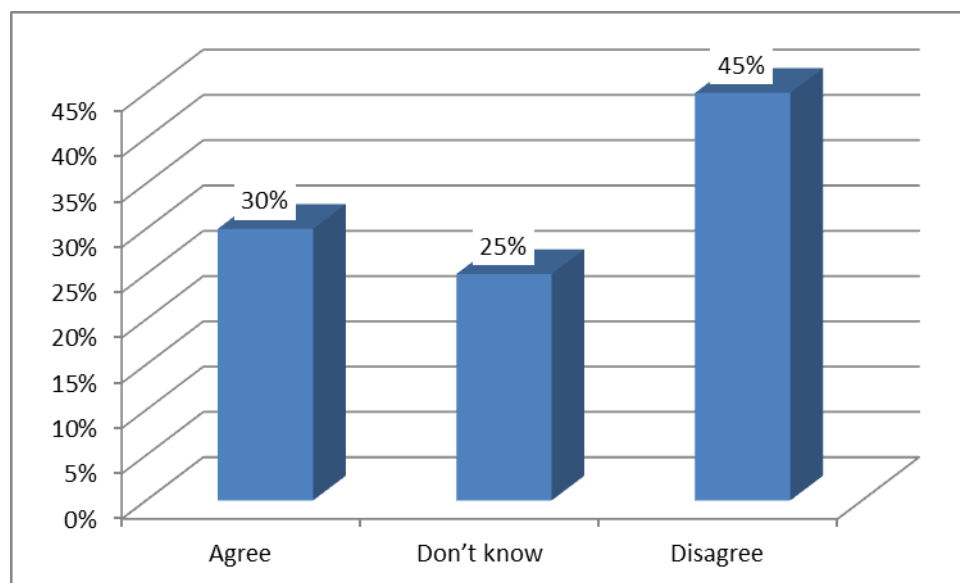

Figure (4.17). Resale Gold Jewerly.

From table (4.19) and figure (4.17) we note that the answer of most of the individuals study is (agree) by frequency (18) and percent (45%), , while the total number of who answer is (disagree) by frequency (12) and percent (30%). Figure shows that the majority of respondent are not satisfying when selling jewelry in the local market .which indicates the giving prices is given

to customers are not matching their expectations but in another hand jewelry consider buying jewelry requires another manufacturing which means manufacturing fees would be deducted from seller of jewelry do you use.

When selling scrap gold jewelry it is highly recommended to do business with a reputable firm in the community who is accountable for their business practices, rather than dealing with companies and individuals.(JIM'S Coins and Stamps).

- **Discussion the phrases:**

Table (18): Frequency distribution of the first hypothesis phrases Answers:

Statement	Chi-square value	P-value	Median	Trend
Consumer Behavior to check purity	16.90	0.000	3	Agree
Importance of purity	22.50	0.000	3	Agree
Apprehension when buying	3.60	0.058	3	Agree
Resale Gold jewerly	2.60	0.273	3	Agree

Source: prepared by researchers, using SPSS, 2017

From the table above:
- The value of chi-square for the first phrase is (16.90) with (p-value=0.000 < 0.05), this indicates that there is significant differences at the level (5%) between answers of study individuals and in favor of agree.
- The value of chi-square for the second phrase is (22.50) with (p-value=0.000 < 0.05), this indicates that there is significant differences at the level (5%) between answers of study individuals and in favor of agree.
- The value of chi-square for the third phrase is (3.60) with (p-value=0.058 > 0.05), this indicates that there is no significant differences at the level (5%) between answers of study individuals.
- The value of chi-square for the fourth phrase is (2.60) with (p-value=0.273 > 0.05), this indicates that there is no significant differences at the level (5%) between answers of study individuals.

4.2 Results of Laboratory Experiments

4.2.1 Using X-rays Fluorescence Spectroscopy Method.

The following results are based on a laboratory experiment was conducted at SGR (Sudan Gold Refinery Co.Ltd)   laborotaories by using X-rays Fluorescence Instrument (SPECTRO MIDEX).
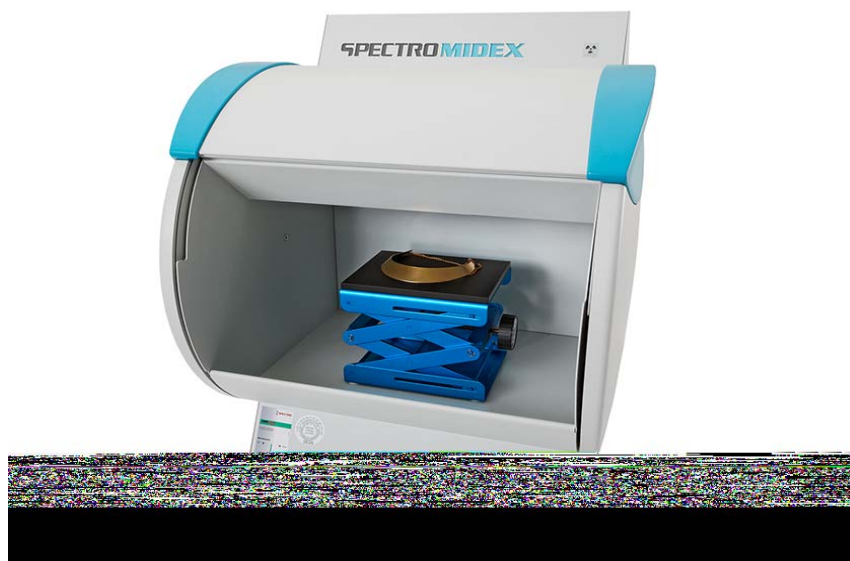
Figure (4.17) : SPECTRO MIDEX

Is also known to be an all-around talent for the fast, non-destructive analysis of small spots and rapid mapping of large surfaces (up 233×160mm, 9.2×6.3) in research and development as well is in compliance screen applications as many elemental analysis tasks in industry, research and the science require a non-destructive measuring system that is extremely sensitive and offers a small measuring spot.

4.2.1 Results of XRF-Spectroscopy Method:-

Table (4.1). Analysis of different pieces of gold jewelry from local market.

Symbol	Element	Sample 1	Sample 2	Sample 3
Cr	Chromium			
Mn	Manganese			
Fe	Iron			
Co	Cobalt		0.01%	
Ni	Nickel			
Cu	Copper	12.48%	10.12%	15.80%
Zn	Zink			
Ga	Gallium			
Ru	Ruthenium			
Rh	Rhodium			
Pd	Palladium			
Ag	Silver	0.35%	1.72%	10.30%
Cd	Cadmium		0.27%	
In	Inium			
Sn	Tin			
Sb	Antimony			
Te	Tellurium			
W	Tungeston			
Ir	Iridium			
Pt	Platinium			
Au	Gold	87.17%	87.89%	74.92%
Au	Gold	20.92 ct	21.09 ct	18 ct
Pb	Lead			
Bi	Bismuth			

According to the table (4.1) above, the gold content or gold concentration in samples 1 & 2 &3 are 87.17%, 87.89%, 74.92% which means 871.7, 878.9 and 749.2 part per thousand 20.91 and 21.09 Carat.

In addition to other metals as copper which has been used in jewelry manufacturing due to its low value and hardness feature.

Little amounts of silver have been used in manufacturing of the samples above and that return to high value of silver with comparison to copper.

Silver also was added to the alloy of gold jewelry and due to its high value and same hardness feature little amounts have been used.

Using copper with large amounts as shown in table (4.1), (12.48%, 10.12%, 15.8%) effects on color of piece of jewelry by usage over time, but using big amounts of silver in gold jewelry manufactured gives shine and constant color

and increase hardness of gold jewelry this concept can be followed in the local market to increase the quality of gold jewelry products.

 Gold is yellow and copper is red, the only two coloured pure metals. All other metals are white or grey in colour. The addition of a red colour to yellow, as every school child knows, makes the yellow pinker and eventually red. The addition of a white makes the yellow colour paler and eventually white. This principle of mixing colours is the same in carat golds. Adding copper to gold makes it redder and adding silver, zinc and any other metal makes gold paler. Thus, we can understand that lower carat golds, because we can add more alloying metals, can have a wider range of colours than the higher carat golds.

As well as affecting physical properties, alloying additions to gold generally increase the strength and hardness, with some reduction in malleability / ductility. The silver atom is slightly larger than that of gold, so alloying gold with silver gives a moderate improvement in strength and hardness. The copper atom is significantly smaller than that of gold and so it has a greater effect on strengthening gold than silver, as it distorts the gold crystal lattice more. Thus reducing caratage from 24 carats through 22 ct and 21 ct down to 18 carat gold results in stronger and harder alloys, as can be seen in Table 3. Beyond 18 ct down to 10, 9 and 8 carats does not have much further effect.(World Gold Council).

Table (4.2) Analysis of various gold bullions

Symbol	Element	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Cr	Chromium					

Symbol	Name					
Mn	Manganese					
Fe	Iron	1.55%		0.25%		
Co	Cobalt					
Ni	Nickel					
Cu	**Copper**	**0.115**		**0.60%**	**16.45%**	
Zn	Zink			0.108%		
Ga	Gallium					
Ru	Ruthenium					
Rh	Rhodium					
Pd	Palladium					
Ag	**Silver**	**0.101**	**0.08%**	**11.26%**	**23.39%**	
Cd	Cadmium					
In	Inium					
Sn	Tin					
Sb	Antimony					
Te	Tellurium					
W	Tungeston					
Ir	Iridium					
Pt	Platinium					
Au	**Gold**	**76.22%**	**99.90%**	**87.77%**	**60.12%**	**100.00%**
Au	**Gold**	**18.2 ct**	**23.98 ct**	**21.06 ct**	**14.43 ct**	**24 ct**
Pb	Lead					
Bi	Bismuth					

The samples in table (4.2) represent gold bullions produced by the local mining companies and received by SGR (Sudan Gold Refinery Co. Ltd.).

The table shows different samples with different purities have been analyzed by using XRF besides trace metals as silver and copper.

It's noted that there is large amounts of silver combined with gold samples 1, 3,4 and their concentration are:10.1% , 11.2%,32.39% and that what distinguishes gold produced locally in Sudan and considers positive feature can be make use of it by using silver amounts in silver and gold manufacturing subsequently adding value to both of them after refining the silver by SGR.

Samples (2) shows very little amounts of silver(0.08%) and that return to high purity of gold bullion as is the case in sample 5 where there is no trace metal because of high purity 99.99 (24) karat.

4.2.2Quantitative Chemical Ana1ysis (Fire Assay or Cupellation)

In the bullion fire assay process, a sample from the bullion is wrapped in a lead foil with copper and silver. The wrapped sample heat at 1050 Ċ in a cupel made of compressed bone ash or magnesium oxide powder. Base metals oxidize and absorb into the cupel. The product of this cupellation (cornet) is flattened and treated in nitric acid to remove silver. Precision weighing of metal content of samples and each process stage is the basis of the extreme method precision.

European assayers follow bullion traditions based in hallmarking regulations. Reputable North American bullion assayers conform closely to ASTM method E1335-04e1. Only bullion methods validated and traceable to accepted international standards obtain genuine accuracies of 1 part in 10,000. Cupellation alone can only remove a limited quantity of impurities from a sample. Fire assay, as applied to ores, concentrates or less pure metals, adds a fusion or scorification step before cupellation.

The following table contains various samples gold bullions have been analyzed by fire assay or cupellation.

Table (4.3) Analysis various sample of gold bullions by using fire assay or cupellation.

No.	Sample No.	Customer Name	Weight/g	Sample Weight/g	Wt. Before	Wt. After	Purity	Average Purity	Remarks
	1	XXXXX	11,173.00	4.2	251669	192617	765.36	765.33	
					250470	191804	765.78		
					254889	194954	764.86		
	2	XXXXX	9.329.3	5.2	260445	260262	999.3	999.26	
					258445	258367	999.7		
					253652	253347	998.8		
	3	XXXXX	13,339.80	4.8	252623	222217	879.64	879.95	
					250981	220983	880.48		
					254356	223769	879.75		
	4	XXXXX	10,875.60	3.9	250663	152490	608.35	608.1	
					257963	156792	607.81		
					261478	159017	608.15		
	5	XXXXX	2,741.30	4	253656	253656	1000	999.9	.
					257627	257627	1000		
					259385	259358	1000		

The table (4.3) shows various sample of gold bullions have been analyzed by fire assay or cupellation method which is the most accurate and acceptable way to determine the purity or fineness of gold bullions.

The table (4.3) is the daily laboratory record for the fire assay or cupellation method, the table shows weights of samples and weights of samples before process of the analysis by using sensitive balance 6 digits scales, for each sample three samples are taken to increase the accuracy and

observe any deviation in the results and then dividing on the final weight on the primary weight to get the purity and finally calculating the average for each sample.

It observes that there are difference results compared to x-rays florescence instruments in table (4.2) especially in samples number (1,4) and that return to low purities of gold bullions were analyzed.

As for samples 2, 5 there is no difference can be mentioned compared to table (4.2) and that return to high purity of gold bullions.

Sample 3 shows little difference compared to result in table (4.2) return to high purity compared to samples (1, 4).

CONCLUSION

The research has given much better understanding of impact of purity (finess) on gold bullions traders and gold jewelry consumers behaviors.

The key research objective was to find out the purchase considerations in the local market and impact of purity or fineness in the purchase process, and to meet the stated objectives, the methodologies were followed are questionnaire and laboratory experiments.

It's distinguished from results of questionnaires; purity or fineness has a great significance to the respondents of the questionnaire, and there aspect of fear to the gold traders and gold jewelry consumers from non-validity of purity when purchasing or selling. In addition to gold jewelry consumers are not satisfied with resale process of used jewelry where the results were as following:
* Gold bullions traders :-

- 96% of respondents consider purity has a great significance when buying and selling gold bullions.

- 80% of respondent don't trust in the results of purity and avoid purchasing which results from laboratories of local market.

- 76% of respondents fear from financial loss which could result from non-validity of purity and lead to financial loss.

- 96% of respondents think that who work in laboratories of gold need qualifying and monitoring

- 98% of respondents laboratories need more monitoring and organizing by the authorities' bodies.

* Gold Jewerly Consumers: -

- 100% of respondents consider purity has a great significance when buying gold jewelry.

- 51% of respondents consider the purpose of purchasing gold jewelry is saving and 49 % consider the purpose is personal use.

- 72% of respondent are afraid from unvalidity of purity(fineness) of gold jewelry.

- 87% of respondents prefer external manufactured gold .

Interesting was to determine and detect the trace and combined elements of gold bullions and gold jewelry throw laboratory experiments and compares the results with various analysis methods.

The research shows the obstacles and fears in the local market at the side of gold traders of bullions and consumers of gold jewelry, In addition to gold jewelry consumers lack of enough information about gold jewelry purchasing this means consumers need increasing awareness of about the process of purchasing   gold jewelry.

 As for gold bullions traders has shown that need of gold bullions traders in increasing the monitoring and control on the local laboratories, besides they need more aware bout various methods of analyzing gold bullions and as known the value of gold is determined by its purity or fineness, so it plays a big role in the trading throw build the trust and   reducing the financial risk.

To promote and growth in the near future the research suggests to publish easy and honest applicable practices by gold jewelry stores and gold laboratories to satisfy both traders and consumers which will definitely reflect on gold trading in the local market.

RECOMMENDATIOS

* Gold Jewelry Trading

In order to reach goals of this research the following are some suggestions could be implemented to build the trust and satisfaction between gold seller and gold jewelry consumer.

The research suggests instruments and tools and can be used in gold jewelry stores and markets.

- One of the instruments are suggested is XRF instrument, which is fast, simple, nondestructive and quickly distinguish between gold plating and solid gold and determine the accurate karat (K) weight of gold jewelry. The instrument can be making use of it when buying and selling gold jewelry by the consumer to eliminate the apprehension resulted from non-validity of purity.

- Screen for daily gold prices could be used in gold jewelry stores and markets to make the consumer aware about daily gold prices when buying or selling. The prices should be governed by the international prices and the local policies of the country

- Making use of silver that is combined with gold bullions locally, throw refining scrap gold and using extracted in manufacturing gold jewelry to enhance the quality of product.

Some issues should be followed to increase monitoring over gold jewelry stores:-

• Calibration of balances are used by specialized authorities or specialized companies of inspection and standardizations periodically.

• Increasing awareness to consumers about how purchasing maintaining gold jewelry.

• Increasing customer awareness about Hallmarking.

* Gold Bullions Trade

• Based on questionnaire in this research majority of respondents think workers need more qualifying and monitoring ,To achieve this point laboratory workers can be attended to training courses in how using XRF instruments and fire assay (Cupellation Method) and giving them practice profession certificate.

• Increasing Monitoring over gold bullions laboratories periodically to ensure the they satisfying technical requirements.

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Appendix

Sudan University of Science and Technology

College of Graduate Studies

Total Quality & Excellence Center

Questionnaire

(Gold Bullions)

Mr. /…………………………..

Introduction

The Questionnaire represents a part of a field study conducted by a researcher to complement the requirements for obtaining a Master's Degree in **Total Quality Management** entitled **(Study Of gold Traders' And Consumers Behaviors & Impact of Technical Analysis in Gold Trade)**, where the research aims to improve, organizing and quality of gold trade and the process of technical analysis of gold in the local market..

So your participation and contribution has a great importance and esteem, and active participation in answering questions from the questionnaire attached objectively considers from most important success factors and certified the results, We would like to point out that the study takes the character of scientific research only and all information is treated confidentially.

`

Personal Data:

Gender:

Male ☐

Female ☐

Age:

Less than 30 year ☐   from 30-40 year ☐   from 41-50 year ☐   from 51-60 year ☐
More than 60 year ☐

Education:

Secondary ☐   Diploma ☐   Bachelor ☐   Master ☐   Ph.D. ☐
Other ☐

Years of trading gold:

Less than 5 years ☐   from 5 to 10 years ☐   from 11 to 15 year ☐

from 16 to 20 year ☐   from 21 to 25 year ☐   More than 25 year ☐

	Statement	Agree	Disagree	I don't know
1	Purity a highly important when buying or selling gold bullions			
2	Preferably determine the purity of gold bullion by using X-ray instruments (laser) and that due to speed.			
3	The identification of gold bullions by using X-ray devices (laser) refers to accuracy.			
4	The identification of gold bullions by using chemical analysis refers to speed.			
5	Preferably determine the purity of gold bullion by using chemical analysis and that due to accuracy.			
6	When buying gold bars(known purity) there's no technical analysis is performed but depending on trust from seller			
7	You can buy gold bullion by inference, given only to determine carat gold			
8	There is apprehensive when buying or selling gold bullions can result from invalidity of purity			
9	Workers in Laboratories in the local market need more control and rehabilitation			
10	Laboratories in the local market need more organizing and supervision			

Sudan University of Science and Technology

College of Graduate Studies

Total Quality & Excellence Center

Questionnaire

(Gold Jewelry)

Ms. /……………………………………..

Introduction

The Questionnaire represents a part of a field study conducted by a researcher to complement the requirements for obtaining a Master's Degree in **Total Quality Management** entitled **(Study Of gold Traders' And Consumers Behaviors & Impact of Technical Analysis in Gold Trade)**, where the research aims to improve, organizing and quality of gold trade and the process of technical analysis of gold in the local market. So your participation and contribution has a great importance and esteem, and active participation in answering questions from the questionnaire attached objectively considers from most important success factors and certified the results, we would like to point out that the study takes the character of scientific research only and all information is treated confidentially.

Personal Data:

Gender:

Male ☐

Female ☐

Age:

Less than 30 year ☐   from 30-40 year ☐   from 41-50 year ☐   from 51-60 year ☐
More than 60 year ☐

Education:

Secondary ☐   Diploma ☐   Bachelors ☐   Master ☐   Ph.D. ☐
Other ☐

Years of buying or selling the gold jewelry:

Less than 5 years ☐   from 5 to 10 years ☐   from 11 to 15 year ☐

from 16 to 20 year ☐   from 21 to 25 year ☐   More than 25 year ☐

	Statement	Agree	Disagree	Don't Know
1	The purpose of buying gold jewelry is personal use			
2	The purpose of buying gold jewelry is saving money			
3	Purity a highly important when buying gold jewellry			
4	Gold jewerly can be defined throw Hallmarking			
5	Or gold jewerly can be defined throw trust from the seeler			
6	The gold jewelry manufactured externally is prefered due to shape and design			
7	There is apprehensive when buying gold jewelry can results from non-validity of purity			
8	Reselling used jewrely gold is considered unsatisfactory in the lcoal market			

جامعة السودان للعلوم والتكنلوجيا

كلية الدراسات العليا

مركز الجودة الشاملة والتميز

السيد / .... (سبائك الذهب)

الموضوع :استمارة استبانة

تمثل هذه الاستبانة جزءا من دراسة ميدانية يجريها الباحث استكمالا لمتطلبات الحصول علي درجة الماجستير في الجودة الشاملة و التميز المؤسسي بعنوان ،(دراسة السوق المحلي للذهب و أثر عملية التحليل التقني للذهب في عمليات البيع والشراء). حيث يهدف البحث الي تحسين وتنظيم وجودة تجارة الذهب وعملية التحليل التقني للذهب في السوق المحلي .

لذا فان استبيانكم والمساهمة معنا ذو اهمية بالغة وتقدير عظيم ، وان مشاركتكم الفعالة والاجابة عن اسئلة الاستبانة المرفقة بموضوعية من اهم عوامل نجاح الدراسة وصدق نتائجها ، علما بأن الدراسة تأخذ طابع البحث العلمي فقط وان جميع المعلومات يتم التعامل معها بسرية تامة .

ولكم مني فائق الاحترام والتقدير ،،،

الباحث :

محمد سيد هارون عبدالكريم

Mobile No.: 0912224591

Email: m.shadad88@hotmail.com

- نرجو التكرم بوضع علامة ($\sqrt{}$) امام مستوي الموافقة المناسب .

القسم الاول: البيانات الشخصية :-

1/ الجنس:

ذكر ☐   أنثي ☐

2/ العمر :

اقل من 30 سنة ☐   من 30-40 سنة ☐   41 – 50 سنة ☐

من 51- 60سنة ☐   اكثر من 60 سنة ☐

3/ المؤهل العلمي :

ثانوي ☐   بكالوريوس ☐   دبلوم عالي ☐   ماجستير ☐   دكتوراة ☐

أخري ....

4/ سنوات نشاط تجارة الذهب :

اقل من 5 سنوات ☐   من 5-10 سنوات ☐   11-15 سنة ☐

من 16-20 سنة ☐   من 21 الي 25 سنة ☐   اكثر من 25 سنة ☐

القسم الثاني : عبارت الاستبانة :-

لا أدري	لا أوافق	أوافق	البيان	الرقم
			يعتبر العيار ذو اهمية عالية عند شراء او بيع سبائك الذهب.	**1**
			يفضل تحديد عيار سبائك الذهب باستخدام اجهزة الاشعة السينية (الليزر) وذلك نسبة للسرعة	**2**
			يعتبر تحديد عيار سبائك الذهب باستخدام اجهزة الاشعة السينية (الليزر) وذلك نسبة للدقة .	**3**
			يفضل تحديد عيار سبائك الذهب باستخدام التحليل الكيميائي هو الافضل وذلك نسبة للدقة .	**4**
			يعتبر تحديد عيار سبائك الذهب باستخدام التحليل الكيميائي وذلك نسبة للسرعة.	**5**
			يمكن شراء سبائك الذهب بالاستدلال بالنظر فقط لتحديد عيار الذهب.	**6**
			عند الشراء لا يتم تحليل السبائك المعلومة العيار وانما الاعتماد فقط علي الثقة من البائع.	**7**
			هنالك تخوف عند شراء او بيع سبائك الذهب ناتج من عدم صحة العيار (نقاوة الذهب).	**8**
			العاملين بمعامل تحليل الذهب بالسوق المحلي يحتاجون الي التأهيل والرقابة أكثر.	**9**
			معامل تحليل سبائك الذهب في السوق المحلي تحتاج الي الرقابة والتنظيم اكثر.	**10**

أي اقتراحات أخري

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وشكرا علي مشاركتكم ،،،،،،،،

السيد / ....   **(ذهب المجوهرات)**

الموضوع :استمارة استبانة

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أخري........................

4/ سنوات نشاط شراء او بيع ذهب المجوهرات :

اقل من 5 سنوات ☐   من 5-10 سنوات ☐   11-15 سنة ☐

من 16-20 سنة ☐   من 21 الي 25 سنة   اكثر من 25 سنة ☐

القسم الثاني: عبارت الاستبانة:-

لا أدري	لا أوفق	أوافق	البيان	الرقم
			الغرض من شراء ذهب المجوهرات هو الاستخدام الشخصي	1
			الغرض من شراء ذهب المجوهرات هو حفظ المال	2
			تعتبر صحة العيار (نقاوة الذهب) مهمة عند شراء ذهب المجوهرات	3
			يتم الاستدلال علي العيار (نقاوة الذهب) من خلال الترميز او الختم	4
			أو يتم الاستدلال علي عيار الزهب من خلال الثقة من البائع	5
			يفضل ذهب المجوهرات المصنع خارجيا وذلك نسبة التصميم او الشكل	6
			هنالك تخوف عند شراء ذهب المجوهرات ناتج من عدم صحة العيار او عدم النقاوة	7
			تعتبر عملية بيع الذهب المستعمل (الكسر) غير مرضية في السوق المحلي	8

اي اقتراحات اخري

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شكرا علي تعاونكم ،،،،،،
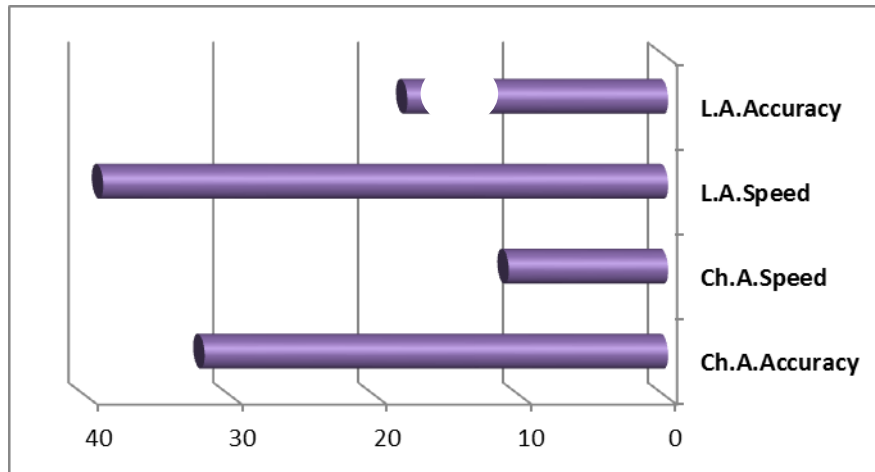
Figure (15) various analysis methods are preferred by respondents in terms of Speed and accuracy.

L.A.Acuuracy:Laser: Analysis in terms of Accuracy.

L.A.Speed:chemical:analysis in terms of Speed.

Ch.A.Speed Chemical: Analysis in terms of Speed.

Ch.A.Accuracy Chemical: Analysis in terms of Accuracy.

Figure (15) shows various analysis methods to determine the purity or fineness of gold bullions in the local market. The figure shows that the majority prefer analysis by using X-rays fluorescence instruments due to its high speed compared to chemical analysis(fire assay or cupellation).As for accuracy the chemical analysis has majority agreement by the respondents compared to analysis by using laser(X-rays fluorescence instruments).

Technically the results are true but the accuracy also important especially in the large weights of gold bullions and that will be clear in the laboratory experiments.

Figure ( ) below clarifies sequence of processes at stamp & jewelry department (Sudanese Standards and Metrology Organization)