

The Key Factors affecting Design and Structural Technology for the Efficiency of Clay Cooking Pots: Special Reference to Culinary Item "Hattiya"

Ranasinghe W.M.N.D,

Department of Integrated Design, Faculty of Architecture, University of Moratuwa
wmndr@yahoo.com

Abstract

Water, fire, air, earth and space are the basic natural elements in the planet. The processes of clay ware manufacturing can be described as a result of the above mentioned elements. At the beginning clay was used as a material to create figures and sculptures rather than manufacturing objects. Sri Lanka is famous for the pottery industry from beginning of the civilization and it has a great history. Gradually it was developed as a cottage level industry. It can be identified as a knowledge transferring craft from generation to generation. However, with the passage of time clay culinary items became less popular. It has been found that they have not been paid proper attention and concern about the design. It is not updated to cater the present social context. The main objective of this research is to explore key factors to uplift the culinary product in Sri Lanka. It has been inspired to conduct this research; otherwise it will become a dying traditional craft in Sri Lanka.

This research followed the quantitative and qualitative research methods. The required data were collected through an extensive literature survey, case study use of different types of Hattiya and structured questionnaires given to the urban and rural consumers in selected areas.

The result of the data analysis reveals that there are five key factors affecting the design and technology of Hattiya. The main findings of this research show that the key factors such as shape and form, texture, value, proportion and balance are needed to be considered when designing and manufacturing clay cooking pots.

Keywords: Design, Technology, Manufacturing, Efficiency, Culinary

0.1 Introduction

Man is a distinctive creation of nature and he has marvelous talents for creativity. When people became modern, their needs also got changed and complicated. They tried to find new techniques and new objects for a sophisticated life style. Most of the objects were produced considering functional usage and design aspects. Therefore new methods and new technologies were adapted to suit their life style. This was done by using their creative abilities and talents. New ways for producing objects for daily needs were developed through many experiments and experiences. As a result of their numerous experiments, clay was identified as a quality and a flexible material which can be used to produce objects. The art of ceramics is one of the oldest known, dating to prehistoric times. Clay is a special kind of earth, found all over the world that is easily worked when moistened, but can be hardened and made waterproof by exposure to heat. The earliest forms of construction were pinched that is, the clay is formed with the fingers to the desired shape (Jirousek, 1995).

Clay is an available material on the earth, which is soft and flexible to the hand, when hold a lump of it. When it is pinched and pressed it takes shape; almost by it self. This piece of earth gets life of its own when touched with fingers. It changes the behaviors when mixed with water and fire. Using their experience, people tried to make different objects out of clay. Most of the designs were simple and creative. Functionality was the main aspect of the products which were designed by people. Because most clay is plastic; it can be shaped and formed and will retain that

from when dried. Another principle is that fire hardens clay. A third is that adding various substances to clay can improve its properties and usefulness (Rice 1987).

People tried to make new utensils by doing experiments and using different types of materials. It was a case of trial and error. Natural resources could not fulfill their daily requirements. For example, they needed storage facilities to gather and to prepare foods. Clay was identified as a material to create utensils and objects. At the beginning people used less sophisticated pots to cater to their needs. Earlier the product was manufactured to satisfy people's personal needs, or as a service, but with the passage of time objective of the manufacturers have changed and it has now become a paid work. The changes of the society, culture, and living pattern and human needs, have been the concern factors in this innovation. With the passage of time clay culinary products became less popular because they did not pay proper attention and concern about the design. It is not updated to cater present social needs; they are not in good condition for the product functionality rather than the previously used products. This research tries to identify key factors to uplift the culinary products.

0.2 Literature Review

Three areas such as the literary sources, archeological remains and the current usage of the prevailing tradition can be explored in order to understand the chronology of the local pottery production and usage. As a result of the archeological investigation carried out in the country it has been reported that the pottery chronology from 900 BCE up to the present (De Silva and Dissanayake, 2008). Somadewa (2006) indicates a continuity of the pottery using cultural occupation of the area from 900 BCE to 1400 CE. Traditional clay cooking pots were designed to cater their day today needs because they were designing their own products. Due to this they had a good knowledge and experience about how it needs to be designed and changed.

Among the existing products veddas' pots can be identified as good products that are designed out of basic considerations. Designs were in a primary level as they only wanted to fulfill their basic requirements and aesthetic values. This led to new experiments and innovations widening the scope for multidisciplinary usage. They developed their creativity and talent of pottery manufacturing processes according to their experience and experimentations. Vedda makes very rough pots (Seligmann and Seligmann, 1993). These pots have a small unfinished orifice, the special character is that they used a loop for hanging the pots. These were used to collect honey. Vedda used simple decorations to make the product attractive.

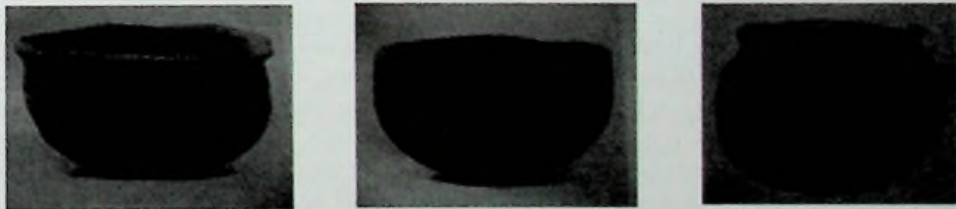


Figure 1: Development stage of "Hattiya"
 Source: (Seligmann and Seligmann ,1993 p.328)

The potter served the people and performed an important function in all period of the evolution of Sri Lankan society. Starting from the pre-historic time the use of pottery has been attested in the earliest stage of the appearance of our ancestors thousands of years before recorded history. Along with implements of hunting and food gathering earthenware have been used for storing, cooking and eating purposes (Tilakasiri, 1994).

2.1 About Earthenware Products

According to the excavators the first evidence of Sri Lanka crude earthenware (red brown ware) association with stone tools (De Silva and Dissanayake, 2008) can be identified the origin of the local earthenware goes reverse towards period of hunter gather of the Sri Lanka. Earthenware is the stage of development of a terracotta (750°C – 850°C) body. It can be grouped under two types such as low temperature earthenware and high temperature earthenware. Low temperature earthenware is fired at around 750°C -1000°C, and exact type can be identified from the colour of the body and the strength. Most of the culinary items, water containers and pans can be categorized under the low temperature products. It has the quality of water absorption (porous body) and also less heat resistance. Tilakasiri (1994) stated that Earthenware clay is the common red clay found in nature and mixed with sand and grit, mainly used for making bricks and tiles, the subsequent dirt –free layers of clay being used for making pottery (p.48). Earthenware clay which contains stones and sand compounds is not good to produce clay cooking pots, it should be a fine and a clean clay compound. According to De Silva and Dissanayake (2008), “The production of pots and pans in Sri Lanka was a well established craft which continued for the last 4000 years, little mention was found in literal sources, yet archaeological excavation carried out in different parts of the island has provided sufficient information to understand the quality and the method of production , art, form, typology, distribution, usage, trade and technology of production of pottery during different periods of Sri Lankan history”(p.12).

Cooking pots and pans can be categorized under the domestic products. Domestic products are generally used in the kitchen. Cooking pots can be divided into three main categories according to the purpose of the usage, as these products can be used for several purposes. It is one of the special features of earthenware culinary products. Ceramic vessels have served a variety of culinary and non-culinary purposes for ten thousand years or so, but in domestic and culinary roles they were used for carrying liquids, storing dry substances, or heating contents over a fire. Each use places different demand on the vessels, and so it is suitability for a particular task on its design (Rice, 1987). Earthenware products are used for various functions in the kitchen. Rice (1987) stated that according to their function, domestic containers can be categorized as follows:

1. Processing Products
2. Transport Products
3. Storage products

2.2 The purpose of Earthenware Processing Products

Processing products are more important than the transport and storage products. This is due to the (preparation products) same products are used for transportation and storage purposes. Processing objects are mainly based on the purpose of heating and non-heating method. Boiling, steaming, frying, roasting can be identified under the heating method and mixing, washing, soaking, pounding; removing can be categorized under the non-heating system. One product can be used for several purposes. It is a special feature of clay vessels. Some of the vessel forms are used for these functions and are expected to get the maximum use of the heat from the fire. They are generally likely to have a round shape rather than angled to avoid the thermal shock. In addition round contours permit greater exposure of the vessel's base, walls and content to the heat.

The shape of orifice is very important to the processing objects and their functions. Vessels can be named as unrestricted and restricted orifices. Unrestricted orifices (open lip) help adding and removing food, but slightly constricted vessels which have narrow necks would prevent overcook of food by reducing evaporation. Vessels used for simmering or frying may be more open and have slightly flat bases. “*Flattiya*”, consists of a wide mouth with unrestricted orifices, wide body and flat or round base. Cooking pots have a grip to hang or for carrying purposes.

Thickness of the vessel is an important fact for the purpose of processing. Thick wall makes the clay vessels strong, so that pounding, stirring or mixing food in them can be done properly and easily. Thickness of the rim helps to hang the object properly and also it can be a disadvantage for cooking, as it would pave the way to waste fuel by taking long time for cooking food.

0.3 Research Methodology

This research is carried out by literature review and case study in order to understand present clay "Hattiya". Three sizes of "Hattiya" will be used to observe its importance, drawbacks and developments. The following areas which are famous for earthenware cooking pots have been used in this study. From Kandy District: Menikhinna, Urispaththuwa, Wattegama, from Kurunegala District: Abagaswewa, Paduwasnuwara, from Rathnapura District: Eheliyagoda, Nakandala, Gampaha District: Biyagama, Kegalle District: Molagoda. Questionnaire survey is used to identify the current situation and development of the product. It will be helpful to identify consumers' experiences and to obtain their valid opinions regarding the development of clay pots. Open ended questionnaire surveys were carried out with consumers in rural and urban areas such as Kandy and Colombo because they have a trend to use clay pots and still the traditional cooking methods are followed in rural areas.

0.4 Results and discussion

4.1 Results and discussion of the case study: Introduction about "Hattiya"

There are six type of "Hattiya" used in present society. These objects are used to get a clear idea about products and its functionality through consumers and manufactures.

4.1.1 Identification of "Hattiya"

"Hattiya" can be described as an important culinary product. De Silva and Dissanayake (2008) explained that "General terms under for vessel are "Valam" or "Hatti", "Mutti" (p.20). Coomaraswamy (1979) stated that generic terms for vessels are "Heliya" and "Valada". Yet the term "Helivalam" measures four pieces used to cook a rice meal which are namely "Muttiya", "Heliya", "Hattiya" and "Nebiliya". There are several sizes of "Hattiya's" in use as of today, and size differences can be identified from province to province. They varied in size, functional features and aesthetical aspects. "Hattiya" is also called as "Athiliya". This also differs according to the province. In Southern Province a larger "Hattiya" is known as "Athiliya". Yet in the Central Province, "Athiliya" is identified as a small "Hattiya". It is shorter than the "Hattiya". "Appallaya" and "Haliya" are the other terms for "Hattiya". In the past, the "Hattiya" was known as "Appalla" in the Central part of Sri Lanka. "Haliya" and the "Hattiya" are called as an "Athiliya" in Southern Province. Pottery sellers say that people come and ask for "Podi Athili" and "Loku Hatti". "Hattiya" is more spacious and normally used to prepare curries with gravy. It is bigger than the "Athiliya". It is a simple restricted vessel with composite contours. This vessel is shallower than "Athiliya" but some types are deeper than "Athiliya". It has a convex spherical body and this helps to boil and mix curries properly. The round body helps to take the contents out with a spoon. The orifice or the lip has a greater thickness but thickness is gradually reduced at the bottom. The bottom is not round but it has an angular shape. Occasionally the top of the outside surface is adorned with simple decorations.



Figure 2: A "Hattiya"



Figure 3: A "Kundabhattiya"

"Kunda Hattiya" is another version of the "Hattiya" which seems as "Athiliya" and currently it is rarely used in practice. This is more spacious and normally used to prepare big curries with gravy. "Hattiya" is also used as a container to set the curd. Before introducing the machine made curd pot "Muttiya", "Kunda Hattiya" and "Athiliya" were used to prepare the curd. Clay body has a quality to set the curd. It helps to absorb the water content from the curd because of the quality of porosity. "Hattiya" is used as long term storage for the curd processes; and is called "Kiri Hattiya". Man made clay pots take the shape gradually reducing the wall thicknesses from orifice to base. It helps for heat absorption and fixes clay particles as a bond.

"Hattiya" is used as long term storage and also for the short term usage. When preparing "Malu Ambulthiyal", "Hattiya" is used as long term storage until the fish pieces become seasoned. It provides a good smell and a good taste for the curry. "Hattiya" was in a good standard which had quality and functionality. Gradually the qualities of the product were decreasing because of the arrival of other alternative products. "Hattiya" is produced using a potter's wheel, and a symmetrical form.

"Hattiya" can be described as a product which is developed during the process of manufacturing the "Muttiya". Globular shape is a steady structure which controls the volume of a liquid. Usually the shape of a product provides safety, and gives an aesthetical appearance despite the different forms that it gets restricted or unrestricted. It promotes the concept of well packing item too. Although the shape of the "Hattiya" maintained its standards such as proper size and etc. at the beginning, qualities like proper design and the functionality were not paid much attention.

Presently "Hattiya" comes in six sizes and lid comes in four sizes. The size of the "Hattiya" is designed according to the family size. Nowadays families are consisted of less number of members such as two or three. Therefore, the size of the product also has been changed to facilitate their needs. There were ten or twelve members in one family in the past and they had to use larger size culinary products. When comparing small and large sizes of "Hattiya", small "Hattiya" has less design qualities as they have a good market for small size products. They have time to pay more attention on the objects with larger sizes. Although functionality is an important aspect of products, people did not consider much about it. Hence problems related to the functionality arise when the products are being used. This drawback makes consumers unhappy and disappointed about clay products.

4.1.2 Characteristics of "Hattiya"

The size varies in height and width of the object. Their orifices, bellies and base segments have slight differences, but more differences can be seen in angle, thickness and shape of the base. Sometimes the shape and the proportion of the "Hattiya" vary from place to place. As mentioned above, "Hattiya" can be classified into six groups and it is common for all areas. From area to area the size variation can be in between 1cm and 1.5 cm. It is totally neglected here and the main value of the product is taken into consideration. The length and width are used to take the mean value. There are no significant differences in shape and form of the product in different areas.

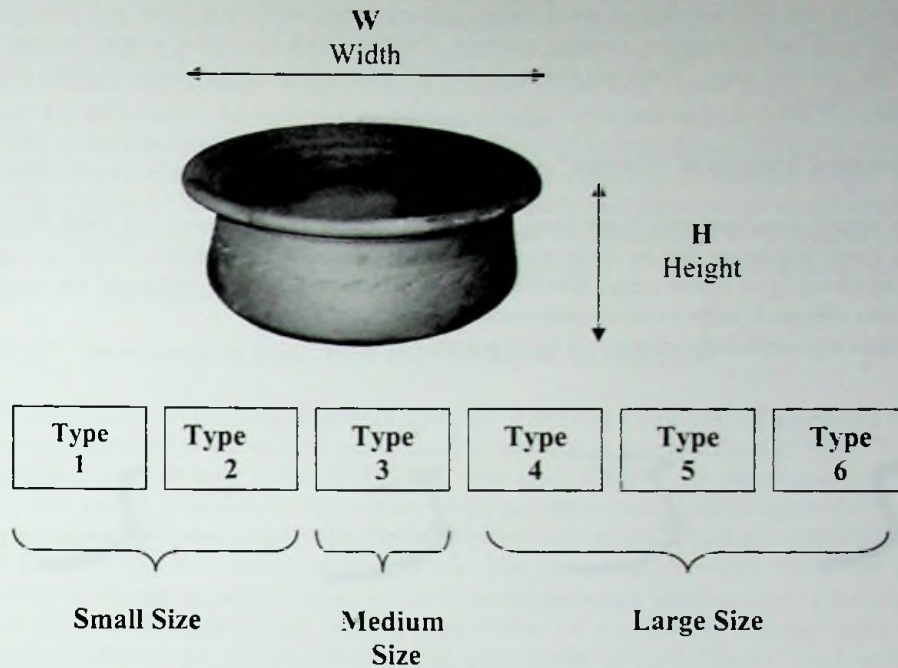


Figure 4: Size Variations of Present "Hattiya"

There are three types of "Hattiya" (Type-1, 2, 3) which can be used to prepare curries for day-to-day needs, and the other three are used in special occasions (for large preparations). Small objects are of less quality but large "Hattiya" are of good quality. As a result, small pots can be sold quickly but it takes time to sell large pots. Manufacturers have to pay more attention when producing large "Hattiya". This improves the quality of the product. They produce small "Hattiya" quickly, without considering product efficiency or functionality of the product. This would reduce the usage of earthenware products.

As a structural quality product proportion can be identified as a compulsory aspect of the production processes. Proportion refers to the relative size and scale of the various elements in design (Park, 2010). Product balance is always combined with the proportion visual weight helps to give first impression about the product. There are two types of balances as, symmetrical and asymmetrical balance. Balance gives a feeling of stability. Most of the earthenware products have center points because most of them are created using a potter's wheel. Vessels have a radial balance. Asymmetrical balance creates a feeling of equal weight on both sides, even though the sides do not look the same. Asymmetrical designs also are called informal designs because they suggest movement and spontaneity.

Product shape and form full fill the main features of product functionality. Much more limitations need to be obtained when designing a product, because it has technical and material limitations. Angular shapes placed diagonally in relation to gravity suggest in stability and shapes that exhibit softly curving surfaces suggest quite comfort and sensuality (Jirousek, 1995). Shapes of circle suggest infinity and it gives a feeling of protection. As an example most of the domestic products basically get circular shapes and finally they take spherical forms. Therefore cooking pots contain a feeling of protection and infinity. Surface texture is important to increase the heat absorption, Skibo, Walker & Nielsen (1995) stated that, exterior texture improves a vessel's heating effectiveness by increasing the exterior surface area and textured exterior surface also improve a pot's resistance to thermal crack. The body thickness of the bottom part of the vessel should be reduced gradually if not it will affect to have a bottom crack. Rather than that textural surface creates a grip between the clay surface and the hand. When concerning about the validity

of the product it can be identified as social value, cultural value, aesthetical value and physical value. A quality of heat absorption ,cooling, porosity, thermal shock resistance, weight are main qualities of the physical value. These are the main considerations that can be identified from the current usage "*Hattiya*".

4.1.3 Structural Analysis of "*Hattiya*"

Clay pot is mainly consisted with three parts, Orifice, Belly and Base. Concerning these three elements is a very important fact to create a completed product. The body shape of "*Hattiya*" is developed by changing of corner point. When corner point varies, the overall shape and the form of the pot also change. It helps to create unrestricted or restricted shapes. Following drawings explain the changes of bend points;



Figure 5: Bend point Changes and structural development of the "*Hattiya*"

Bend point has a direct effect to change the product when profile. Generally the bend point of the "*Muttiya*" is in the upper part of the vessel structure when "*Hattiya*" is made. The lower part of the body gets a spherical shape with a big volume. When the bend point moves to the lower part of the vessel structure the mouth of the pot becomes wider and height becomes lesser than the "*Muttiya*". That profile is identified as a "*Hattiya*". This is shown from the drawings. Changing the bend point has an effect on the use of the product and product functionally.

The structure of the "*Hattiya*" can be divided in to two parts as the upper part and the lower part. A vertical view of the exterior can be divided in to four parts. $\frac{1}{4}$ of the height (from the bottom) can be identified as the lower part while the upper part accounts for $\frac{3}{4}$ (three quarters). The upper part consists of an orifice, belly and the lower part consists of a base.

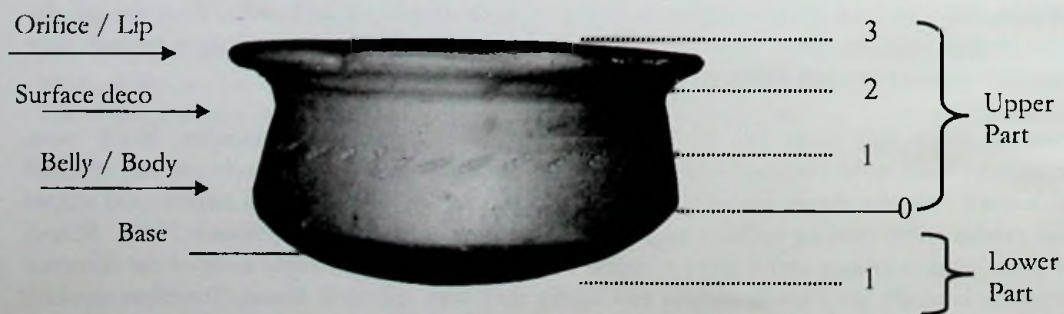


Figure 6: Upper Part & Lower Part of the "*Hattiya*"

The upper part of the vessel needs more functional characteristics than the lower part of the vessel. Mostly upper part of the vessel indicates the functional and stylistic characteristic of a pottery vessel (De Silva & Dissanayake, 2008). The orifice, the belly and the base are important for product functionality. A structure of a vessel might look simple but it consists of angles, curves, and corners. All body shapes need to address functional requirements. Ceramic products have numerous limitations. They cannot be created in several shapes. When developing vessel shapes, much attention has to be paid to the wall thickness and the product weight. The weight of the clay vessel is important to handle the object easily and thickness has an effect on water and heat absorption of the clay vessels. All body shapes and forms have to be created according to the usage of a product. These facts can be identified as main considerable factors when manufacturing clay vessels.

4.1.4 Importance of Body, Base and Stability of the "Hattiya"

Body and base are the other important elements of the vessel structure. The area of a vessel body can be identified as the area of orifice to base, and also it can be termed as belly. "Hattiya" has different types of body shapes but they all look alike. Vessel body has a volume. Traditionally outside surface is used to do decorations. In the past there were valuable decorations and designs created on top of the surface. When it is compared with present situations, design had been used for the surface decorations, which did not have any value. However there was a precious tradition. People did not pay much attention to the aesthetical pleasing of the products. It is one of the main features of clay cooking pots. There are six sizes of "Hattiya" used in current situation. Potters pay less attention to finish and decorate to small "Hattiya", because they can be sold faster than the large "Hattiya", with a short period. Therefore they do not bother to finish and create designs on them. They spend much time to finish and decorate large "Hattiya" consequently large pots are rich with design qualities and aesthetical values. People have the talent to create good products but they do not consider these factors.

Surface decoration gives the first impression of the product, because the aesthetical appearance is also important as the product functionality. Earthenware clay pots can have smooth or rough textured surfaces. There is a possibility of cracking the pots which have smooth surface during the process of firing. Thickness of the clay body (clay compound) provides a cooling effect for the inside surface, as it is an important aspect of the clay vessels. It facilitates the quality of warmth and the coolness of the product.

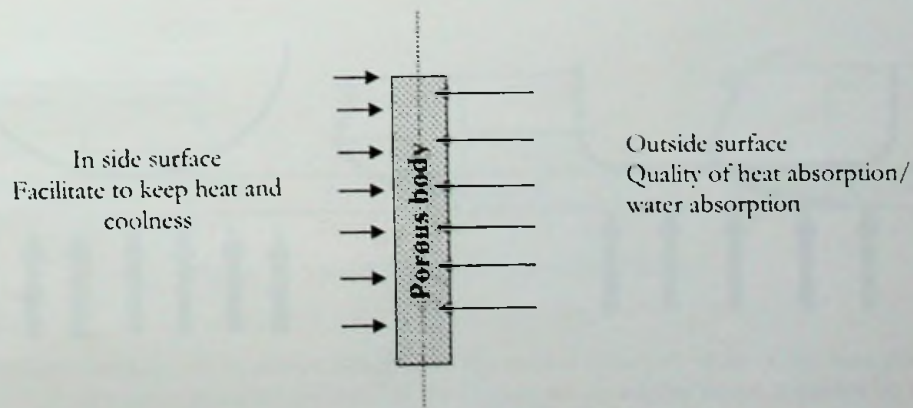


Figure 7: Section of a clay body

Body of the "Hattiya" is always fixed with the orifice and the base. Base is also an important part of the clay vessel. Wheel throwing product mostly gets a round base because the bottom part of the object is done manually. Base directly affects the product stability. The shape of the bottom and the thickness are important for handling and staking the object. Body thickness is important for cooking purpose and should not be a thin surface. Different parts of the body need to have

different thicknesses. Center of gravity of the "Hattiya" is an important factor for staking objects and keeping them on the hearth. It helps to handle the product in a proper manner, with ample confidence.

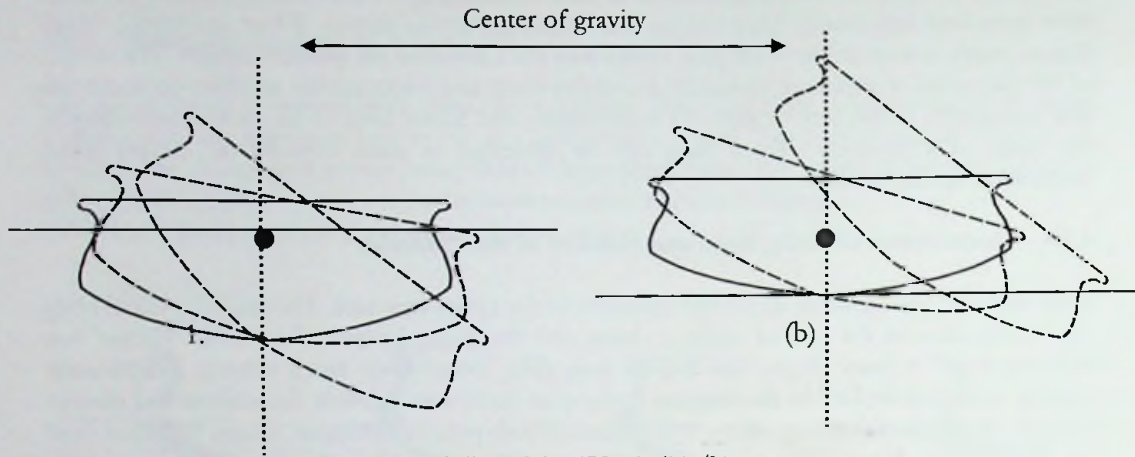
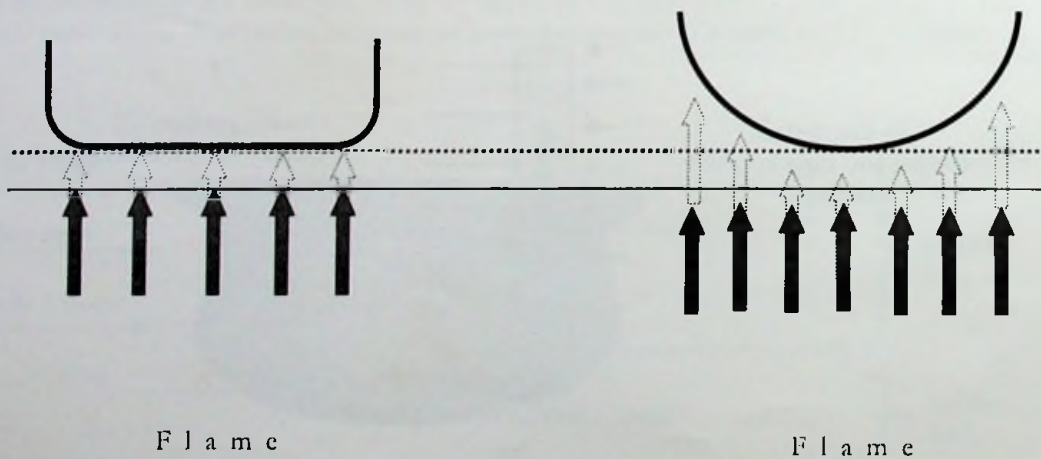


Figure 8: Stability of the "Hattiya" (a/b)

"Hattiya" cannot be kept on a flat surface as it has a curved base. De Silva and Dissanayake (2008) stated that the majority of cooking vessels are sphere shaped. These vessels have a large basal surface that helps to transfer heat to a greater extent. They are short and squat. Most of the earthenware cooking pots consist of a round base. A round base is good as it absorbs heat gradually.

Heat absorption is faster than the round base but makes the food dried easily.

Round base is important for



F l a m e

F l a m e

Figure 9: Variety of Base Shapes and heat absorption

Round base has an advantage, as the round surface is movable or rotatable unlike the flat base. Flat base can be damaged easily when rotating the object, because of straight angles of the base. It is an advantage of the "Hattiya". The round base is difficult to be kept on a flat base. Although it is a disadvantage, people have overcome these difficulties as they have developed and found innovative solutions to them. They use a "Daranawa" which should be less harder than the clay body to obtain the product stability

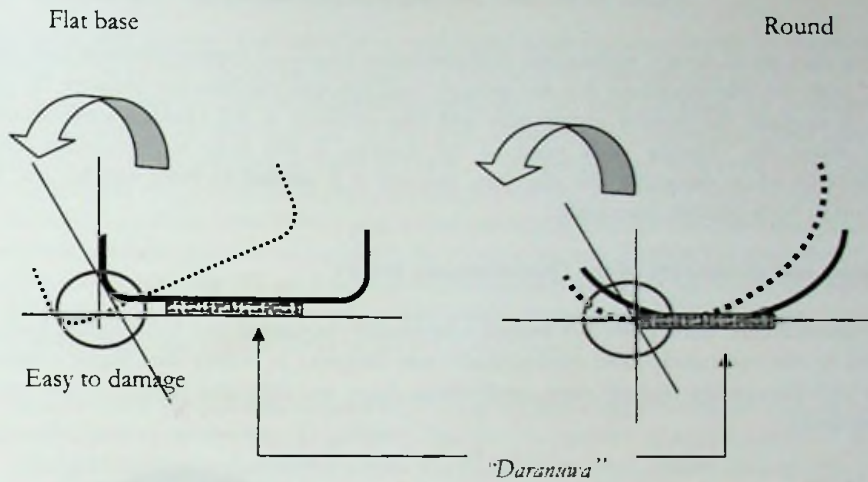


Figure 10 : Use of "Daranawa"

Cleanliness and maintenance are very important for culinary products, as they should be kept clean and hygienic. Therefore, shape and form of the product should get more attention as those two factors are very important in cleaning products. "Hattiya" has a round base and the round base is easy to clean. There have been some textured which gets corner points and get the restricted form with deep curve it makes a space to deposit food particles and cleaning difficulties. Thus, it is a considerable point when designing the clay cooking pots.

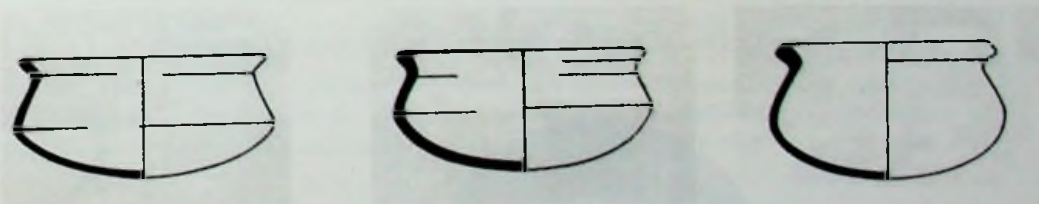


Figure 11: Variety of Base Shapes of the "Hattiya"

Several types of base shapes can be identified in the present "Hattiya". Most of the base shapes do not consider the usage of the product. If the product has an angular shape, it cannot be kept on the gas hearth. It can be identified as a disadvantage of the product.

Base is also important to the product stability. When staking, "Hattiya" has to be kept upside down, as the orifice can easily rests on the round base. It helps to remove the extra water inside the surface and also the product transportation. It is easy to stack one by one. When transporting "Hattiya" people use rush and reed in between the products to protect them from damages.

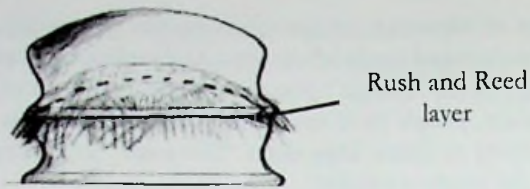


Figure 12: Product Stacking when Transporting

Collecting data about design, techniques, manufacturing processes, current situation and value of the clay pots are investigations for the pottery tradition and earthenware industry. It will be helpful to upgrade the pottery community and clay products in Sri Lanka. Identification and analysis about the "Hattiya" is a need of the society. It will help to understand the key considerations when designing the clay pot, because it is needed to carry out for the future generation to keep product standards.

4.2 Results and discussion of the Questionnaire survey

For the questionnaire survey five key factors were mainly considered and these factors have been identified by the case study. The questionnaire was designed to collect data about consumers' opinion with concerning texture, value, proportion, shape and form and balance of the currently using products.

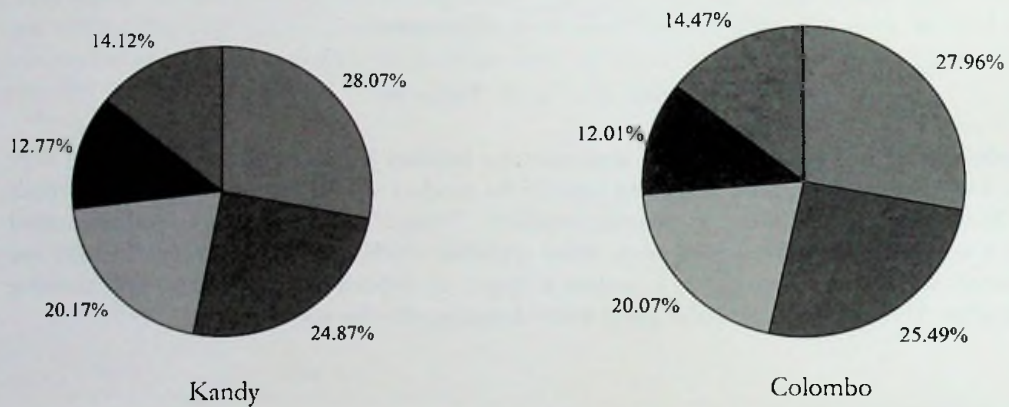


Figure 13: Data of Key Factors of the Survey Kandy & Colombo

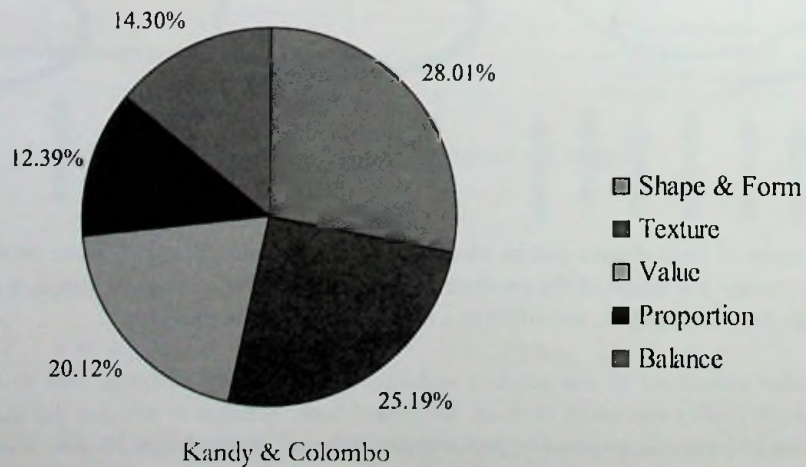


Figure 14: Data of Key Factors of the Survey

Above pie-chart shows the importance of the factors with regard to the selected sample ("Hattiya"). In the rating, people of Kandy and Colombo have given similar ratings. Throughout the research, several types of vital facts could be identified to develop the current clay pot ("Hattiya"). There are much more limitations and technical obstacles behind that processes. Five key factors discriminate as the major findings of the research in order to develop shape and form, texture, value, balance and proportion.

0.5 Conclusions and Recommendations

"Earthenware clay cooking pots" have been used as the main cooking utensils in traditional ways of cooking in Sri Lanka. Therefore, they played a huge role in conventional methods of cooking. As clay is an eco friendly material, it is undisputable that clay pots are good for preparing food. They are well known for their hygienic quality, too. However, it is understood that present clay products are not in the position to cater to needs of the people due to several drawbacks. This situation has made the people use alternative products for preparation of food particularly. It has been further revealed that these factors play a vital role and if they are not considered much there will be a failure of the earthenware vessels in the modern society. Despite the attraction for other alternative products people still prefer clay products, as they are good for health and also can be used for a prolonged period. However, people always expect high quality clay products which come in good shape and form in order to use them with ease.

Hence, this research has made an attempt to identify the prevailing situation of clay cooking pots and possible ways of developing the industry. The specific features of selected product that have to be developed to achieve the aim have been identified. It has been proved through this research that shape, form, texture, balance and value are the most considerable aspects of a product. Although "Hattiya" is in much use, it needs further improvements, taking shape, form, texture, balance and value as its key considerations to achieve design efficiency. The shape, form, texture, value and the balance are considerable key factors for a designer who needs to make a marketable earthenware cooking product. It has been proved that these key considerations are common to all the earthenware cooking pots and need much attention in developing the product further. These criteria can be used to improve the quality of earthenware clay cooking pots. It will make people appreciate and adore clay products immensely.

0.6 Future research

In this research, key components which are required to develop clay cooking pots according to the function of them have been identified. Nevertheless, future studies are necessary to identify how these key factors can be developed to increase product's functionality. Apart from this, further studies can be continued on body composition, manufacturing methods and technological development of clay products. They are invaluable in developing earthenware clay cooking pots and also to reestablish the earthenware industry in Sri Lanka.

References

- Coomaraswamy, A.K. (1979). *MEDLAEVIAL SINHALESE ART*. (3rd ed). United State of America.
- De Silva, N. & Dissanayak, R.B, (2008), *A CATALOGUE OF ANCIENT POTTERY from SRI LANKA*, PGIAR Publication, First Publish, Postgraduate Institute of Archeology, University of Kelaniya, Sri Lanka.
- Jirousek, C.(1995), Art,Design and Visual Thinking. Retrieved from <http://www.char.txa.cornell.edu/media/ceramic/ceramic.htm>

- Rice, M.P. (1987). *Pottery Analysis: A Source Book*. United States of America: Chicago University Press.
- Seligman, C.G., Seligman, B.Z. (1993). *The Vedda*. Navrang, (2nd ed.), Lake house bookshop, Colombo 2.
- Somadewa, R., (2006). *Urban Origins in Southern Sri Lanka*. Uppsala. University of Uppsala.
- Thilakasiri, J. (1994). *HANDICRAFTS OF SRI LANKA*. First Publish, Ace Printing & Packaging (pvt) Ltd, Colombo 13, Sri Lanka.
- Wijesekara, N.D. (1949). *The People of Ceylon*. Colombo, M.D. Gunasena and co, Ltd.