Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City

By

S.Kavipriya

(17PIR007)

Thesis Submitted to

Avinashilingam Institute for Home Science and Higher Education for Women,

Coimbatore- 641 043

In partial fulfilment of the requirements for the degree of

Master of Science in Interior Design and Resource Management

April, 2019

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INTRODUCTION

I. INTRODUCTION

"Sacred Space is where you can find yourself again and again."

-Joseph Campbell

A house is a sacred space and a building that functions is a home. They can range from simple dwellings such as rudimentary huts of nomadic tribes and the improvised shacks in shanty towns to complex, fixed structures of wood, brick, concrete or other materials containing plumbing, ventilation, and electrical systems. Houses use a range of different roofing systems to protect from vagaries of nature such as rain from getting into the dwelling space. A house may have a backyard or front yard, which serve as additional areas where inhabitants can relax or eat (https://en.wikipedia.org/wiki/House).

Subramanian and Perumal (2001), state that the floors were most often made of rammed mud, finished oxide coating or cow dung slurry. Some of the importance of housing are it is a place of strong security. One can save his belongings and other valuables in his home. It is the safest place if it is well equipped. This help to safeguard his valuable from robbery and theft. If one is tired due to his work or other activities, he runs for his home for relief from stress. Staying at home is one of the best ways to escape from stress and anxiety. Also during retirement home is the best place to spend your time. House is a place where one can enjoy complete freedom. He lives as he likes and does what he wants. There would be no restriction inside as he is not causing trouble in society. Home is the place where one can equip maximum comforts like air conditioning, bathing, dining, bed and other comforts to a maximum level. Since it is also a permanent solution, one would be enjoying the comforts for a long time. Home is the best place for peace of mind. If one has a happy family then there would be no place other than home for complete peace of mind (https://www.mindcontroversy.com/importance-of-home/).

According to Punmia, (1993) a building has two basic parts i) sub structure or foundations ii) super structure. Sub structure or foundation is the lower portion of the building, usually located below the ground level, which transmits the loads of the super structure to the supporting soil. A foundation is therefore that part of the structure which is in direct contact with the ground to which the loads are transmitted. Super structure is that part of the structure which is above ground level, and which serves the purpose of its intended use. A part of the super structure, located between the ground level and the floor level is known as plinth. Plinth is therefore defined as the portion of the structure between the surface of the surrounding ground and surface of the floor, immediately above the ground. The level of the floor is usually known as the plinth level. The built up covered area measured at the floor level is known as plinth area. A building has the following components such as foundations, masonry units, floor structures, roof structures, doors, windows and other openings, vertical transportation structures and building finishes.

Foundation: The basic function of a foundation is to transmit the dead loads, live loads and other loads to the sub soil on which it rests. **Masonry units:** Masonry may be defined as the construction of building units bonded together with mortar. These building units, commonly known as masonry units may be stones, bricks or precast blocks. **Floor structures:** Floors are horizontal elements which divide the building into different levels for the purpose of creating more accommodation within a restricted space one above the other and provide support for the occupants, furniture and equipment of a building. **Roof structures:** A roof is the upper most part of a building. It is a covering provided on the top of the building with a view to keep out rain, snow, sun and wind and to protect the building from their adverse effects. **Doors, windows and other openings:** A door is a movable barrier in the opening of a wall, to provide access to various spaces of a building. **Vertical transportation structures:** This consists of stairs, ramps, ladders, lifts and

escalators etc to afford access between various floors. **Building finishes:** Building finishes are used to give protective covering to various building components and at the same time, they provide decorative effects.

Flooring is the general term for a permanent covering of a floor, or for the work of installing such a floor covering. Floor covering is a term to generically describe any finishing material applied over a floor structure to provide a walking surface. Both terms are used interchangeably but floor covering refers more to loose-laid materials (Meehan, 2002).

Srinivasan (1998) states that floors are the only areas that undergo the maximum wear and tear caused by man and machine. A great deal of time and effort go in the cleaning and maintenance of floors. As they are walked on continuously they may become a haven for bacterial growth if they are not maintained hygienically. Floors can be classified as hard, semi hard or soft and are available in a wide range colours, finish etc.

Nissen, (1988) states that floors are flat horizontal surfaces meant to be walked on, sometimes to be sat on; they take a limited amount of wheel traffic such as vacuum cleaners, service carts, children's toys and occasionally wheel chairs; they support people and furniture and provide insulation against cold and dampness. Floors get to the greatest wear and the most dirt of any part of the house. But floor design and materials are not as completely mundane as these factors imply. Floors can define and separate areas without benefit of walls, suggest traffic patterns and be as dominant or subordinate as desired.

Varghese, (2005) states that floors are typically of two sorts. Basement floors are concrete slabs poured directly on the earthen subgrade or a foundation of crushed rock. Heating masonry floors has greatly lessened and major disadvantage as it combined coldness and hardness rather than hardness alone which brings foot fatigue. In summer however with the heat

turned off the coolness of such floors is welcome. Concrete slab floors reduce construction and maintenance costs. They also make practicable a low house intimately related to outdoor areas.

Kultermann, (2012) opines that hard floor materials are materials such as brick, concrete, stone and tile. Of all the exciting hard flooring materials on offer, the most commonly used in the modern home are tiles. Due to a range of manufacturing processes floor tiles offer a wide choice of practical hard wearing products suitable for most domestic situations. Ranging from natural earthy shades to bright and vibrant colours, they can also be chosen to complement any decor. Terracotta the simplest and one of the oldest types, remains a time honoured favourite for kitchens. Quarry tiles which are once economical and hard wearing are also enduringly popular. Ceramic floor tiles are available in many colours and styles are perhaps the most versatile. Mosaic used for centuries to decorate floors is the perfect material for recreating a design, although simple, coloured borders set against a plain background are the easiest designs with which to work.

According to Punmia, (1993) floor is composed of two essential components are i) Sub floor, base course or floor base and ii) Floor covering or flooring. The floor base is a structural component, which supports the floor covering. For the ground floors the object of floor base is to give proper support to the covering so that it does not settle, and to provide damp resistance and thermal insulation. Ground floors may either rest directly on the ground or may be supported a little distance above the ground. The floors supported directly on the ground are known as solid floors while the floors supported above the ground level are called suspended floors. Suspended floors are generally made of timber.

Floor may be also classified as indoor and outdoor flooring. There are different types of flooring materials available for both indoor and outdoor area, same product should not be used for both purposes. Outdoor flooring have different needs and purposes. Ultraviolet rays have the most devastating effect on the life of an outdoor area. The material used has to be reduced well enough to reduce the adverse effect of rays on the flooring. Heat is an important factor that needs to be considered while designing safety flooring for outdoor application. Apart from heat, outdoor flooring is also exposed to unwanted amounts of morning dew, dust and other factors that may contribute to its decay such as rain, strong wind and sand. An outdoor floor should possess anti slip properties than an indoor floor because of dew collection. Outdoor safety flooring also needs to be stuck on much better by using different kinds of adhesives. One of the most significant differences is the water permeability of the flooring. Flooring surfaces used for outdoors may also need amore cleaning due to its exposure to sand and dust. The safety flooring for outdoor use is water permeable and has different draining needs than indoor flooring. A drain has to ensure that the water that seeps in flows out, so that it does not damage the adhesive used to stick the safe flooring on. Otherwise it can lead to water accumulation in case of heavy rains and puddles will be formed on it. When not drained properly, water can accumulate for a long time damaging the floor tiles by forming cracks and also making the surface slippery (https://www.flooringinc.com/blog/outdoor).

There are numerous outdoor flooring materials available in the market to suit the expectation of the consumers. The expectations of the individuals may be different from person to person. Though the availability of outdoor flooring materials also change with the changing needs of the consumers, the investigator initialized to gather information about the availability and use of outdoor flooring material in the residential and commercial buildings.

There are lots of research done on indoor flooring material while there is very little research identified on outdoor flooring material. Outdoor flooring plays an important role in residential and also in commercial interiors. This initiated an interest in the investigator to take up the study on “Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City” with the following objectives:

- To find out the availability of outdoor flooring materials in the market for use in the residence and commercial buildings
- To gather information among recently constructed residential and commercial buildings about their satisfaction towards using the flooring materials in their construction
- To observe the outdoor flooring materials commonly used in recently constructed residential and commercial buildings

It is hoped that the study would be helpful in disseminating knowledge about the availability of different types of outdoor flooring materials in the market, their cost, quality, durability and its use as residential and commercial interiors.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

The review of literature pertaining to the study entitled "**Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City**" is discussed under the following headings.

F. History and Development of Flooring
G. Types of Outdoor Flooring Materials
H. Factors Influencing Selection of Outdoor Flooring Materials
I. Advantages and Disadvantages of Outdoor Flooring Materials
J. Care and Maintenance

A. History and Development of Flooring

In many early homes, the floor was just a patch of ground. This is still true in some parts of the world, such as places in Africa where the weather is always warm. Dirt is a good, inexpensive surface. Hay, straw, and cow dung are sometimes strewn on the floor and tamped down as people walk on it, creating a surface almost as hard as cement. In some regions, household waste was just thrown on the floor and trampled down. During the Middle Ages in Europe (about AD 400 to 1400), animals sometimes shared the house with peasants, though in a separate room. Occasionally the animals wandered into the humans' part of the house, and their dung was also trampled into the floor. When the mineral called saltpeter (potassium nitrate) was first used to develop gunpowder around the year 1100s, the floors of former peasant homes served as a good source for saltpeter. It was found in places where manure and refuse accumulated in the soil under dry conditions (https://www.csmonitor.com/2004/0518/p18s02-hfks.html).

A lot of flooring materials today are called "traditional" or "timeless." In some cases, this is just marketing language, but in other cases, it's actually historically accurate, as some flooring materials have been around in one form or another since ancient times. Probably guess that natural stone flooring is one of them, and may even tile (https://www.thespruce.com).

1. The First Floors

The very first floors used in interior construction were made simply of the ground itself. The soil was often cleared and leveled off before the structure was erected above it. In some cases, hay or straw was used to soften this surface and make it slightly warmer in the winter. Cured animal skins may also have been draped over the earth to provide some degree of padding. There were numerous variations on the practice of compacting material into a dirt floor. Some methods would help ensure that the floor would set well. Others seemed to be designed for aesthetics. Animal blood, most often taken from a slaughtered pig, was commonly sprinkled over trampled-refuse surfaces to harden them faster. Mint was used in many European floor surface mixes as a deodorizing agent, to help counteract the smell of waste and faeces (https://www.thespruce.com).

2. Ancient Indian Flooring

Traditional dirt floors were given a new twist in the Indian subcontinent with the addition of an array of colorful decorative sands. These could be strewn across the floor or mixed with rice powder and flower petals to tint and color the natural surface of the ground randomly. They could also be arranged in intricate patterns and designs, in an art form known as rangoli, which is still practiced today (https://www.thespruce.com).

3. The History of Natural Stone Flooring

Stone construction was first developed in Egypt over 5000 years ago, with the building of palaces and monuments using large bricks of mountain-cut material. Today, the pyramids at Giza have some of the oldest examples of natural stone flooring in the world, proving the long-term resilience of these surface coverings. The use of stone in flooring continued to develop over time, and there is evidence that the Greeks were creating pebble mosaic floors as early as 3000 years ago. These were made by placing hundreds of small, rounded stones into a mortar bed to form an image. As this flooring material evolved, the pebbles were replaced by flat pieces of colorful stone tile. There are other examples of natural stone materials being used across the ancient world. The Greeks prized marble as a flooring material for its translucent abilities, particularly with light-colored stone that seemed to glow in the sunlight. The royal families of the Carthaginian Empire had a special Turkish marble that they used to build all of their palaces as a symbol of prestige (https://www.thespruce.com).

4. Dressing up stone

About 5,000 years ago, Egyptians developed stone construction. Stone and brick floors began to appear. Soon these floors became works of art as well as a useful surface for the home. Colored tiles created patterns called mosaics across the floor to add beauty to the house. As far back as 3,000 years ago, after creating pebble mosaics for their floors, gradually they began using oblong stone shapes rather than pebbles. This technique was used in ancient France, Spain, Italy, and Northern Europe. During the Roman Empire (27 BC to AD 476) engineers found another advantage of stone floors - heating. They built a small basement with pillars under the floor to support large stone squares. A vent was created at one end of the basement, and a fire was started under the opposite end. The heat and smoke from the fire

would heat the stone floor above. Evidence also shows that ceramic tiles were used for floors thousands of years ago (https://www.csmonitor.com-2004/0518/p18s02-hfks.html).

5. Wood floors

The earliest known wood floors came into use during the Middle Ages. At first, rough planks were laid across the floor. Then these were sanded or smoothed by rubbing them with stone or metal. Later, varnishes or stains were applied to help smooth the floor and make it last longer. Stains were also used to add patterns to the floors. Sometimes inlaid patterns were created by carving shapes out of different-colored woods and piecing them together to form patterns, like a puzzle. People also painted patterns and designs on the floor (https://www.csmonitor.com/2004/0518/p18s02/hfks-html).

6. Resilient floors

Resilient floors include such pliant floor surfaces as rubber, linoleum, or vinyl. Rubber floors first appeared around 1200 and remained popular until the 1600s. An English rubber manufacturer, Frederick Walton, noticed how linseed oil formed a leathery skin on top of paint. In 1863 he patented linoleum, still made by mixing linseed oil with powdered wood or cork (or both), resins, pigments, ground limestone, and drying agents. Rubber, cork, and asphalt tiles were developed in the late 1800s and early 1900s. Laying different colored tiles was a popular way to make geometric designs (https://www.csmonitor.com/2004/0518/p18s02-hfks.html).

B. Types of Outdoor Flooring Materials

The rock ledges of caves and earth beaten down by use were probably the first hard surface floors. Stones smoothened and set into place represented on improvement, constructed floors of brick and wood yet a

further refinement. Until a century or so ago these were the only possibilities for permanent flooring. Today many new materials supplement the standard ones. Compared with carpeting almost all are durable, cool, hard or moderately resilient, more or less stain resistant, and easy to clean with water. But these general similarities should not obscure the equally important differences in appearance and behaviour among them.

1. Ceramic tiles

Varghese (2005) state that there are many types of ceramic tiles that can be used for flooring. Firstly we have the ordinary clay flooring tiles which have been traditionally used in many old buildings. These tiles are being replaced by glazed ceramic tiles (like specific tiles) which are made from special clay and given a coloured glazing. Glazed tiles were originally used only for walls where there is no traffic, but improved techniques of glazing, have made it possible first to manufacture these tiles for use in light as in residences traffic. Nowadays they are also made for heavier traffic as in airports. As these tiles require very less time for laying as compared to terrazzo, it is popular for a number of places like residences. However as ordinary ceramic tiles tend to have irregular edges, the joints between the tiles have to be large and are unsightly. Unless the glazing is of sufficient thickness, glazed floor tiles tend to wear away soon. They are also brittle and tends to crack if heavy objects fall on them. Hence great care should be taken in their selection. Further progresses in ceramic tiles were made in the production of fully vitrified floor tiles. These tiles are also available in different colours. They are generally available in 30 cm x 30 cm or 20 cm x 20 cm sizes ordinarily in thickness of 7.5 mm. They are also made in thickness of 10 mm for medium duty industrial floors and chemical resistant lining in factories.

Neilson, (2002) opines that fine, white clays formed and glazed before the first or second firing. Shiny or smooth to patterned to rough and matte.

Mosaic tiles are small tiles set into a pattern, may be preset sheets a face mount, ready to be set with grout. It should be applied for non residential and residential buildings. Entryways, bathrooms, kitchens, high traffic areas and solariums.

2. Porcelain tiles

Porcelain tiles are commonly used to cover floors and walls, with a water absorption rate of less than 0.5 percent. The clay used to build porcelain tiles is generally denser. They can be either glazed or unglazed. Porcelain tiles are one type of vitrified tiles and are sometimes referred to as porcelain vitrified tiles. Although porcelain has been used making tiles many years, modern production methods and quantities has made porcelain tiles available for the average householder in recent years. It has quickly replaced ceramic tiles as the most popular option. Large scale production of porcelain tile is undertaken in many countries, with the major producers being China, Italy, India, Spain and Turkey. There are also countries undertaking small scale production such as Australia and strong growth in Brazil. The wear rating of the tile rating from zero to five according to ISO 10545-7 (also, ASTM C1027) test for surface abrasion resistance of glazed tile and this can be used to determine suitability for various end use conditions. Specialized cements are necessary for installation of porcelain tiles. Porcelain tiles are denser and heavier than ordinary ceramic tiles. Porcelain tiles for outdoors come in a wide variety of patterns and textures that resemble natural stone, brick, concrete, rock and even wood. Porcelain tiles are clay based materials, but they are fired at extremely high temperatures, unlike ceramic tiles that make them very hard, durable and non porous. They are available in a variety of sizes and shapes and many different colours, patterns and textures. Outdoor tiles need a non- slippery surface (https://en.wikipedia.org-wiki/Porcelain_tile*).*

3. *Concrete floors*

Neilson, (2002) opines that portland cement, sand, gravel or rock aggregate and water mixed and poured into forms or slabs, texturized. Hardens as it sets. Naturally gray but may be colored. Subfloors and floors may be cast or stamped into shapes. It is non residential flooring.

Varghese, (2005) opines that if proper attention to details be given this makes an excellent floor. It is even cheaper than ordinary flagstone paving and still possesses most of the advantages of costlier types. However if it is carefully made it gives endless trouble and can never be satisfactorily repaired by patch work. The necessary surface slope in the proper direction to facilitate washing of the floor when finished should be given in the layer of the concrete of subgrade. For inside floors about 1 inch in 10 ft sufficient. The subgrade is made as usual of rubble stone or broken brick packing and 4" to 6" concrete either of lime or cement on its top as already described above. If it is lime concrete it should be watered and rammed for two days and on the third day the wearing cost of cement concrete, as described below should be applied. If it be cement concrete, the wearing coat should be laid within 45 minutes after the cement concrete is placed and before it is appreciably hardened. The mixture should consist of two parts by volume of clean, crushed stone, ½ inch size, one part of dry, coarse sand and one part of fresh cement. The materials should preferably be taken on the basis of cement bag as a unit. In that case one bag of cement or 1 ¼ c.ft one bag of sand or 2 ¼ c.ft and two bags of ¾ inch broken stone 5 c.ft should be taken and mixed twice in a dry state. To this should be added 4 ½ to 5 gallons (never more than 5 gallons) of water per bag of cement and should be mixed, if by hand three times. If the mixture is stiff and unworkable more water should not be added, but it should be mixed once more. If it is still stiff and not workable, the proportion of crushed stone should be slightly reduced and that of sand correspondingly increased.

4. Flagstone paving

According to Punmia, (1993) the slabs should be first dressed for straight edges and right angled corners. Then on a firm unsinkable base of rubble and 4” of concrete on it (if on the ground floor) or for topping of floor supported on walls, first to lay two slabs on a bedding of mortar about 3/4” to 1” thick, in two diagonally opposite corners of the room giving the proper slope for washing the floor subsequently. Stretch a string from the top of one slab to that of the other and lay all the intermediate slabs so that their top would just touch the string. Each slab should be firmly bedded on lime and not at a few points only. It should then be struck lightly with a wooden hammer. If one side or a corner is at a lower level, the slab should be lifted up and stiff mortar should be laid below. When all the slabs have been laid, the mortar from the joints should be raked out and cement and fine sand (1:3) made into a thick paste with water should be thrust and the joints wiped out. Channelled joints at top are not good as they harbour dust.

Neilson, (2002) states that flagging describes exterior or interior paving, bluestone, quartzite, sandstone and slate. Shape can be regular and surface will be fairly uniform. It is applicable for both the residential and non residential.

5. Brick flooring

According to Neilson, (2002) bricks are made using clay, shale and water mixed, colored and shaped into solid or hollow rectangular blocks and then fired to harden. Solid bricks for flooring are ¾ to 2 inches thick and are referred to as pavers. The application of the brick floorings are interior and exterior floors and patio paving, residential and non residential.

According to Sarkar, (2009) this kind of flooring is very suitable for stores, godowns, etc., where heavy articles are put. It is also suitable for

outdoor area. Sometimes it is done even in residential buildings, but as brick is very absorbent it is not recommended. The subgrade should be made with a 9 inch layer of rubber and 4” to 6” of concrete on its top. Over this are laid bricks of the best quality thoroughly well burnt, with sharp edges and corners, either flat or on edge, the sides being rubbed, if necessary, to give fine joints about 1/16 inch thick. Care should be taken to that the masons cover the side of the brick last laid with mortar before placing the next brick against it. In no event should the joints be filled by pouring cement or mortar grout from the top. Covering the top with mortar should not be allowed as it is likely to be used to conceal bad workmanship. The bricks may be laid with rows of parallel joints either at right angles to walls or in herringbone pattern.

6. Stone flooring

Rao, (2009) states that stone flooring consists of thin slabs laid on concrete bedding. The slabs may be normally square and rectangular in shape. The stone slabs are fixed with thin layer of mortar. When the stone slabs are properly set, mortar in the joints is taken out and flushed with floor surface. Stone flooring is hard, durable, easy to lay and maintain**.**

According to Varghese, (2005) stone floors are very attractive and are commonly used in places of heavy traffic like commercial, institutional and public buildings. They are also known by the following names:

Flat stones used for paving are known as flagstones. Such floors are known as flat stone floors. The name Indian patent stone flooring is used for concrete floors and the term grey artificial patent stone floors are sometimes used in PWD specifications for concrete floors.

Some of the natural stones used in India for flooring are the following:

- Cuddappa slabs
- Kota stone
- Sand stone
- Shahabad stone
- Granite
- Marble

The standard sizes of stones used are 30 cm x 30 cm, 60 cm x 60 cm and 45 cm x 60 cm with thickness 2 to 4 cm. The top surfaces of all these stone floors can be polished. They wear very well under heavy traffic depending on the hardness of the stone and look very attractive in their appearance. Of all the stone floors, marble floors are considered as the most superior flooring material.

7. Paving stone

Pavement, in construction, is an outdoor floor or superficial surface covering. Paving materials include asphalt, concrete, stones such as flagstone, cobblestone, and setts, artificial stone, bricks, tiles, and sometimes wood. In landscape architecture, pavements are part of the hardscape and are used on sidewalks, road surfaces, patios, courtyards, etc. Pavement comes from Latin pavimentum, meaning a floor beaten or rammed down, through old French pavement. The meaning of a beaten-down floor was obsolete before the word entered English. A **paver** is a paving stone, tile, brick or brick-like piece of concrete commonly used as exterior flooring. In a factory, concrete pavers are made by pouring a mixture of concrete and some type of coloring agent into a mold of some shape and allowing to set. They are applied by pouring a standard concrete foundation, spreading sand on top, and then laying the pavers in the desired pattern. No actual adhesive or retaining method is used other than the weight of the

paver itself except edging. Pavers can be used to make roads, driveways, patios, walkways and other outdoor platforms.

Interlocking concrete pavers

An **interlocking concrete paver** is a type of paver. This special type of paver, also known as a **segmental paver**, has emerged over the last couple of decades as a very popular alternative to brick, clay or concrete. Segmental pavers have been used for thousands of years. The Romans built roads with them that are still there. But it was not until the mid-1940s that pavers began to be produced out of concrete. It started in the Netherlands where all the roads are made to be flexible because the country is below sea level and the ground shifts, moves and sinks. Poured concrete is not an option because it will crack. Individual units not set in concrete, and placed in sand perform far better than concrete. Before the paver was made from concrete, either real stone or a clay product was used. The first concrete pavers were shaped just like a brick, 4” by 8” (10 cm x 20 cm) and they were called Holland Stones and still are today. These units turned out to be economical to produce and were exceedingly strong. In addition to being economical, interlocking concrete pavers are also widely available in water-permeable designs, which have added ecological benefits.

Stone pavers

A **stone paver** is another type of paver. This type of paver is used widely in building and landscaping as it is highly prized for beauty, strength and durability. Stone pavers are made of many materials including limestone, bluestone, basalt (such as that from The Palisades used in New York City), sandstone and granite. Travertine is a durable, low-porous stone that stays cool in direct sunlight, making it a popular choice for pool-sides, patios, walkways and outdoor entertainment areas. Travertine is salt

tolerant and has a low sunlight reflection. Granite pavers have high integral strength and density making it easy to maintain and hard-wearing in outdoor use. Limestone pavers are cut from natural limestone blocks, a sedimentary rock found in mountainous areas and ocean sea beds (https://en.wikipedia.org/wiki/Pavement_(architecture).

8. Vitrified tiles

Vitrified tile is a one type of ceramic tile with very low porosity. It is an alternative to marble and granite flooring. Vitrified tiles are often used outdoors due to their water and frost resistance. Vitrified tile is made by hydraulic pressing a mixture of clay, quartz and silica which make vitreous surface. Thus creating a single mass making them hard with low porosity. Different clay bodies reach vitrification at different temperatures (https://en.wikipedia.org/wiki/Vitrified_tile). There are four types of vitrified tiles. They are as follows

- Soluble salt vitrified tiles are screen printed and polished
- Double charge vitrified tiles are fed through a press that prints the pattern with a double layer of pigment 3 to 4 mm thicker than other types of tile. This process does not permit complex patterns but results in a long wearing tile surface suitable for heavy traffic commercial projects. Design layer should not be more than 4 mm thickness, which may weaken the strength of the tile.
- Full body vitrified tiles have pigment in entire body of the tile. This makes chips and scratches less noticeable and makes this an ideal choice for high traffic zones but the process significantly increases the cost.
- Glazed vitrified tiles have a glazed surface. They offer a wide variety of design, art work and surface textures like wood, grain, bamboo, slate or stone. This is also an expensive process but the cost is dropping as

digital printing techniques are introduced (https://en.wikipedia.org-wiki/vitrified tile).

C. Factors Influencing Selection of Outdoor Flooring Materials

According to Srinivasan, (1998) the factors influencing selection of flooring materials are as follows;

- Durability usually comes first because floors take severe punishment, chiefly from the abrasion of feet but also from the weight of furniture, especially when moved. Durable floors have a surface sufficiently tough to prevent wearing through another material. They do not crack, splinter or disintegrate nor do they get permanently indented or otherwise make noticeable the hard use they get.
- Economy of upkeep is of great importance and the generalizations about easily maintained surfaces pertain to floors. Upkeep is lessened when floor materials resist stains and bleaches, do not absorb liquids or dirt. Neutralized colours near middle in value and camouflage patterns reduce labor, regardless of material or surface texture. Floor areas without jogs or crevices are easier to sweep, vacuum, or mop than those of complicated shape. And somewhat surprisingly, certain tests indicate that carpeted floors take less labor to maintain than do those with hard surfaces.
- Warmth actual and apparent is welcome in all but excessively hot climates. There are three ways to make floors actually warm put the heating elements in the floor, the heat in the ceiling so that the floor will be warmed by radiation, and insulate the floor. There are also three ways of making floors look warm: warm hues, middle to dark values and soft textures.
- Light reflection is usually associated with ceilings and walls but much light hits floors day and night. The more floors reflect the brighter your home will be and the lower the utility bills.

- Sound absorption is not the same as the noise reduction resulting from resilience. Rough, porous materials lessen noise already made, an observation that is as true of floors as of ceilings, walls and furnishings. Pile rugs rate high on this quality.
- Safety precautions are required while selecting the flooring material. Polished and smooth slippery floors may look good but are not accident proof fire retardant and anti shock qualities are a must in areas where they are exposed to hazards.
- While appearance may look as the first choice, one must consider the maintenance cost and the ease with the floor may be cleaned thereby reducing labor costs. Flooring that may withstand cleaning process with water and chemicals without staining will be a better choice compared to porous or soft floors that may get damp and moldy in the presence of humidity.

D. Advantages and Disadvantages of Outdoor Flooring Materials

1. Advantages

- Tiles are being easy to maintain and clean, besides being resistant to temperature changes, making it ideal for exteriors.
- Wood is undoubtedly the best outdoor flooring material when it comes to beauty and aesthetics.
- Additionally, wood comes in a wide variety, including teak, bamboo and oak, which are more resistant to the rain and other weather changes.
- Wooden floors give a feeling of warmth and are comfortable for walking barefoot.

- Outdoor polished cement flooring is easy to install, because it is material resistant to all types of oils and detergents, it is easy to clean, and its maintenance is very economical.
- Although we are accustomed to seeing it in grey, the truth is that one can play with a wide range of colors when choosing outdoor flooring (https://www.homify.in/ideabooks/4099121/4-types-of-outdoor-flooring-with-advantages-and-disadvantages).

2. Disadvantages

- Patterned tiles will be at the mercy of the elements, with bad weather often causing fading or even damage, if expansion gaps are not left between tiles.
- Decorative outdoor ceramics tend to be fairly costly and given that they are laid directly on the soil, it require a lot of time leveling the surface and preparing the ground first.
- Being a natural material, wood will be exceptionally affected by weather. Regular staining, sanding or replacing might be necessary, depending on the climate, as rot is difficult to stem, once in place.
- Natural stone is both environmentally friendly and visually pleasing material, but more than that, it feels beautiful underfoot and creates unique displays.
- If crazy paving style of installation is opted, anyone can manage it and the end result will always look professional, expensive and striking. (https://www.homify.in/ideabooks/4099121/4-types-of-outdoor-flooring-with-advantages-and-disadvantages).

E. Care and Maintenance

1. Flagstone

- To clear dust and dirt floor should be regularly swept. Materials such as sand and grit can easily damage the floor due to the abrasive action. A damp mop can clear away most dirt occurrence on a flagstone floor. The floor should be cleaned with a neutral soap. Natural stone soap and water are an effective way to clean the flagstone floor. A sponge can help to remove dirt and stains. The floor should be well rinsed and then dried with a clean cloth. The rinsed water should be changed frequently.
- Due to the porous nature of flagstone, stains may occur on the floor. Organic stain removers can be used to clear organic stains. Non-organic stains can be cleared with a mild bleach solution. It is important that the treated area should be rinsed thoroughly. Residues of stain remover can cause permanent discoloration on the floor.
- Flagstone is a porous rock. As such, liquid spills on the floor can easily cause stains. Hence every 2 to 3 years the floor should be sealed. This helps to prevent stains and also enhances the beauty of the floor (https://www.doityourself.com/stry/6-flagstone-flooring-maintenance-tips).

2. Concrete floors

- In areas of heavy traffic, such as entrances and foyers, reduce maintenance and wear and tear by using indoor floor mats or rugs. Outdoor floor mats also help reduce the amount of dirt and grit that gets tracked in.
- Clean spills from the floor as quickly as possible so that they don't absorb into the surface and cause staining.
- Concrete floors are a good choice for pet owners because they won't trap pet dander and allow easy cleanup of muddy paws.
- Only use cleaning solutions that are recommended by the contractor or the sealer or wax manufacturer. Avoid harsh cleaning products such as ammonia, citrus, bleach, vinegar or pine cleaners because they are not pH-neutral.
- Microfiber cleaning pads are recommended for both dry and damp mopping (https://www.concretenetwork.com/concrete/interiorfloors/caring.html).

3. Ceramic

- Cleaning new floor with a damp mop once a week is the best thing to maintain your ceramic floor.
- A simple sweeping or vacuuming of the tile floor prior to mopping will remove any dust or debris.
- The cleanser that was chosen should be compatible with grout cleaning, (neutral pH), and should not stain the grout. Detergent should not be used because it may dull the surface.
- When cleaning, the entire area should be cleaned or scrubbed with the cleansing solution, through the use of a cotton mop, cloth, sponge, or non-metallic brush.

- The entire flooring area should then be rinsed with clean water to remove any cleaning solution residue.
- Routine cleaners should never contain acids, vinegar, chlorines or ammonia as these chemicals can damage and discolor the grout or the surface of the stone or tile.
- Always thoroughly rinse the flooring surface after cleaning, using clean clear water, to avoid any periodic residue build up or mold and mildew growth(https://images.homedepot-static.com/catalog/pdfImages5c-5c0-cae0e-3f68-40e9-a9c4-6fa3016307c0.pdf).

4. Brick

Brick should be thoroughly cleaned by sweeping, vacuuming, or dry-mopping the floor to remove any dirt or particles that may be clinging to its surface. A natural cleaning solution can be prepared and used for cleaning (https://www/thespruce.com/cleaning-a-brick-floor).

5. Stone

- Remove any loose debris.
- Blot spills; wiping the area will spread the spill.
- Flush the area with plain water and mild soap and rinse several times.
- Dry the area thoroughly with a soft cloth.
- Repeat as necessary.
- If the stain remains, refer to the section in this guide on stain removal.
- If the stain persists or for problems that appear too difficult to treat, call your stone care professional, installer, or restoration specialist (https://www.naturalstoneinstitute.org/default/assets/File/stone/care clean. pdf).

6. Paving stone

- Cracks between pavers should be filled with polymeric sand, which hardens when moistened. This special sand helps to hold the pavers in place and prevents weeds from growing between the bricks.
- Debris and dirt should be swept from the pavers. Removing nature's debris from the bricks keeps them clean and reduces the risk of staining the brick surface.
- Directing the water spray straight into the joints should be avoided, as it can disrupt the sand, particularly if regular sand is used.
- Using a mild detergent mixed with water the stains should be scrubbed using wire brush.
- Seal the pavers every two or three years using a sealant designed for pavers. Sealing protects the pavers from environmental factors and prevents stains from setting into the bricks (https://homeguides-sfgate.com/maintain-pavers-50773.html).

7. Porcelain

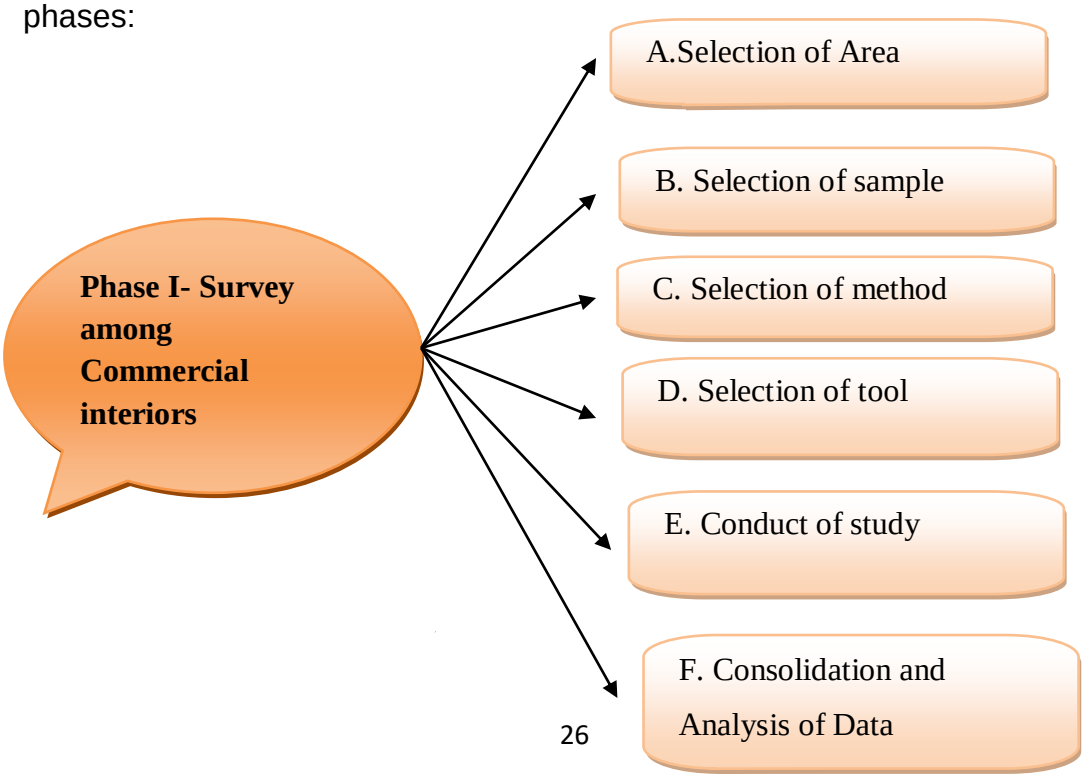
- The area should be swept twice with a soft-bristle broom, first in the direction of the tile, then on a diagonal.
- To remove the dirt vacuum can be used.
- The tile should be saturated with a vinegar-and-water solution, allowing it to soak for five to ten minutes.
- The floor should be scrubbed with a soft-bristle brush.
- The floor should be rinsed with hot water in order to thoroughly remove the cleaning solution and mopped with damp cloth and dried with clean towel (https://www.bobvila.com/articles/how-to-clean-porcelain-tile/).

METHODOLOGY

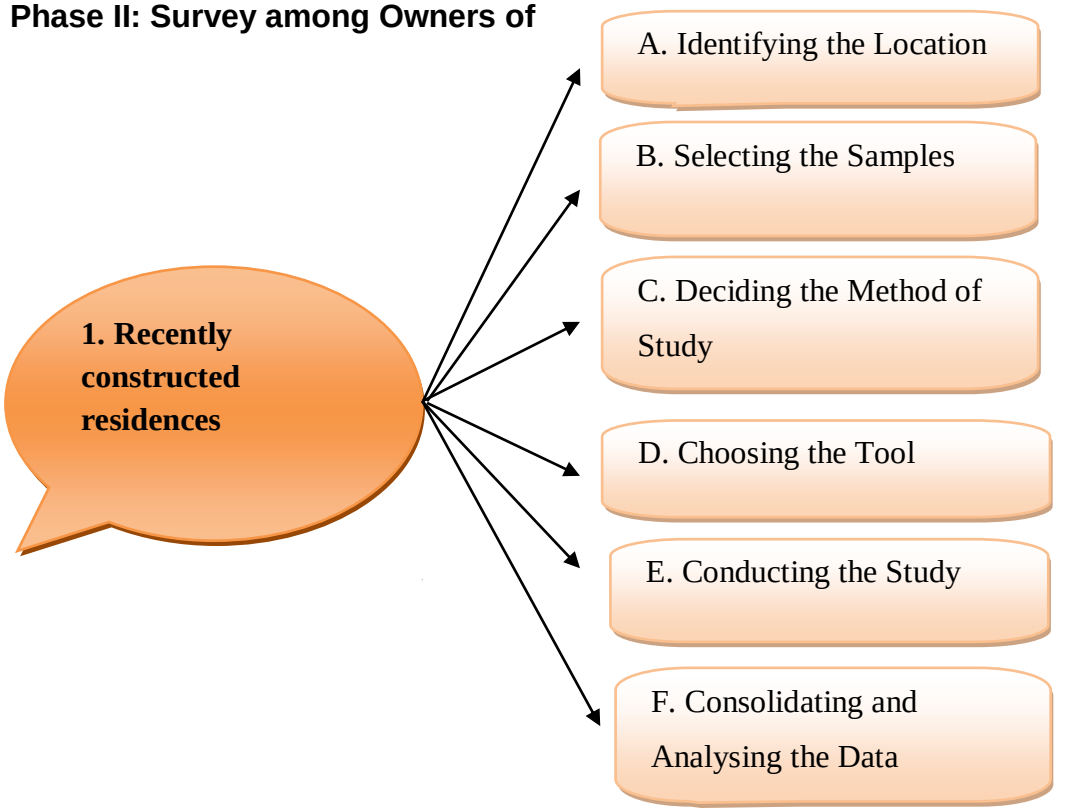
III. METHODOLOGY

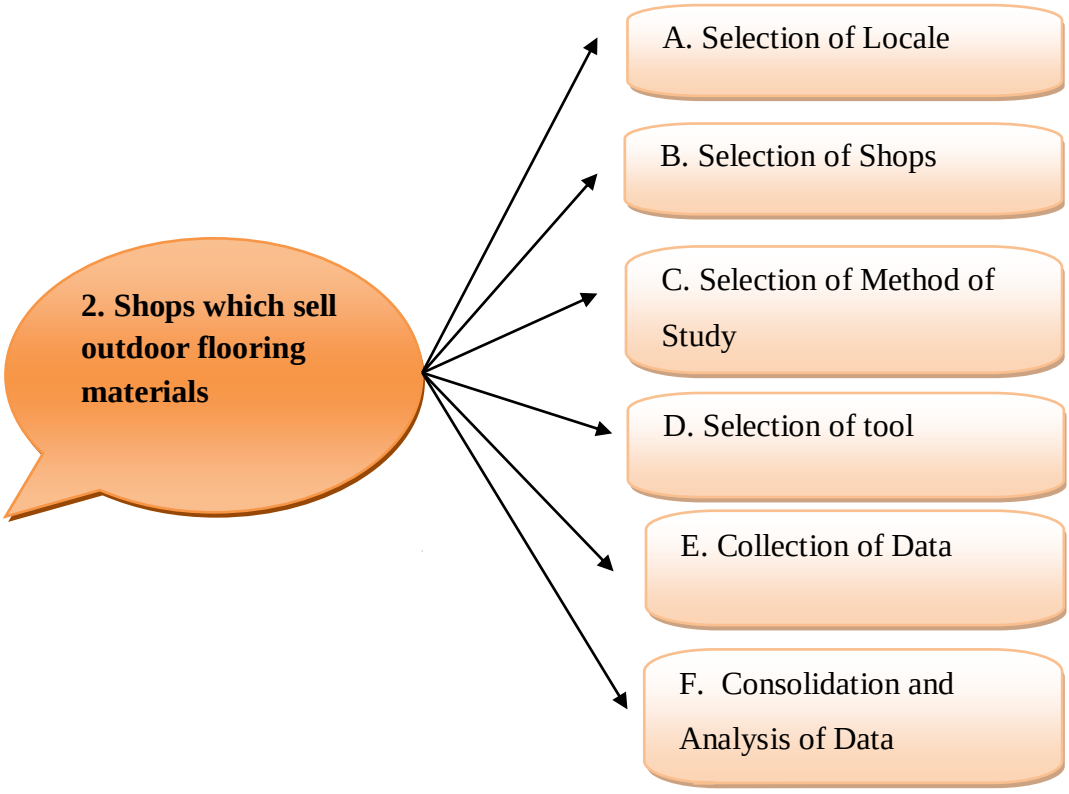
Methodology is the procedure of research techniques. It is the logic of specific investigation. It is not a research model employed in a particular project but it is a technique which entails theoretical principles as well as a framework that provides guidelines about how research is done in the context of a particular paradigm. It translates the principles of a paradigm into research language and shows how the society can be explained and studied. Literally, 'methodology' means the science of methods. It contains the standards and principles employed to guide the choice, structure, process and use of methods as directed by the underlying paradigm. Methodology is determined not by the research model but rather by the principles of research entailed in the paradigm (Gupta 2003). The methodology along with the references and proforma was submitted for Ethical Clearance. The Ethical Clearance obtained is given in Appendix I.

The methodology pertaining to the study entitled "**Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City**" comprised of the following phases:



Phase II: Survey among Owners of





Phase 1: Commercial Interiors

A commercial area is intended for use for profit in businesses, such as office, complexes, shopping malls, service stations and restaurants. Commercial areas in a city are areas, districts or neighbourhoods primarily composed of commercial buildings such as a downtown, central business district, financial district or shopping centre. Commercial activity within cities includes the buying and selling of goods and services in retail businesses, wholesale buying and selling, financial establishments, and a wide variety of uses that are broadly classified as business (https://en.wikipedia.org/wiki/Commercial_area).

Wells (Nakkiran, 2009) defines survey as “a fact of finding study dealing chiefly with working class poverty and with the nature and problems of the community”. According to Young as presented by Nakkiran, (2009) survey is a “search of information which could be obtained easily from large, representative but diverse and widely scattered group of population, researchers have resorted to the sample surveys”. The market survey included the following steps given below:

G. Selection of Area
H. Selection of Sample
I. Selection of method
J. Selection of Tool
K. Conduct of Study
L. Consolidation and Analysis of Data

A. Selection of Area

Coimbatore is also known as Kovai is a major city in the Indian state of Tamilnadu was selected for the study. It is located on the banks of the Noyyal river and surrounded by the Western Ghats. Coimbatore is the second largest

city by area and population in Tamilnadu after Chennai and the 16th largest urban agglomeration in India. It is administered by the municipal corporation and is the administrative head office of Coimbatore district. It is also known as the Manchester of South India. There are more than 25,000 small, medium, large scale industries and textile mills situated. Coimbatore is also famous for foundry and automobile industries, manufacturing of textile industry equipment's, spares, motor pump sets, wet grinders and varied engineering goods and services. Coimbatore serves as an entry and exit point to neighbouring Kerala state and the very popular hill station of Udhagamandalam (Ooty) is 70 kms from Coimbatore. It is the disembarking point for those who want to take the mountain train that runs from Mettupalayam just 35 kms from Coimbatore (https://en.wikipedia.org/wiki/Coimbatore). In Coimbatore city the area selected for the study on use of different types of outdoor flooring materials in commercial interiors were R.S.Puram, Saibaba colony and Mettupalayam road. The reason for choosing these areas is familiarity of the place and location of shops. There are number of shops of different kinds located in these area.

B. Selection of Sample

Sampling is the process of selecting units from a population of interest so that by studying the sample we may fairly generalise our results back to the population from which they were choosen (Chakraborty, 2009). For the study on availability of outdoor flooring materials 25 shops located in R.S.Puram, Saibaba colony and Mettupalayam road were selected by purposive sampling. Singh (2017) informed that purposive sampling is a non probability sampling procedure in which elements are selected from the target population on basis of purpose of the study and specific inclusion and exclusion criteria. It is also referred to as purposeful sampling. In purposive sampling elements are not selected simply on the basis of their availability,

convenience or self selection, but on the basis of the suitability of the samples for the study. Thus the investigator selected the samples who were according to the expectation of the investigator and who cooperated with the investigator to share the details required.

C. Selection of Method

A survey is defined as a research method used for collecting data from a pre defined group of respondents to gain information and insights in various topic of interest. The personal interview method was chosen for the collection of data. Saravanavel, (2009) informs that personal interviewing is a two way purposeful conversation initiated by an interviewer to obtain information that is relevant to some research purpose. It is not only the words spoken which matter but also the gestures, glances, facial expressions, pauses, modulation of voice, intonation, rate of speech, etc which also matters a lot. In the words of Young as given by Saravanavel, (2009) 'personal interview' is an effective, informal verbal and non – verbal conversation initiated for specific purpose and focused on certain planned areas. The investigator chose the personal interview method to gather the required information from the selected respondents.

D. Selction of Tool

The tool used for the study was interview schedule. The set of structured questions in which answers are recorded by the interviewer is called interview schedule or simply the schedule (Ahuja, 2003). The interview schedule contains a series of questions about the use of different types of outdoor flooring materials in the selected commercial interiors. An interview schedule was prepared by the investigator to gather information on the use of different type of outdoor flooring materials, material cost, labour cost, use of outdoor area, area provided for outdoor and the views of respondents regarding the use of outdoor flooring in recently constructed commercial

building. A pre-test is where a questionnaire is tested on a (statistically) small sample of respondents before a full-scale study, in order to identify any problems such as unclear wording or the questionnaire taking too long to administer (https://www.insightsassociation.org/issues-policies/glossary/pre-test). The interview schedule was pretested among three samples for its validity. Based on the feedback from the samples the interview schedule was modified and schedule was finalized for further study. The interview schedule used for the survey is Appendix II.

E. Conduct of Study

Data collection is one of the most important steps in a research. The data collection should be carried out in an accurate and systematic manner. If the execution of the project proceeds on correct lines, the data collected would be adequate and dependable (Kothari, 2011). The investigator personally went to 25 selected commercial interiors and collected the necessary information as per the interview schedule. The purpose of the study was explained to the shop owners and data was collected. The types of flooring materials used in the shops are shown in Plate 1.

F. Consolidation and Analysis of Data

Consolidation of data is the process of encoding the data and categorizing it. Coding involves the desegregation of textual data into segments, investigating the data resemblances and dissimilarities and assessing together conceptually alike data in the particular nodes (Wickham, 2005). The collected data were consolidated and tabulated. The tabulated data were analysed and discussed in Chapter IV, Results and Discussion.

Phase 2

1. Survey Among Owners of Recently Constructed Residences

Survey was found essential to conduct among the owners of recently constructed residences. A residential area is a land used in which housing predominates, as opposed to industrial and commercial areas. Housing may vary significantly between and through residential areas. These include single family housing, multifamily residential or mobile homes.

A survey was done among the owners of residences which were constructed recently. The term survey is used for the technique of investigation by a direct observation of a phenomena or systematic gathering of data from population by applying personal contact and interviews when adequate information about a certain problem is not available in records, files and other sources (Verma, 2001). The conduct of survey among owners of recently constructed residences included the following aspects

G. Identifying the Location
H. Selecting the Samples
I. Deciding the method of Study
J. Choosing the Tool
K. Conducting the Study
L. Consolidating and Analysing the Data

A. Identifying the Location

Coimbatore is known for its various industries, engineering goods, textile mills, educational institutions, health care facilities, dry-hot weather, friendly culture and hospitality. There is a significant minority of people from Northern and Western India in Coimbatore which gives it the "local Indian-cosmopolitan" outlook. The Tamil spoken here is called Kongu Tamil. Other languages spoken include English, Malayalam, Telugu and Kannada. The

people are very friendly and courteous. It's one of the upcoming Information Technology Hub with new initiatives from the State Government. The locals claim they have the world's second tastiest water "Siruvani Water" after Nile, no official or scientific proof for this claim though. Coimbatore is an orthodox city. It has developed in terms of wealth; however the general populace is still down to earth. People here don't have a flashy lifestyle; they are generally very contented (https://wikitravel.org/en/Coimbatore). Hence Coimbatore was selected to find out the outdoor flooring materials used by consumers. In Coimbatore city the area selected for the household survey on use of different types of outdoor flooring materials in recently constructed residential buildings are Kovai Thiru nagar and Bharathi park road. Ease of approach and familiarity of space to the investigator were also the reason for selecting the location.

B. Selecting the Samples

A sample as the name implies is a smaller representation of a larger whole. In other words a section of the population selected from the latter in such a way that they are representative of the universe called a sample. Sampling may be defined as the selection of part of an aggregate or totality on the basis of which a judgement or inference about the aggregate or totality is made (Saravanavel, 2009). For the study of use of different types of outdoor flooring materials 50 residential interiors located on Kovai Thiru nagar and Bharathi park road were selected by purposive sampling. The residences recently constructed were indentified. In this type of sampling which is also known as judgemental sampling the researcher purposely chooses persons who in his judgement suit the appropriate characteristic required of the sample members (Ahuja, 2003).

C. Deciding the Method of Study

Survey is the process of collection of data and this is the first step for any statistical enquiry (Singh, 2009). Personal interview is the method used to collect the data. Personal Interview is the foremost tool to judge the abilities of a person. In the face-to-face contact between the interviewer and interviewee, it is possible to record more than only verbal responses; which are often superficial. When human beings communicate directly with each other, much more information is communicated. The nature of words used, facial expressions and body language- together contribute in judging a person (https://timesofindia.indiatimes.com/life-style/relationships/work/Tips-for-a-Personal-Interview/articleshow/5132-7247cms). Hence survey was done among the samples to obtain the necessary information.

D. Choosing the Tool

The tool used for the collection of the data about the study of different types of outdoor flooring materials used in residential interior was interview schedule. An **interview schedule** is basically a list containing a set of structured questions that have been prepared, to serve as a guide for interviewers, researchers and investigators in collecting information or data about a specific topic or issue. The schedule will be used by the interviewer, who will fill in the questions with the answers received during the actual interview (https://www.cleverism.com/interview-schedule-definition-types-templates-tips/). An interview schedule was prepared by the investigator to gather information on the use of outdoor flooring materials, material cost, labour cost, use of outdoor area, place of purchasing, area provided for outdoor and the views of respondents regarding the use of outdoor flooring in recently constructed residences. Pretesting is the administration of the data collection instrument with a small set of respondents from the population for

the full scale survey. If problems occur in the pre-test, it is likely that similar problems will arise in full scale administration. The purpose of pretesting is to identify problems with the data collection instrument and find possible solutions (http://www.oag-bvg.gc.ca/inter-net/engligh/meth_-gde_19734.html). The interview schedule was pretested among three samples for its validity. Based on the feedback from the samples the interview schedule was modified and schedule was finalized for further study. The finalized interview schedule is given in Appendix III.

E. Conducting the Study

Kothari (2011) states that the data collection is any process of preparing in collecting data. The purpose of the data collection is to obtain information to keep on record, to make decision about important issues or to pass information. Data are basic input in any decision making process. The process of collecting data gives statistics importance of the study informs Pannerselvam, (2005). The investigator personally went to survey among the owners of 50 residential interiors at their convenient time and collected data as per interview schedule. The investigator explained the samples about the purpose of study and requested them to answer the questions and then collected the data. Plate 2 and 3 shows the flooring material used in residential area.

E. Consolidating and Analysing the Data

The gathered information was arranged in an organized and systematic manner. The collected data were consolidated and tabulated. The tabulated data were presented and discussed under Chapter IV, Results and Discussion.

2. Survey Among the Owners of the Shops which Sell Outdoor Flooring Materials

Grooves (2009) states that the survey is a systematic method of gathering information from a sample of entities for the purpose of constructing quantitative descriptors of the attributes of a large population of which the entities are members. The survey included the following aspects. A survey among the shops which sell outdoor flooring material was found essential by the investigator for the study by following the steps given below

G. Selection of Locale
H. Selection of Shops
I. Selection of Method of Study
J. Selection of Tool
K. Collection of Data
L. Consolidation and Analysis of Data

A. Selection of Locale

Coimbatore is a major industrial city in Tamilnadu, often referred as Manchester or Detroit of South India. Coimbatore existed even prior to the 2nd or 3rd century AD by Karikalan, the first of the early Cholas. When kongunadu fell to the British along with the rest of the state its name was changed to Coimbatore and it is also called as kovai (https://coimbatore.nic.in/). In Coimbatore city the locale selected for the study to identify the shops which sell different types of outdoor flooring materials were R.S. Puram, Saibaba colony and Brooke bond road.

B. Selection of Shops

A sample is a limited number of individuals selected to obtain information about some characteristic of the population from which it is drawn. Thus elements of a sample constitute a subset of the set of elements

belonging to population (Sharma and Jain, 2009). The shops were selected based on purposive sampling in order to collect the data. For the study of use of different types of outdoor flooring materials 25 shops were selected from the area stated above.

C. Selection of Method of Study

A survey is a method of gathering information from a sample of people, with the intention of generalizing the results to a larger population. Surveys provide a critical source of data and insights for nearly everyone engaged in the information economy, from businesses and the media to government and academics (https://www.qualtrics.com/experiencemanagement-research-survey-basics). Personal interview method was choosen for the collection of information. The owners of the shop were approached by the investigator. The investigator explained to them about the purpose of the study and fixed an appointment for the conduct of the interview using the prepared tool.

D. Selection of Tool

The tool used for the study was interview schedule. Interview on samples may be carried out either with a structured framework or with an undirected approach. The structured framework involves use of some predetermined questions. Interview method enables the researcher to personally feel the problems of the samples. (Sutapa et al, 2009). The interview schedule contains a series of questions about the availability, sizes, thickness, cost, quality and demand on different types of outdoor flooring materials in the selected shops. Pretesting is generally defined as the testing of a set of questions or a questionnaire on subjects from the target population, and dates back to the founding of the modern survey, in the mid 1930s (https://core.ac.uk/download/pdf/26663748.pdf) .The tool was pretested among three shops for checking its content and modified based on the response from the shop owners. Thus the finalized tool was administered to the shop owners to gather required data. The tool is given in Appendix IV.

E. Collection of Data

Data collection is the process of gathering and measuring data, information or any variables of interest in a standardized and established manner that enables the collector to answer or test hypothesis and evaluate outcomes of the particular collection. This is an integral, usually, initial, component of any research done in any field of study. Data collection is concerned with the accurate acquisition of data although methods may differ depending on the field, the emphasis accuracy remains the same (Kothari, 2011). The investigator personally went for a survey among the owners of 25 shops which sell outdoor flooring materials and collected data as per interview schedule. The different type of flooring materials displayed in the market is given in plate 4 and 5.

F. Consolidation and Analysis of Data

The collected data was consolidated and tabulated. The purpose of a table is to simplify the presentation and to facilitate comparison (Jain, 2000). The tabulated data was analyzed, discussed and presented under Chapter IV, Results and Discussion.

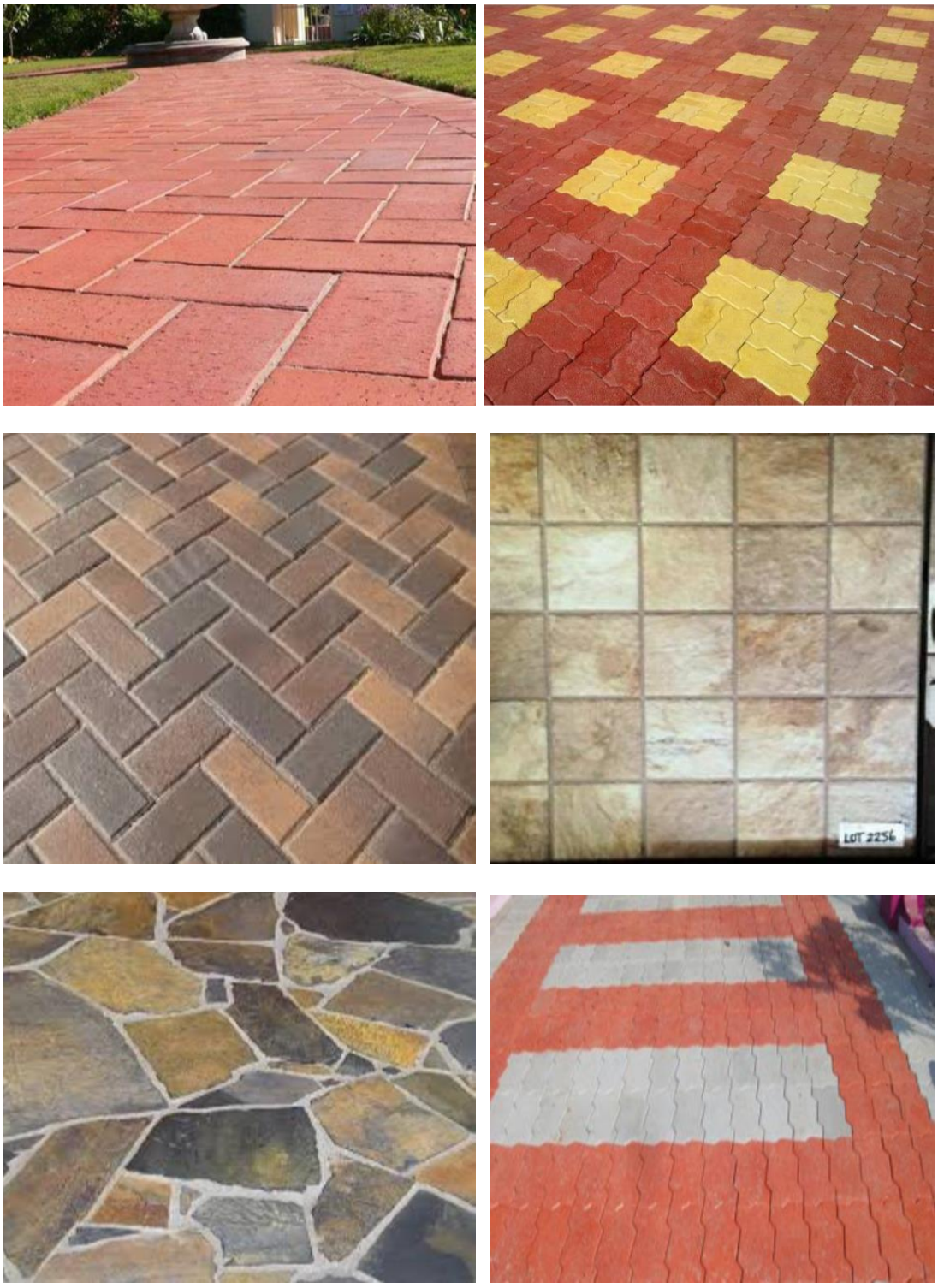


PLATE- 1

Suitable Flooring Materials for Commercial Buildings

PLATE - 2

Suitable Flooring Materials for Residential Buildings

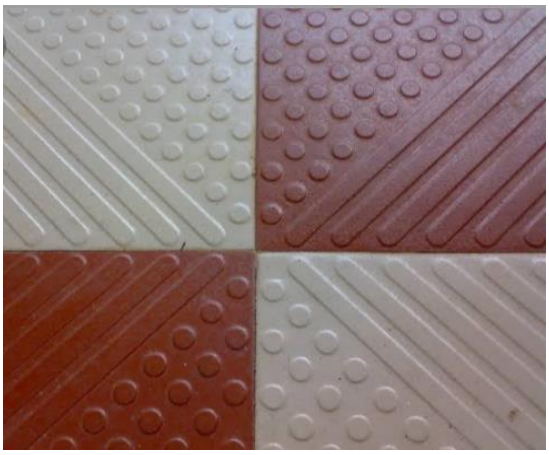





PLATE - 3

Suitable Flooring Materials for Residential Buildings

PLATE - 4

Types of Flooring Material Displayed in the Market

PLATE - 5

Types of Flooring Material (pavement) Displayed in the Market

RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

The findings pertaining to the study on "**Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City**" is discussed under the following headings.

A. RESULTS OF THE SURVEY CONDUCTED IN COMMERCIAL AND RESIDENTIAL BUILDINGS
B. RESULTS OF THE MARKET SURVEY

A. RESULTS OF THE SURVEY CONDUCTED IN COMMERCIAL AND RESIDENTIAL BUILDINGS

The results of the survey under this topic is presented under the following topics

1. Results of the Commercial Survey
2. Results of the Residential Survey

1. Results of the Commercial Survey

The results of the survey is discussed under the following heads

e. General Information about the Commercial Buildings Surveyed
f. Details on Outdoor Flooring Materials Used
g. Information on Purchasing of Flooring Materials
h. Views of the Respondents about the Performance of Outdoor Flooring Materials

a. General Information about the Commercial Buildings Surveyed

This part of the study discusses the information on type of shop, year of establishment, plinth area, and satisfaction regarding their business, ownership and plinth area of the outdoor. Table 1 presents general information of the commercial shops surveyed.

Table- I

General Information about the Commercial Buildings Surveyed

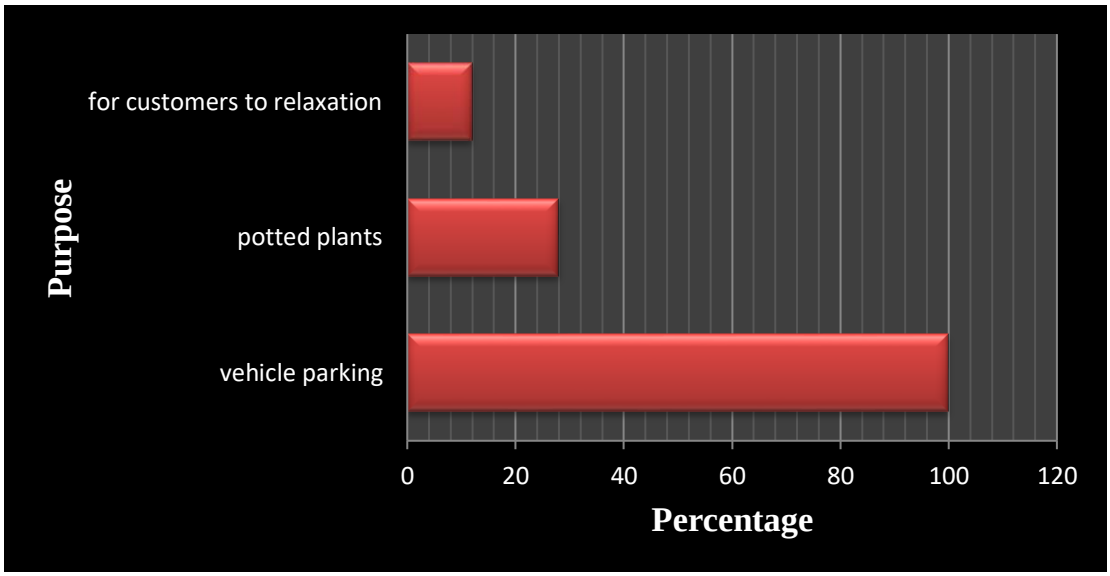
General Information	Number of owners responded	
	(N=25)	Percentage
Type of shops		
➢ Shop	11	44
➢ Store	7	28
➢ Office	4	16
➢ Boutique	3	12
Year of establishment		
➢ 2010-2012	13	52
➢ 2013-2015	9	36
➢ 2016-2018	3	12
Plinth area(sq.ft)		
➢ 1000-1300	3	12
➢ 1300-1600	7	28
➢ 1600-1900	13	52
➢ 1900-2200	2	8
Ownership		
➢ Sole owner	22	82
➢ Partnership	3	12
Available outdoor area (sq.ft)		
➢ 200-500	9	36
➢ 500-800	16	64
Type of ownership		
➢ Own	17	68
➢ Rental	8	32

Interior design is gaining popularity and people have started to give greater importance for it being residential or commercial interiors. Residential interiors are decorated due to the status or living style of the families residing in the house or due to the taste of the owners of the house, due to the change in attitude towards interior design their aptitude to develop the style in the interior and exterior is gaining importance. In order to improve the sales commercial interiors are also gaining momentum in decorating the interior as well as exterior. The survey conducted to gather details about the general information revealed that maximum 44 per cent of the commercial buildings surveyed were shops which sell special products like readymade garments, sweets and savouries, cell phones, bakeries and confectionaries. Twenty eight per cent of the commercial buildings were stores, 16 percent were offices and 12 per cent were boutiques. All these commercial buildings needed to attract its customers. Hence decorating the interiors become inevitable.

Maximum 52 per cent of the commercial buildings were established during the year 2010-2012. The plinth area of maximum 52 per cent of the commercial buildings ranged between 1600- 1900 sq.ft. Irrespective of the type of shop or commercial building all of them were satisfied with their business. Majority 82 per cent of the surveyed individuals informed that they were the sole owner for the building.

The outdoor spaces provided in a commercial building added to the value of the building. Hence, the owners of the buildings have allocated space in front of the commercial building. The survey informed that maximum 64 per cent of the samples surveyed had provided 400-600 sq.ft in front of the building.

In commercial spaces like offices, shops, complexes, shopping malls etc outdoor area is the most important thing considered because it should serve several purposes like for customers to relaxation, vehicle parking and arranging of potted plants. The purpose for which the outdoor area is used by the commercial building is represented in Figure 1.



*Total exceeds 100 due to multiple responses

Purpose for Which the Outdoor Area is Used

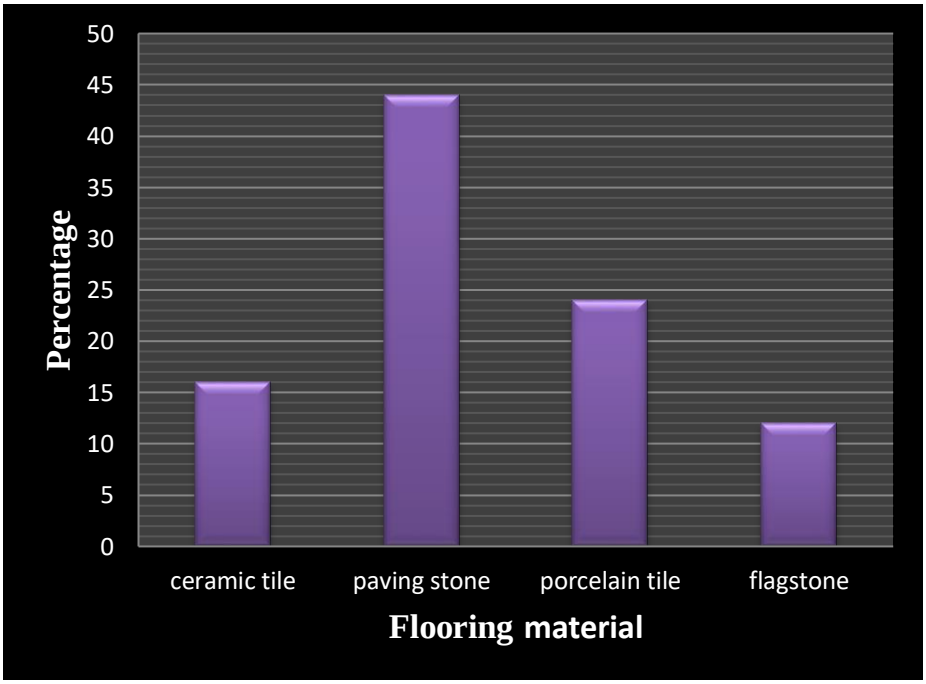
Figure- 1

All the selected 25 commercial interiors (100 percent) gave more importance for parking the vehicles in the outdoor area, 28 per cent used the outdoor area for decorating with the potted plants. Customers are the most important persons for commercial purposes. Only 12 per cent of the people provided outdoor area for relaxation of the customers.

b. Details on Outdoor Flooring Materials Used

Today the market is flooded with outdoor flooring materials in order to satisfy the needs of the people. However the survey revealed only 68 per cent of samples had awareness on the different type of outdoor flooring materials available in the market.

Table II and Figure 2, 3, 4 and 5 presents information on the most common flooring materials used in the outdoor, the approximate cost, cost of labour in laying the flooring and the time taken for fixing the flooring material in the available space.



Type of Flooring Material Used

Figure- 2

The survey revealed the fact that maximum 44 per cent of the samples surveyed had used paving stones due to its convenience, easy availability, ease of laying and possibilities of re-laying without much damage. Different

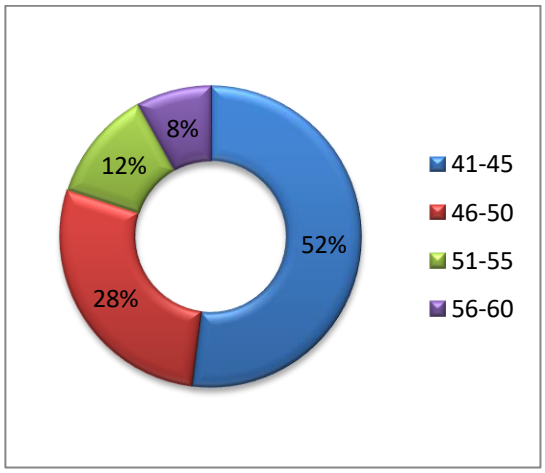
types of paving stones were widely available in the market. Hence paving stones were mostly used in the commercial space surveyed. Other materials available were porcelain tile (24 per cent), ceramic tile (16 per cent) and flagstone (12 per cent).

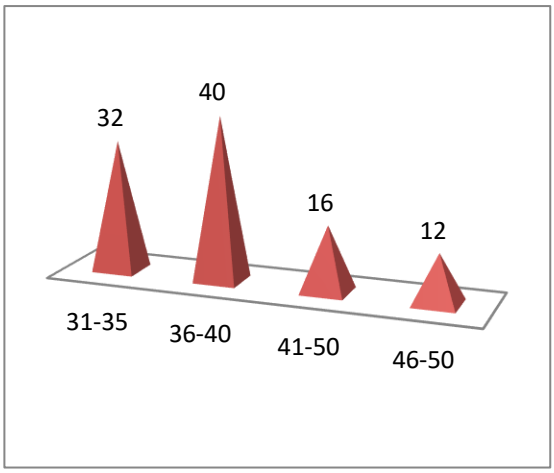
Material and labour cost of the flooring materials is given in Table II and Figure 3 and 4.

Table- II

Material Cost and Labour Cost Involved in Laying the Floor

Cost in range	Number of owners responded
	Percentage
Material cost	
41-45	52
46-50	28
51-55	12
56-60	8
Labour cost	
31-35	32
36-40	40
41-45	16
46-50	12





Material Cost

Figure- 3

Labour Cost

Figure- 4

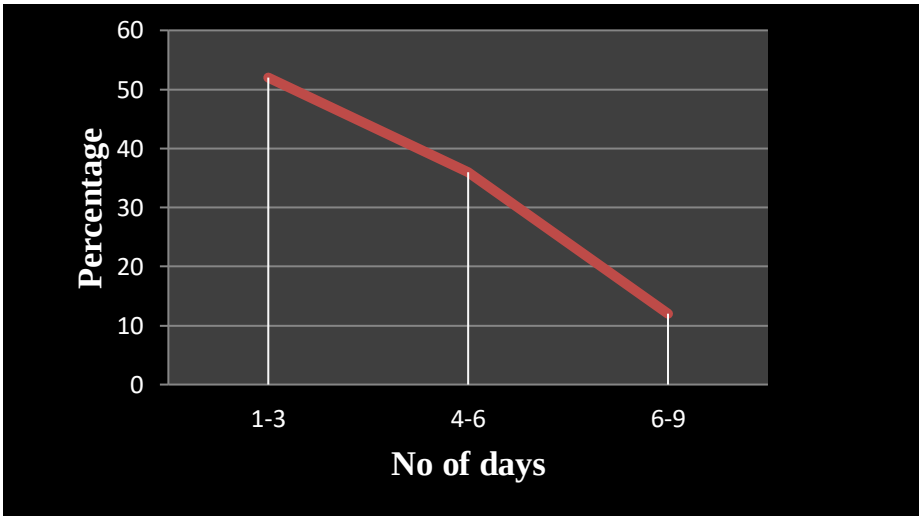
The cost of the outdoor flooring material varied with the cost of material and year of purchase. The cost of the flooring material used by the commercial owners of maximum 52 per cent varied between Rs 41-45 per sq.ft. Generally people do not go for very expensive material for outdoor flooring material. That is observed in the survey. Cost of labour is also calculated for per square feet. Maximum 40 per cent of the surveyed population revealed that they had spent Rs 36-40 per sq.ft while 12 per cent informed that they had expended Rs 46-50 per sq.ft as the labour cost for laying the outdoor flooring.

The number of days required to lay the outdoor flooring depended on the area covered. Table III and Figure 5 represent the number of days taken for laying the flooring.

Table- III

Number of Days Taken for Laying the Flooring

Number of days	Number of owners responded
	Percentage
1-3	52
4-6	36
6-9	12



Number of Days Taken for Laying the Flooring

Figure- 5

The number of days required for laying the flooring material varied with the intricacy involved in laying the flooring and the area to be covered. However the survey showed that maximum 52 per cent of the samples surveyed required only 1-3 days for laying the outdoor flooring.

c. Information on purchasing of flooring materials

Table III represent the information about person who suggested the flooring material.

Table- IV

Person Who Suggested the Flooring Material

Person	N=25	Percentage
Engineer	12	48
Architect	6	24
Shop keeper	4	16
Family members	3	12

The persons who suggested the selected flooring materials for the respondents were engineers (48 per cent), architects (24 per cent), sales person (16 per cent) and family members (12 per cent).

Different types of flooring materials are available in the market. People have lots of options while selecting outdoor flooring material. Some of the common factors for the people to choose one specific type of outdoor flooring materials are given in Table V.

Table- V

Factors Expressed by the Samples for Choosing the Flooring Material

Factors	Number of owners responded	
	N=25	*Percentage
Reasonable cost	24	96
Comfort	21	84
Durability	19	76
Slip resistant	15	60
Aesthetic	12	48
Trendy	9	36
Texture	6	24

*Total exceeds 100 due to multiple responses

From the Table above it could be observed that 96 per cent of people surveyed considered reasonable cost as the main factor for choosing the specific flooring material they had used, 84 per cent of the samples selected based on the comfort of the flooring material and 76 per cent of people chose the flooring material for its durability. Slip resistant is the most important factor considered while choosing outdoor flooring material. Only 60 per cent of the owners of commercial buildings selected the outdoor flooring material based on its slip resistance, while 48 per cent of the surveyed sample gave importance for aesthetic look and 36 per cent selected for its trendy look. Texture is always referred as smooth, medium or hard. It is the most important reason considered while selecting outdoor flooring material. However only 24 per cent of the samples selected the flooring material based on its texture.

d. Views of the Respondents about the Performance of Outdoor Flooring Materials

Table VI discusses about the views of the respondents about the performance of outdoor flooring materials they had used in their commercial buildings. The performance of the flooring material was assessed based on its comfort in use, slip resistance and water resistance.

Table- VI

Views of the Respondents about the Use of Outdoor Flooring Materials

Views of respondents	Number of owners responded			
	Yes		No	
	N=25	Percentage	N=25	Percentage
Comfort	25	100	0	0
Slip resistance	25	100	0	0
Water resistance	25	100	0	0

While selecting outdoor flooring materials comfort, slip resistance and water resistance are some of the most common factors that should be considered because once the flooring material is fixed it is too difficult to replace again. Each person should have different expectation about the performance of outdoor flooring materials in their construction. Hundred percent of the surveyed respondents were satisfied with its comfort, slip resistance and water resistance. However 16 per cent of consumers faced some challenges while selecting outdoor flooring materials. Some of the challenges faced were difficulty in choosing the right flooring material for the purpose for which the flooring is meant for. After laying the flooring none of them had faced any problems in the use of flooring material so far, as the respondents did not spare any effort to choose the right material. Hence all

the samples surveyed were satisfied with the flooring material used in the outdoor.

Forty four per cent of the samples surveyed were highly satisfied and 56 per cent of the people were satisfied by the use of outdoor flooring material in their construction.

2. Results of the Residential Survey

A household survey collects comprehensive and diverse socio demographic data pertaining to conditions under which people live, their welfare, demographic characteristics and cultural factors which influence behaviours, as well as social and economic changes. Household surveys are one of the most important sources of social and demographic statistics (sogosurvey.com). The data received from the selected 50 households are presented under the following headings.

f. General Family Background of the Respondents
g. Details of their Residential Space
h. Details on Outdoor Area Provided
i. Details on Outdoor Flooring Materials Used
j. The Respondents Views towards Use of Outdoor Flooring Materials

a. General Family Background of the Respondents

Table VII discusses about the general family background of the respondents, gender, age, occupation, and total number of members on the family, size of family and type of family.

Table- VII

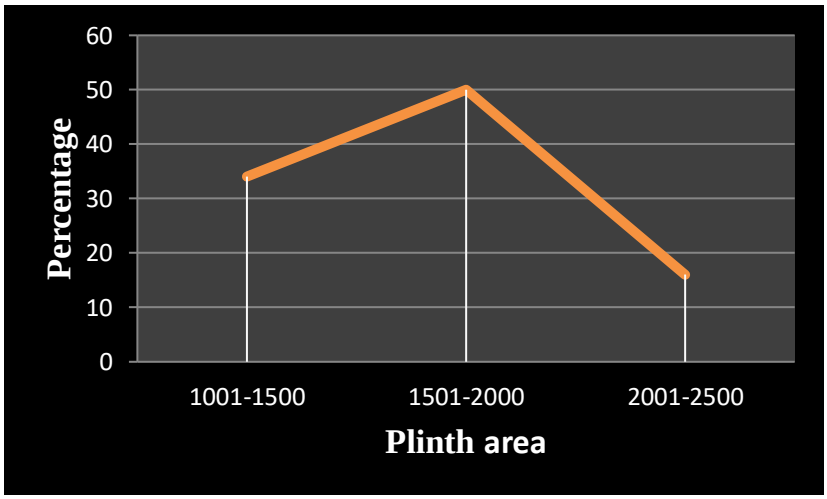
General Family Background of the Respondents

General information	Number of owners responded	
	N=50	Percentage
Gender		
➢ Male	18	36
➢ Female	32	64
Age group		
➢ 26-45	24	48
➢ 46-65	26	52
Occupation		
➢ Employed	22	44
➢ Self employed	7	14
➢ House wife	21	42
Income (Rs)		
➢ Below 35,000	9	18
➢ 35,000-55,000	12	24
➢ Above 55,0000	8	16
Total number of members		
➢ 3-4	34	68
➢ 5-6	16	32
Size of family		
➢ Small	15	30
➢ Medium	29	58
➢ Large	6	12
Type of family		
➢ Nuclear	34	68
➢ Joint	16	32

Regarding the gender of the selected respondents (owners of the house) 64 per cent were female while the remaining 36 per cent were male. Regarding the age group of the respondents maximum 52 per cent of the sample belonged to the age group between 46-65 yrs. Among the selected samples 22 per cent were employed, 21 per cent were house wives and seven per cent were self employed. The income group of the selected samples when analyzed the annual income of maximum 24 per cent were ranging between Rs 35,000- 55,000. Among the samples surveyed total members in the family of 68 per cent ranged between 3-4. Maximum fifty eight per cent of samples were classified under medium size. Maximum 68 per cent of the family's type was nuclear.

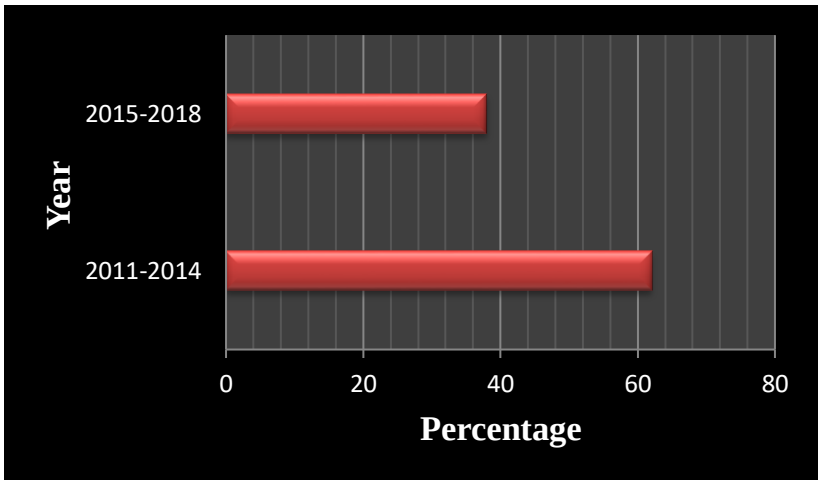
b. Details of their Residential Space

The information on the plinth area, year of construction, type of house, planning of house, number of rooms in the house are represented in Table VIII and Figure 6, 7 and 8.



Plinth Area

Figure- 6



Year of Construction

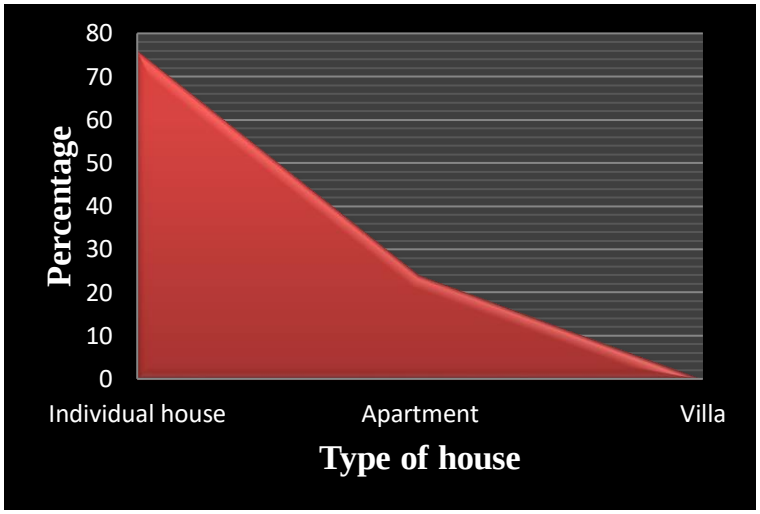
Figure- 7

Regarding the plinth area of the residential buildings surveyed maximum 50 per cent had covered an area ranging between 1501-2000 sq.ft. They had constructed the building only recently. The year of construction of a building influenced the material used in it. The information among maximum 62 per cent of commercial building surveyed was constructed during the year 2011-2014.

Table- VIII

Type of House

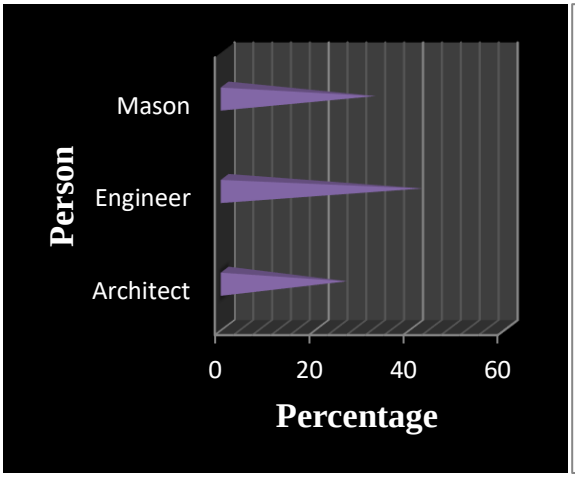
Type of house	Percentage
Individual house	76
Apartment	24



Type of House

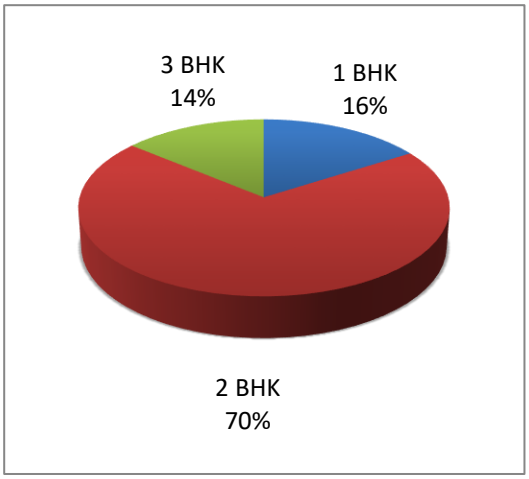
Figure- 8

Among the houses surveyed in which the respondents were residing, it was found that 76 per cent of them were living in individual house and 24 per cent were living in apartments. None of them were residing in individual villas.



Person Who Planned the House

Figure- 9



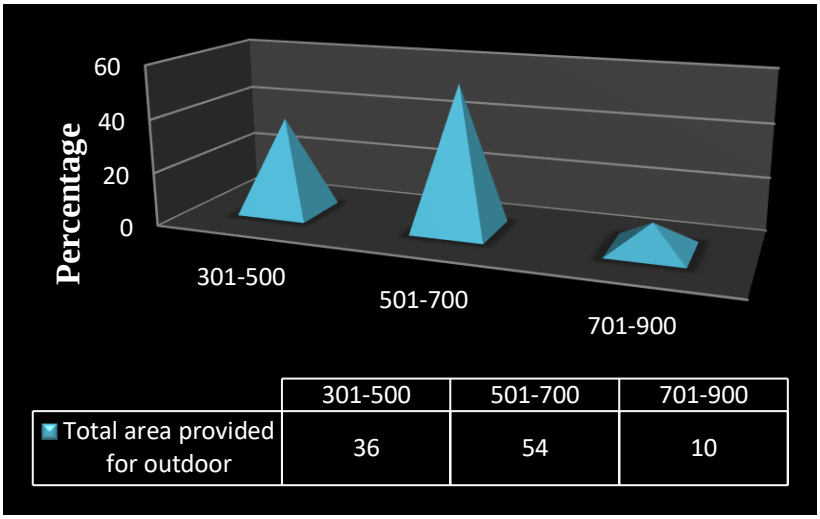
No of Rooms in the House

Figure- 10

Today any house is being planned with the help of an engineer, architect or at the least with the advice of mason. The survey revealed that 42 per cent of the surveyed houses were constructed by qualified civil engineers. Similarly among the surveyed houses maximum 70 per cent of the houses were 2 BHK houses.

c. Details on Outdoor Area Provided

According to corporation guidelines one has to leave 10 ft in the front for the approval of the plan of a building. However the area allocated for each building varied in the front and at the back of the building. The outdoor area provided for the surveyed residences are given in the Figure 11.



	301-500	501-700	701-900
Total area provided for outdoor	36	54	10

Plinth Area Provided for Outdoor

Figure- 11

Nowadays people give more importance to the outdoor area for their comfort and convenience. Thirty six per cent of the people had left 301-500 sq.ft, 54 per cent of the people had provided 501-700 sq.ft and 10 per cent of people had allotted 701-900 sq.ft for outdoor area.

Table IX shows the purposes for which the outdoor area was used in the surveyed residences.

Table- IX

Uses of the Outdoor Area

Use	Number of owners responded	
	N=50	*Percentage
Car parking	33	66
Drying clothes	21	42
Potted plants	17	34
Play area	12	24
Rest and relaxation	8	16

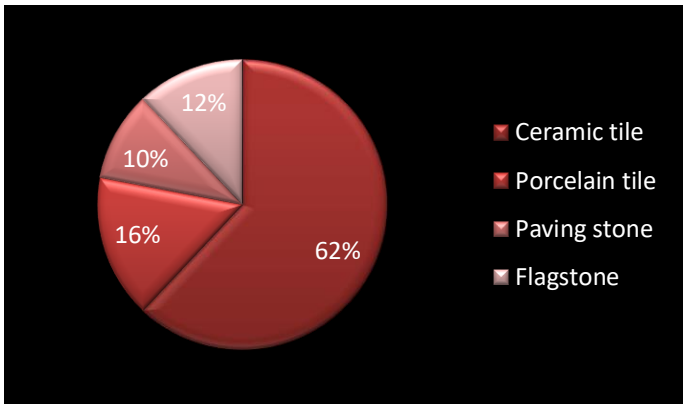
*Total exceeds 100 due to multiple responses

Outdoor area plays a major role in every residence, which was mainly used for various purposes. Among the selected samples 66 per cent of people revealed that they used the space for car parking. The outdoor area was utilized for drying clothes among 42 per cent of the surveyed houses. Thirty four per cent of people stated that they had kept potted plants to enhance the appearance of the building. Among the families which have small children (24 per cent) the open space was used as play area for the children. Minimum 16 per cent of them rested and relaxed in the outdoor space especially in the evening.

d. Details on Outdoor Flooring Materials Used

This part of the results present details on type of flooring material used, its material and labour cost, reasons behind selecting the material, the person responsible for selection and place of purchasing the materials.

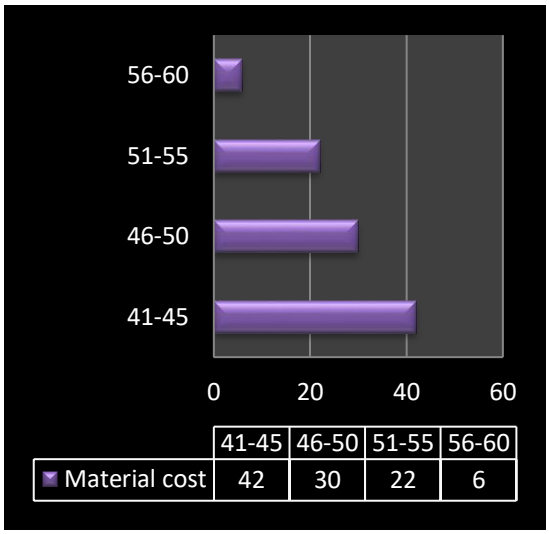
The type of flooring materials used in the selected residences is represented in Figure 12.



Type of Flooring Material Used

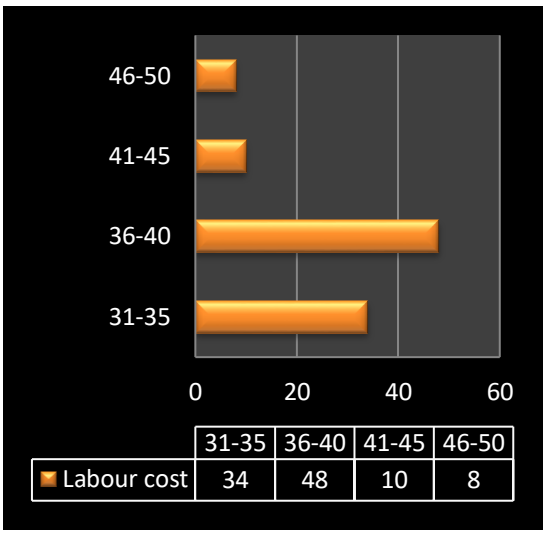
Figure- 12

Ceramic tile (62 per cent) is the most commonly used flooring materials for outdoor flooring in the selected residences. Porcelain (16 per cent), paving stone (10 per cent), and flagstone (12 per cent) were the other materials used for outdoor flooring.



Material Cost

Figure- 13



Labour Cost

Figure- 14

The materials required for laying outdoor flooring materials varied with the type of material used and the process involved in laying the floor. The material cost of the outdoor flooring material layed by the selected respondents ranged from Rs 41-45 in 42 per cent, Rs 46-50 among 30 per cent, Rs 51-55 in 22 per cent and Rs 56-60 among six per cent. The labour cost varied from Rs 31-35 (34 per cent), Rs 36-40 (48 per cent), Rs 41-45 (10 per cent), Rs 46-50 (8 per cent) in the selected residences.

Before selecting an outdoor flooring material people used to enquire about the flooring materials from the shops, friends and relatives who had already layed the flooring. The reasons for choosing the selected flooring material are given in Table X.

Table- X

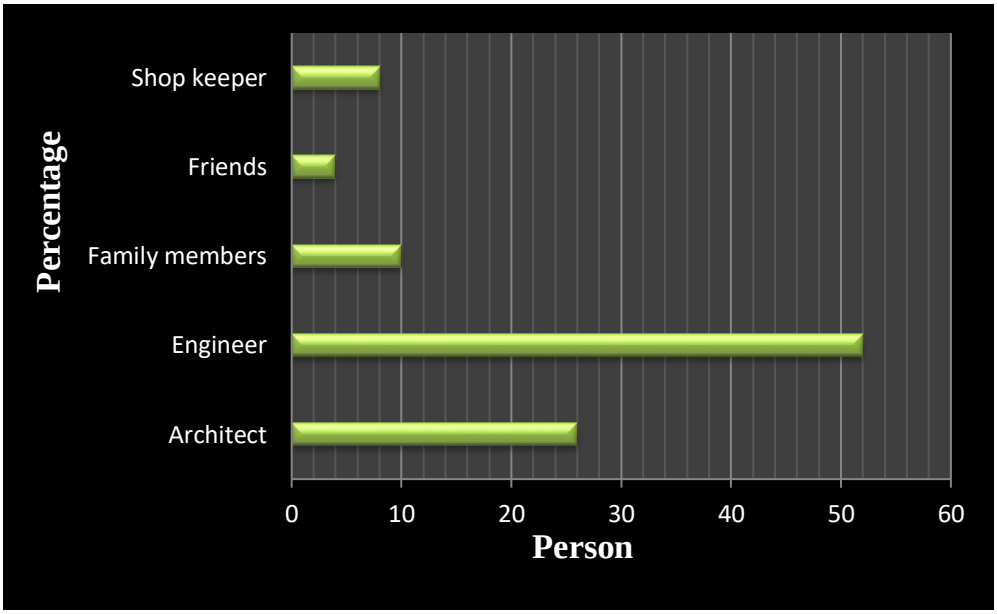
Reasons for Choosing the Selected Flooring Material

Reasons	Number of owners responded	
	N=50	*Percentage
Cost	47	94
Slip resistant	43	86
Comfort	41	82
Durability	33	66
Trendy	24	48
Texture	22	44
Aesthetics	19	38

*Total exceeds 100 due to multiple responses

Cost of the flooring materials was given priority in the selection by majority 94 per cent of the surveyed individuals followed by slip resistance (86 per cent), comfort to use (82 per cent), and durability (32 per cent). Aesthetics was given importance only among 38 per cent of the respondents. This reveals the fact that the selected respondents did not select the outdoor flooring material based on appearance only.

Though the owners of the house had some expectations regarding the outdoor flooring materials, they also had consulted other people before the selection of the flooring material. The person who suggested the flooring material is given in Figure 15.



Person Who Suggested this Flooring Material

Figure- 15

Recently the trend of constructing the building has changed. Whatever may be the income group people mostly prefer to engage a civil engineer or architect to construct their houses. The survey reveals the fact either the engineer (52 per cent) or the architect (26 per cent) whoever is involved in constructing the building took a major decision in selecting the flooring material also. They also took the suggestion of family members (10 per cent), sales person (8 per cent) and friends (4 per cent).

Since the selected respondents were from Kovai Thiru nagar and Bharathi park road they had purchased flooring materials from nearby shops located in the areas such as R.S.Puram (36 per cent), Avinashi road (34 per cent), Mettupalayam road (18 per cent) and Brooke Bond road (12 per cent). The reasons for purchasing in these places are nearness to locality and familiarity of the shops.

e. The Respondents Views towards Outdoor Flooring Materials Used

According to the views of the respondents towards satisfaction in the performance of the outdoor flooring material, all of them were satisfied with the performance towards slip resistance and water proof. While purchasing the flooring material they did not face any challenges.

B.RESULTS OF THE MARKET SURVEY

Market survey is the survey of research and analysis of the market for a particular product or service which includes the investigation into customer inclinations. It is a study of various customer capabilities such as investment attributes and buying potential (www.questionpro.com). The data received from the selected 25 shops which sell outdoor flooring materials are presented under following headings

1. General Information of the Shops Surveyed
2. Information on Outdoor Flooring Materials Available in the Shop
3. Details Regarding Types of Customers
4. Purchase and Sales Details of the Shops
5. Views of Shop Owners Regarding the Outdoor Flooring Material

1. General Information of the Shops Surveyed

This part of the study discusses about the general information of the selected 25 shops. Table XI gives information on the area of the shop, year of establishment, type of building, number of members working in the shop and godown, nature of business, service rendered by the shop and satisfaction regarding their business.

Table- XI

General Information of the Shop Surveyed

General information	Number of shops N=25	Percentage
Area (sq.ft) Showroom		
➢ 1000-2000	11	44
➢ 2000-3000	9	36
➢ 3000-4000	5	20
➢ 4000-5000	1	4
Godown (N= 10)		
➢ 500-1000	4	40
➢ 1000-1500	3	30
➢ 1500-2000	1	10
➢ 2000-2500	2	20
Type of building		
➢ Own	17	68
➢ Rental	8	32
Year of establishment		
➢ 1986-1995	9	36
➢ 1996-2005	11	44
➢ 2006-2015	5	20
Members working		
➢ 1-10	16	64
➢ 11-20	9	36
Members working in the godown		
➢ 1-10	7	28
➢ 11-20	2	8
➢ 20-30	1	4

The showroom of maximum 44 per cent of the shops surveyed enclosed an area 1000-2000 sq.ft. Similarly among 40 per cent of the shops which had a godown maximum 40 per cent covered an area of 400- 500 sq.ft. Regarding the year of establishment of the shops surveyed maximum 44 per cent of the shops were initiated during the year 1996-2005. In maximum 64 per cent of the shops 1-5 members were working and were taking up different responsibilities as sales person and manager. Similarly among 10 shops which had a godown 55 per cent had engaged 1-5 members to take up various responsibilities. Other than sales only four per cent of the shops extended their service in laying of the flooring material. Only 44 per cent offered door delivery for the customers. Hundred percent of the shop owners expressed their satisfaction regarding business.

2. Details on Outdoor Flooring Materials Available in the Shop

Table XII discusses about the sizes, thickness, quality, price, slip resistance, suitability for residential or commercial use and demand of different types of outdoor flooring materials available in the selected shops. Among the selected 25 shops ceramic and porcelain tiles were available in all the shops (100 percent), concrete tile was available in 19 shops (76 per cent), flagstone tile was seen in 22 shops (88 per cent) and paving stone was stocked in 14 shops (52 per cent). The details of the tiles available are discussed in the following Table.

Table- XII

Details on Availability of Outdoor Flooring Materials in the Shop

	Ceramic and porcelain tile		Concrete tile		Flagstone tile		Paving stone	
	N=25	%	N=25	%	N=25	%	N=25	%
Sizes (ft)								
(12x12)	25	100	19	76	22	88	14	56
(24x24)	10	40	8	32	9	36	6	24
(30x30)	3	12	5	20	-	-	-	-
Thickness								
1/2 ”	25	100	19	76	22	88	14	56
3/4 ”	10	40	8	32	9	36	6	24
Quality								
Excellent	18	72	-	-	9	36	10	40
Very good	7	28	16	64	10	10	4	16
Good	-	-	3	12	3	12	-	-
Price (Rs)								
(31-40)	16	64	14	56	19	76	14	56
(41-50)	9	36	5	20	3	12	-	-
Suitability								
Residential	19	76	9	36	15		-	
Commercial	-	-	4	16	4	16	10	40
Both	6	24	6	24	3	12	4	16
Demand								
High	21	84	13	52	7	28	14	56
Moderate	4	16	6	24	15	60	-	-

From the Table above it is understood that the tiles were available in standard sizes of 12x12 inches, 24x24 inches and 30x30 inches. The thickness of tiles was also available in ¼ inch and ¾ inch in case of ceramic, concrete, flagstone and paving stone tile. The quality of outdoor flooring materials has been rated as excellent for ceramic tile among 72 per cent of the shops. Maximum 64 per cent of the shop owners rated concrete tile as good. Regarding the price of the flooring materials all the four materials were rated as affordable by maximum 56-76 per cent of the owner of the shop. Similarly all the materials were designed to be slip resistance being an outdoor flooring material. Hence these materials were identified as suitable material for both residential and commercial purpose. Demand was considered as high and moderate for all the materials. To be specific ceramic and porcelain tiles plays a major role in outdoor flooring and the demand rate was high for the materials (84 per cent) followed by concrete (52 per cent), flagstone (28 per cent), and paving stone (56 per cent). The moderately demand flooring materials are ceramic and porcelain tile (16 per cent), concrete tile (24 per cent), flagstone tile (60 per cent).

3. Details Regarding Type of Customers

Table XIII, and figure 16 and 17 indicates the type of clients, source of information for the customers related to the outdoor flooring material.

Table- XIII

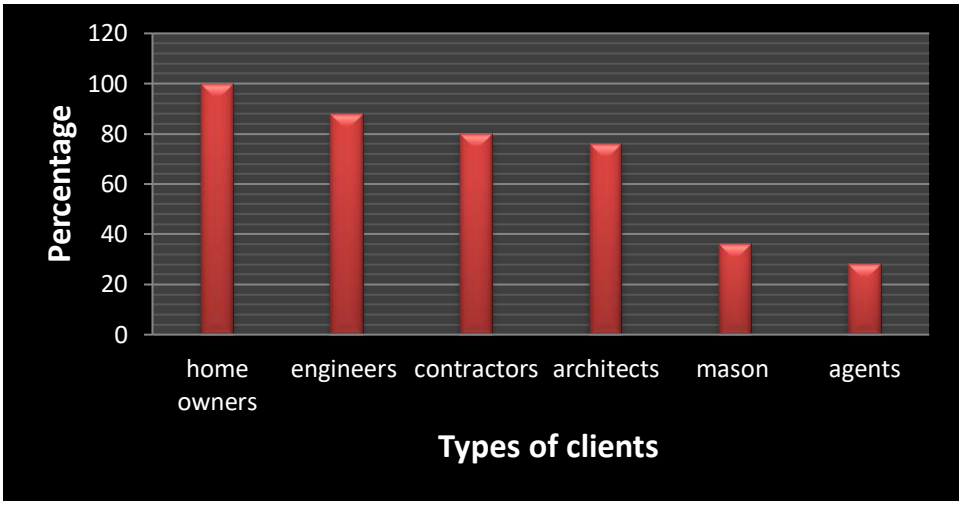
Type of Customers and Sources of Information on Flooring Materials

Details	N=25	*Percentage
Types of customers		
➢ Home owners	25	100
➢ Engineers	22	88
➢ Contractors	20	80
➢ Architects	19	76
➢ Mason	9	36
➢ Agents	7	28
Source of information		
➢ Engineers	20	80
➢ Advertisements	18	72
➢ Architects	17	69
➢ Agents	11	44
➢ Magazines	10	40
➢ Contractors	9	36

*Total exceeds 100 due to multiple responses

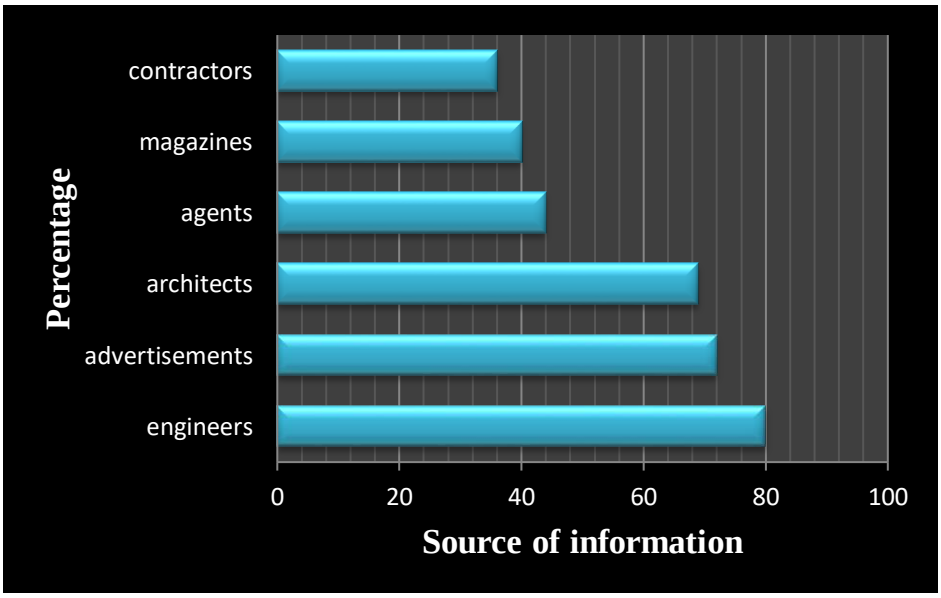
The shop owners informed that they received all type of customers. Hundred percent of the home owners visited their shop. The respondents also informed that above 75 per cent of engineers, contractors and architects also came to their shop for purchase of outdoor flooring materials.

The shop owners also informed that their clients had obtained the information maximum through engineers (80 per cent), advertisements (72 per cent) and architects (69 per cent).



Types of Clients

Figure- 16



Source of Information on Flooring Material

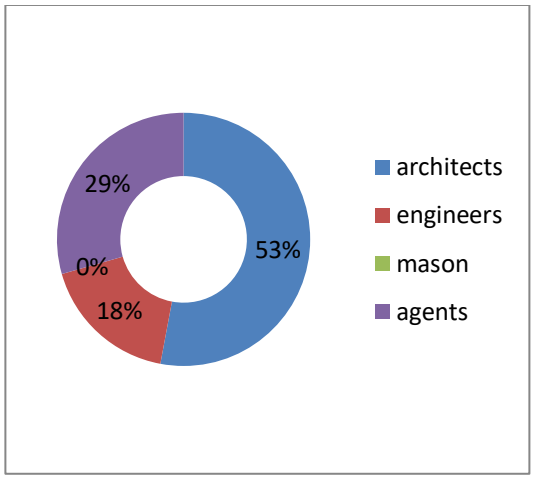
Figure – 17

The selected shops conveyed the message about their shops to the customers regarding the availability of outdoor materials through

advertisements (72 per cent), newspaper (60 per cent), magazines (40 per cent) and TV (28 per cent).

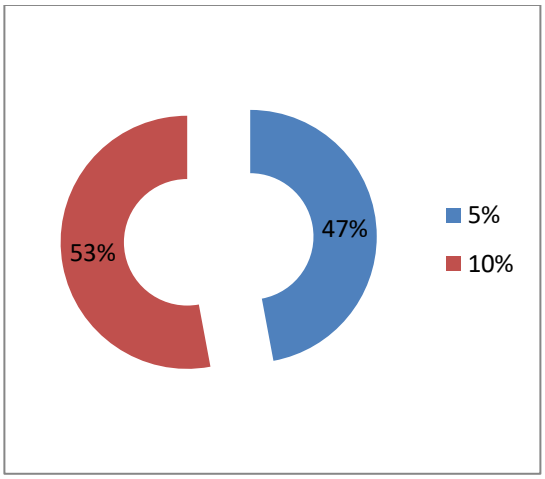
4. Purchase and Sales Details of the Shops

Information on the commission given to their customers who were involved in construction field, place of purchasing the flooring materials is represented in Figure 18 and 19.



Commission Given by the Shop Owners

Figure- 18



Percentage of Commission Given by Shop Owners

Figure- 19

Out of 25 shops surveyed only 17 shops gave commission for the following customers involved in the construction field. Thirty six per cent gave commission to the architects who came to purchase for clients. There were agents (20 per cent) who purchased the materials for the customers and got the commission from the shop owners. Similarly they also gave commission to engineer who purchased for their clients (12 per cent). The percentage of commission ranged between 5-10%.

The shop owners purchased the products from local as well as other metropolitan cities for their sales. Either they went inperson or placed orders through online or through agents. The frequency of purchase of the flooring materials varied based on the on the demand of the products. Table XIV gives information on the place of purchase of the outdoor flooring material.

Table- XIV

Place of Purchase of the Outdoor Flooring Material

Place	N=25	*Percentage
Local	25	100
Gujarat	9	36
Chennai	6	24
Rajasthan	5	20
Bangalore	3	12
Mumbai	2	8

*Total exceeds 100 due to multiple responses

The flooring materials such as pavements and concrete slabs were available locally. Hence all of them purchased the flooring materials from local manufacturers. However the selected shop owners purchased the flooring materials such as ceramic, porcelain and flagstone tile from Gujarat (36 per cent), Rajasthan (20 per cent), Mumbai (8 per cent), Chennai (24 per cent) and Bangalore (12 per cent). Flagstone was also available within Tamilnadu.

Person responsible for purchasing the outdoor flooring materials for the concerned shop were accountant (36 per cent), sales person (28 per cent), owner (24 per cent) and manger (12 per cent).

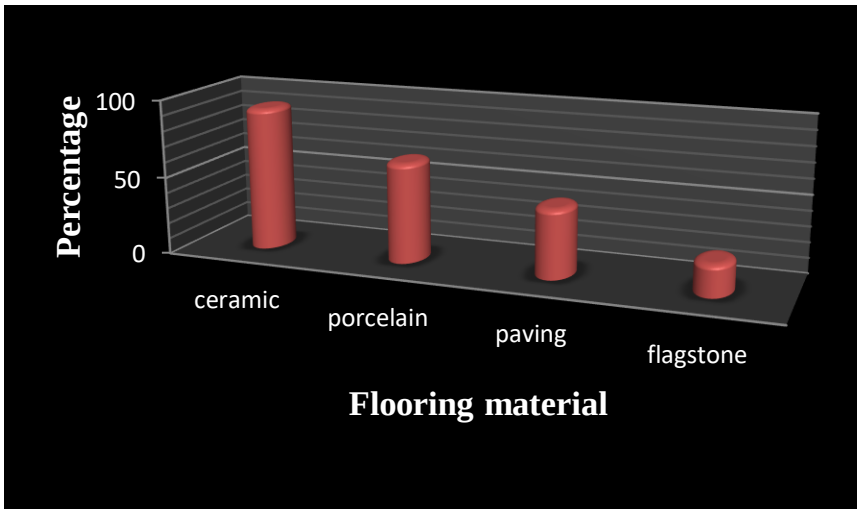
Table XV and Figure 20 give details on flooring materials commonly demanded by the customers of the shop owners.

Table- XV

Flooring Materials Demanded by the Customers

Flooring material	N=25	*Percentage
Ceramic tile	23	92
Porcelain	16	64
Paving	11	44
Flag stone	5	20

*Total exceeds 100 due to multiple responses



Demanded by the Customers

Figure- 20

Table XIV and figure 20 indicates that maximum ceramic tile 92 per cent was demanded by the customers. Porcelain was purchased by 64 per cent, paving stone 44 per cent and flagstone 20 per cent of their customers.

Thus it could be inferred that the outdoor flooring material varied with the customers wish.

5. Views of Shop Owners Regarding the Outdoor Flooring Material

This part of the topic gives the information on the views of the shop owners on the advantages of outdoor flooring materials and most ideal flooring material for commercial and residential purpose.

According to the views of the shop owners the requirement of using outdoor flooring materials are ease of cleaning and maintaining, aesthetic look, comfort to walk on the surface and slip resistance. The porcelain, ceramic, paving stone and flagstone satisfies the above said requirements by above 75 per cent. Hence as per their perception these materials were considered as ideal flooring material for residential and commercial purpose.

SUMMARY AND CONCLUSION

V. SUMMARY AND CONCLUSION

Floors are horizontal flat surfaces meant for walking, running, jumping or dancing. They are also used for supporting furniture. The floors also take a certain amount of wheel traffic, for example, vacuum cleaners, trolleys, children's toys etc. Floors also get the greatest wear and most dirt than any part of the house. Floor materials contribute to the expressive character of the whole house. Floor materials can be used to define and separate areas without benefit of walls, suggest traffic patterns and can be dominated or subordinate in character. Floors are the only areas that undergo maximum wear and tear caused by man and machine.

With this concept in mind the investigator took up the study on "Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City" with the following objectives:

- To find out the availability of outdoor flooring materials in the market for use in the residence
- To observe the outdoor flooring materials commonly used in recently constructed residential and commercial buildings
- To gather information among recently constructed residential and commercial buildings about their satisfaction towards using the flooring materials in their construction

The survey was conducted in two phases. In phase one survey was conducted among owners of 25 commercial buildings located in R.S.Puram, Saibaba colony and Mettupalayam road. and owners of 50 residential buildings located in Kovai Thiru nagar and Bharathi park road. In phase two a market survey was conducted among the owners of the shops which sell outdoor flooring materials located in R.S. Puram, Saibaba colony and Brooke bond road. These were selected on the basis of purposive sampling.

The highlights of the study are summarized under the following headings given below:

C. Results of the Survey Conducted in Commercial and Residential Buildings
D. Results of the Market Survey

A. Results of the Survey Conducted in Commercial and Residential Buildings

1. Results of the Commercial Survey

Interior design is gaining popularity and people have started to give greater importance for it being residential or commercial interiors. Residential interiors are decorated due to the status or living style of the families residing in the house or due to the taste of the owners of the house. Due to the change in attitude towards interior design, their aptitude to develop the style in the interior and exterior is gaining importance. In order to improve the sales commercial interiors are also gaining momentum in decorating the interior as well as exterior. The survey conducted to gather details about the general information revealed that maximum 44 per cent of the commercial buildings surveyed were shops which sell special products like readymade garments, sweets and savouries, cell phones, bakeries and confectionaries. Twenty eight per cent of the commercial buildings were stores, 16 percent were offices and 12 per cent were boutiques. All these commercial buildings needed to attract its customers. Hence decorating the interiors become inevitable.

Maximum 52 per cent of the commercial buildings were established during the year 2010-2012. The plinth area of maximum 52 per cent of the commercial buildings ranged between 1600- 1900 sq.ft. Irrespective of the type of shop or commercial building all of them were satisfied with their business. Majority 82 per cent of the surveyed individuals informed that they were the sole owner for the building.

The outdoor spaces provided in a commercial building added to the value of the building. Hence, the owners of the buildings have allocated space in front of the commercial building. The survey informed that maximum 64 per cent of the samples surveyed had provided 400-600 sq.ft in front of the building.

All the selected 25 commercial interiors (100 percent) gave importance for parking the vehicles in the outdoor area. Twenty eight per cent of commercial space used the outdoor area for decorating with the potted plants. Customers are the most important persons for commercial purposes. Only 12 per cent of the people provided outdoor area for relaxation of the customers.

Today the market is flooded with outdoor flooring materials in order to satisfy the needs of the people. However the survey revealed only 68 per cent of samples had awareness on the different type of outdoor flooring materials available in the market. The survey revealed the fact that maximum 44 per cent of the samples surveyed had used paving stones due to its convenience, easy availability, ease of laying and possibilities of relaying without much damage. Different types of paving stones were mostly available in the market. Hence paving stones were widely used in the commercial space surveyed. Other materials available were porcelain tile (24 per cent), ceramic tile (16 per cent) and flagstone (12 per cent).

The cost of the outdoor flooring material varied with the cost of material and year of purchase. The cost of the flooring material used by the commercial owners of maximum 52 per cent varied between Rs 41-45 per sq.ft. Generally people do not go for very expensive material for outdoor flooring material. That is observed in the survey. Cost of labour is also calculated for per square feet. Maximum 40 per cent of the surveyed population revealed that they had spent Rs 36-40 per sq.ft while 12 per cent informed that they had expended Rs 46-50 per sq.ft for as the labour cost for laying the outdoor flooring. The number of days required for laying the flooring material varied with the intricacy involved in laying the flooring and the area to be covered. However the survey showed that maximum 52 per cent of the samples surveyed required only 1-3 days for laying the outdoor flooring.

The persons who suggested the selected flooring materials for the respondents were engineers (48 per cent), architects (24 per cent), sales person (16 per cent) and family members (12 per cent). Ninety six per cent of people surveyed considered reasonable cost as the main factor for choosing the specific flooring material they had used, 84 per cent of the samples selected based on the comfort of the flooring material and 76 per cent of people chose the flooring material because of its durability. Slip resistant is the most important factor considered while choosing outdoor flooring material. Only 60 per cent of the owners of commercial buildings selected the outdoor flooring material based on its slip resistance, while 48 per cent of the surveyed samples gave importance for aesthetic look and 36 per cent selected for its trendy look. Only 24 per cent of the samples selected the flooring material based on its texture.

The views of the respondents about the performance of outdoor flooring materials they had used in their commercial buildings. The performance of the flooring material was assessed based on its comfort in use, slip resistance and water resistance.

2. Results of the residential survey

Regarding the gender of the selected respondents (owners of the house) 64 per cent were female while the remaining 36 per cent were male. Regarding the age group of the respondents maximum 52 per cent of the samples belonged to the age group between 46-65 yrs. Among the selected samples 22 per cent were employed, 21 per cent were house wife and seven per cent were self employed. The income group of the selected samples when analyzed the annual income of maximum 24 per cent were ranging between Rs 35,000- 55,000. Among the samples surveyed total members in the family of 68 per cent ranged between 3-4. Maximum fifty eight per cent of samples were classified under medium size. Maximum 68 per cent of the family's type was nuclear.

Regarding the plinth area of the residential buildings surveyed maximum 50 per cent had covered an area ranging between 1501-2000 sq.ft. They had constructed the building only recently. The year of construction of a building influenced the material used in it.

Among the houses surveyed in which the respondents were residing it was found that 76 per cent of them were living in individual house and 24 per cent were living in apartments.

Today any house is being planned with the help of an engineer, architect or at the least with the advice of mason. The survey revealed that 42 per cent of the surveyed houses were constructed by qualified civil engineers.

Similarly among the surveyed houses maximum 70 per cent of the houses were 2 BHK houses.

Nowadays people give more importance to the outdoor area for their comfort and convenience. Thirty six per cent of the people had left 301-500 sq.ft, 54 per cent of the people had provided 501-700 sq.ft and 10 per cent of people had allotted 701-900 sq.ft for outdoor area. Outdoor area plays a major role in every residence, which was mainly used for various purposes. Among the selected samples 66 per cent of people revealed that they used the space for car parking. The outdoor area was also utilized for drying clothes. Thirty four per cent of people stated that they had kept potted plants to enhance the appearance of the building, play area for the children and for rest and relaxation.

Ceramic tile (62 per cent) is the most commonly used flooring materials for outdoor flooring in the selected residences. Porcelain (16 per cent), paving stone (10 per cent), and flagstone (12 per cent) were the other materials used for outdoor flooring. The materials required for laying outdoor flooring materials varied with the type of material used and the process involved in laying the floor. The material cost of the outdoor flooring material layed by the selected respondents ranged from Rs 41-45 per sq.ft among maximum 42 per cent of the households. The labour cost varied from Rs 31-50 per sq.ft in the selected residences.

Cost of the flooring materials was given priority in the selection by majority 94 per cent of the surveyed individuals followed by slip resistance (86 per cent), comfort to use (82 per cent), and durability (32 per cent). Aesthetics was given importance only among 38 per cent of the respondents.

Recently the trend of constructing the building has changed. Whatever may be the income group mostly people prefer to engage a civil engineer or architect to construct their houses. The survey reveals the fact either the

engineer (52 per cent) or the architect (26 per cent) whoever is involved in constructing the building took a major decision in selecting the flooring material.

Since the selected respondents were from Kovai Thiru nagar and Bharathi park road they had purchased flooring materials from nearby shops located in the areas such as R.S.Puram (36 per cent), Avinashi road (34 per cent), Mettupalayam road (18 per cent) and Brooke Bond road (12 per cent).

According to the views of the respondents towards satisfaction in the performance of the outdoor flooring material, all of them were satisfied with the performance towards slip resistance and water proof. While purchasing the flooring material they did not face any challenges.

B.Results of the Market Survey

The showroom of maximum 44 per cent of the shops surveyed covered an area 1000-2000 sq.ft. Similarly among 40 per cent of the shops which had a godown maximum 40 per cent occupied an area of 400- 500 sq.ft. Regarding the year of establishment of the shops surveyed maximum 44 per cent of the shops were initiated during the year 1996-2005. In maximum 64 per cent of the shops 1-5 members were working and were taking up different responsibilities as sales person and manager. Similarly among 10 shops which had a godown 55 per cent had engaged 1-5 members to take up various responsibilities. Other than sales only four per cent of the shops extended their service in laying of the flooring material. Only 44 per cent offered door delivery for the customers. Hundred percent of the shop owners expressed their satisfaction regarding business.

Among the selected 25 shops ceramic and porcelain tiles were available in all the shops (100 percent), concrete tiles was available in 19 shops (76 per cent), flagstone tiles was seen in 22 shops (88 per cent) and paving stones was stocked in 14 shops (52 per cent). The tiles were available in standard sizes of 12x12 inches, 24x24 inches and 30x30 inches. The thickness of tiles was also available in ¼ inch and ¾ inch incase of ceramic, concrete, flagstone and paving stone tile. The quality of outdoor flooring materials has been rated as excellent for ceramic tile among 72 per cent of the shops. Maximum 64 per cent of the shop owners rated concrete tile as good. Regarding the price of the flooring materials all the four materials were rated as affordable by maximum 56-76 per cent of the owners of the shop. Similarly all the materials were designed to be slip resistance being an outdoor flooring material. Hence these materials were identified as suitable material for both residential and commercial purpose. Demand was considered as high to moderate for all the materials. To be specific ceramic and porcelain tiles played a major role in outdoor flooring and the demand rate was high for the materials (84 per cent). The moderately demand flooring materials were flagstone tile (60 per cent), concrete tile (24 per cent), ceramic and porcelain tile (16 per cent).

The shop owners informed that they received all type of customers. Hundred percent of the home owners before finalising the outdoor floor covering visited their shop. The respondents also informed that above 75 per cent of engineers, contractors and architects also came to their shop for purchase of outdoor flooring materials. The shop owners also informed that their clients had obtained the information maximum from engineers (80 per cent), advertisements (72 per cent) and architects (69 per cent).

Out of 25 shops surveyed only 17 shops gave commission for the customers who were in the construction field. Thirty six per cent gave commission to the architects who came to purchase for clients. There were

agents also (20 per cent) who purchased the materials for the customers and got the commission from the shop owners. Similarly they also gave commission to engineer who purchased for their clients (12 per cent). The percentage of commission ranged between 5-10 per cent of the cost of material.

The shop owners purchased the products from local as well as other metropolitan cities for their sales. Either they went inperson or placed orders through online or through agents. The flooring materials such as pavements and concrete slabs were available locally. Hence all of them purchased the flooring materials from local manufacturers. However the selected shop owners purchased the flooring materials such as ceramic, porcelain and flagstone tile from Gujarat, Rajasthan, Mumbai, Chennai and Bangalore. Person responsible for purchasing the outdoor flooring materials for the concerned shop were accountant (36 per cent), sales person (28 per cent), owner (24 per cent) and manger (12 per cent). Maximum ceramic tile (92 per cent) was demanded by the customers. Porcelain was purchased by 64 per cent, paving stone by 44 per cent and flagstone by 20 per cent of their customers. Thus it could be inferred that the outdoor flooring material varied with the customers taste.

According to the views of the shop owners the requirements of a good outdoor flooring materials are ease of cleaning and maintaining, aesthetic look, comfort to walk on the surface and slip resistance. The porcelain, ceramic, paving stone and flagstone satisfies the above said requirement by above 75 per cent. Hence as per their perception these materials were considered as ideal flooring material for residential and commercial purpose.

CONCLUSION:

Flooring plays a major role in every part of the house. Nowadays there are various outdoor flooring materials available in the market and people also give more importance to the outdoor flooring in their construction. This study helps to identify the suitable flooring material for the residential and commercial buildings. People mostly use ceramic, porcelain, concrete, flagstone and paving stone for their residences and also in commercial buildings. It should be durable, easy to clean and maintain, comfortable to walk on the surface and slip resistance. Throughout the centuries, even in very primitive culture various type of flooring have been used for very much the same reasons that we use today. The consumer today is faced with a wide range of possible flooring. In all probability, colour, texture and price were the factors that have the strongest influence on one's choice. It is important for professional interior designers as well as residential designers should have an awareness about the expectations of their clients. Commercial designers normally are familiar with the available material, but for the residential designers this project may give them knowledge about the outdoor flooring materials and their requirement.

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LIST OF APPENDICES

APPENDIX I

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women

Deemed to be University Under category 'A' By MHRD, (Estd. u/s 3 of UGC Act 1956)

Re Accredited with 'A' Grade By NAAC, Recognised by UGC Under Section 12 B

Coimbatore - 641043, Tamil Nadu, India

Seek and Ye Shall Find

24 January 2019

To
Ms. S.Kavipriya
Department of Resource Management
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore – 641 043

Dear S. Kavipriya,

Ref: Your proposal No. IHEC /18-19/IDRM/09 entitled "Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City" submitted for approval to the IHEC on 30.09.18

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No. IHEC /18-19/IDRM/09 entitled "Availability and Use of Outdoor Flooring Materials in Recently Constructed Residential and Commercial Buildings of Coimbatore City" submitted by you. The Approval number for the same is AUW/IHEC/IDRM-18-19/XMT-09.

We wish you all the best in your research endeavours.

Regards,

S. Uma Mageshwari

Dr.S.Uma Mageshwari
Member Secretary

Institutional Human Ethics Committee

APPENDIX II

INTERVIEW SCHEDULE TO ELICT INFORMATION FROM OWNERS OF COMMERCIAL SPACES ABOUT THE USE OF OUTDOOR FLOORING MATERIAL

1) Name of the interviewer:
2) Name of the interviewee:
3) Name of the shop/ store/ office:
4) Name of the owner:
5) Address:
6) E-mail id:
7) Contact no:
8) Year of establishment:
9) Plinth area (sq.ft):
10) Is your business satisfactory? □yes □no
11) What are the legal rights of the firm?
□owner □partnership
12) Are you aware of different types of outdoor flooring materials available in the market? □yes □no
13) Type of flooring materials used for outdoor

_____

14) What is the total square feet of the outdoor area?
15) What is the purpose of the outdoor area?
□vehicle parking □potted plants
□for customers to relaxation □any other specify
16) What type of outdoor flooring materials used in your construction?

_____

17) Who suggested this flooring material for you?
□architect □engineer □ family members
□friends □shopkeeper □others

18) Purpose for choosing the flooring material for your outdoor area?

□comfort □cost □durability

□aesthetic □slip resistance □texture

19) Expenditure on outdoor flooring materials per square feet?

Material cost Labour cost

20) Total number of days taken to fix the flooring material?

21) Is the flooring material comfortable for you to walk on the surface?

□yes □no

If no, specify the problem _____

22) Is it slip resistant? □yes □no

23) Is it water proof? □yes □no

24) Are you satisfied by the use of outdoor flooring material?

□yes □no

25) Did you face any challenges while selecting outdoor flooring materials?

□yes □no

If yes specify the challenges _____

26) Did you face any problems after installing outdoor flooring material?

□yes □no

If yes specify the problems _____

27) Level of satisfaction by using this flooring material

□highly satisfied □satisfied

□not satisfied

APPENDIX III

AN INTERVIEW SCHEDULE TO COLLECT INFORMATION ON THE USE OF OUTDOOR FLOORING MATERIALS IN RESIDENTIAL BUILDINGS OF COIMBATORE CITY.

1) Name of the interviewer:
2) Name of the interviewee:

General family background

3) Name of the head of the family:
4) Contact address:
5) E-mail id:
6) Contact no:
7) Total number of members in the family?
8) Size of the family

□small □medium □large

9) Type of family

□joint family □nuclear family

10) General information of the family

Name of the family members	Relationship to the interviewee	Age in (yrs)	Sex	Education	Occupation	Monthly income

11) Other sources of income:

Details of the house

12) Plinth area (in sq.ft):
13) Year of construction:

14) Type of house

□individual house □apartment

□villa □any other

15) Who planned the house?

□architect □engineer

□mason □any other

16) Total number of rooms in the house? □1BHK □2BHK □3BHK

Selection and use of outdoor flooring materials

17) What is the total area provided for outdoor?

18) What are the uses of the outdoor area?

□car parking □potted plants □play area

□drying clothes □rest and relaxation □any other

19) What type of flooring material is used for outdoor?

Front yard _____ Backyard _____

20) Who suggested this flooring material for you?

□architect □engineer □ family members

□friends □shopkeeper □others

21) Reasons for choosing this flooring material for outdoor area?

□comfort □cost □durability □trendy

□aesthetic □slip resistance □texture □any other

22) Expenditure on outdoor flooring materials per square feet?

Material cost _____ labour cost _____

23) Does your flooring material satisfy your needs? □yes □no

If no, specify the problem _____

24) Is it slip resistant? □yes □no

25) Is it water proof? □yes □no

26) Are you satisfied by the use of outdoor flooring material? □yes □no

27) Did you face any challenges while selecting outdoor flooring materials?

□yes □no

If yes specify the challenges _____

28) State the place of purchase of the outdoor flooring material?

29) Did you face any problems after installing outdoor flooring material?

□yes □no

If yes specify the problems _____

30) Level of satisfaction by using this flooring material

□highly satisfied □satisfied □not satisfied

APPENDIX IV

INTERVIEW SCHEDULE TO ELICT INFORMATION ON OUTDOOR FLOORING MATERIALS AVAILABLE IN SELECTED SHOPS

1) Name of the interviewer:
2) Name of the interviewee:

Details of the shop

3) Name of the shop:
4) Name of the shop owner:
5) Address:
6) Area of the shop:
   Display Godown
7) Type of building
   □rental □own
8) Location/ area of the godown:
9) E-mail id:
10) Contact no:
11) Year of establishment:
12) Number of members working in the shop:
13) Number of members working in the godown:
14) Nature of the business □ Sole Owner □partnership
15) Types of service □sales alone □installation □both
16) Wholesale / retail:

17) Personal satisfaction regarding business

□highly satisfied □satisfied □not satisfied

18) Do you provide door delivery? □yes □no

Availability of outdoor flooring materials in the shops

19) Details about outdoor flooring materials available in your shop

Types	Common sizes (LXB)	Thick -ness	Quality	Price /sq.ft	Slip resistance	Suitable for commercial or residential	Demand
Composite &traditiona wood decking							
Porcelain & ceramic tile							
Artificial grass							
Brick							
Concrete							
Foam tiles							
Flag stone							

Paving stone							
Any other							

20) What type of clients do you get?

□engineers □architects □contractors

□home owner's □mason □agents

21) Do you feel customers are well informed about outdoor flooring materials in the shops?

□yes □no

22) What are source of information for customers to know about the availability of outdoor flooring materials?

□advertisements □magazines □engineers

□architects □contractor □mason

23) How do you inform your customers regarding the materials you sell?

□advertisements □magazines □TV

□newspaper □radio □any other

24) Do you give any commission for the following?

□engineers □mason □architects □agents

25) Percentage of commission _____

26) Do you give any suggestions for customers while selecting outdoor flooring materials? □yes □no

If yes, do they accept your suggestions? □yes □no

27) Are the customers satisfied about the flooring materials suggested by you? □yes □no

If no, specify reasons

28) Place of purchasing _____

29) Who is responsible for purchasing the flooring materials? _____

30) Criteria for purchasing _____

31) If the flooring material demanded by the customer is not available do you get the flooring material from some other place and distribute them?

□yes □no

32) Mention the advantages/purpose of using outdoor flooring materials?

a) b) c)

33) What kind of flooring materials is frequently demanded by the customers?

a) b) c)

Why?

34) State the most ideal flooring material for outdoor for residential purpose? Give reasons.

35) State the most ideal flooring material for outdoor for commercial purpose? Give reasons.