Optimizing Kitchen Experience

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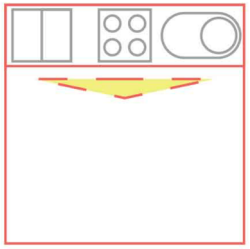
Abstract
This project aims at exploring ways to enable active ageing. Active ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. Nowadays, there is an increasing number of elderly living independently that lead us to delve into everyday spaces and tasks which might be difficult for them. In this context, kitchen space was chosen as the area of study as it is the highest functional room in every house. And the ability to cook for self with ease and comfort forms an important part of independent living. A good and safe kitchen space is very critical and often most neglected while planning a house. The aim of this project is to study Indian kitchens, mostly the modular kitchen segment, with respect to the aging population and come up with simple design interventions that can be easily adopted and implemented by this segment, in order to eliminate or reduce ergonomic risk factors.

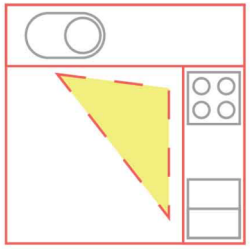
Author Keywords
Universal Design; Human factors and ergonomics; Design for India; Optimizing space utilization; User centric innovation

ACM Classification Keywords
Human factors and ergonomics

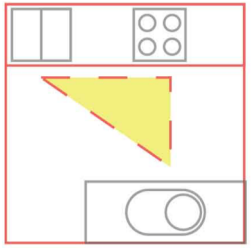
Figure 1. Kitchen Layout & Work Triangle



Single Line



L Shaped



Gallery Layout

Introduction

The number of elderly in the developing countries has been growing at a phenomenal rate. According to the United Nations' projected age structure of population for 2010 (UN, 2008 revision), India is expected to have a total of over 91.6 million persons in 60+ age groups, the second largest population of older adults in the world after China.

Old age is associated with many reduced physical and mental abilities. Nowadays, there is an increasing number of elderly living independently that lead us to delve into everyday spaces and tasks which might be difficult for them. In this context, kitchen space was chosen as the area of study as it is the highest functional room in every house. All residents use this space, so it needs to be accessible by the least able to the most able person and also from smallest to the tallest. An Indian kitchen poses unique challenges to the elderly, in terms of its context and usage. With older people's changed physical, psychological and cognitive characteristics, design of elements in a kitchen would play a crucial role in not only maintaining but improving their quality of life at every step.

Universal Design principles and approach was used in this project. Universal design, also known as inclusive design refers to broad-spectrum ideas meant to produce buildings, products and environments that are inherently accessible to all kinds of people irrespective of their shape, size, age, physical, perceptual, and cognitive abilities; thus making it functional and user friendly to all.

Understanding Kitchen ergonomics

Kitchen Layouts & Work triangle

The layout of the kitchen has impact on the way the user cooks at the kitchen.

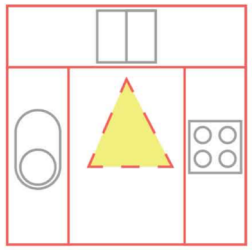
Refer the image 1.1 for the type of kitchen layouts and work triangle.

- Single Line - A very basic layout that should be kept as compact as possible. The cooker and sink must be kept closer in this layout. Numbered list
- L Shaped - A work sequence runs around two walls, keeping work triangle reasonable compact. Space utilization could have been better.
- Gallery Layout - Gallery kitchen has the most compact work triangle which is less tiring to use.
- U Shaped - This adaptable layout is wrapped around three walls in an unbroken sequence. The two corners would give some wasted space.
- Island - This should be used in places where space is plentiful, if there is lot of walking while cooking, this plan might turn inconvenient.

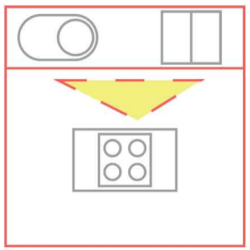
Ergonomic Risk Factors in a kitchen

Users are prone to following risk factors

- Force - Physical effort plays load on the muscles increases the body's energy demands and the possibility of an injury.
- Repetition - Repetitive tasks are tasks that use the same muscle groups repeatedly lead to fatigue and muscle damage.



U Shaped



Island

- Postures - Awkward postures occur when the body has to work in postures that are not natural.
- Static Pose - Muscles tire quickly in static postures because blood flow is restricted. Static can be as short as 20 seconds.
- Contact Stress - Contact stress happens when body parts come in contact with hard or sharp objects.

In India, kitchen space is used for food storage, preparation, cooking and dishwashing. Although the main function of kitchen is cooking, it can be the entre of other activities as well depending on its size, furnishing, and equipment and a typical Indian cooks thrice a day. The kitchen may also be the place where the family eats, provided it is large enough. Sometimes, it is the most comforting room in a house, where family and visitors tend to congregate.

User Research methodology

User Profiling

- Age group of 50+ were chosen for the research.
- Cities.
- Homes with modular kitchens of various brands.
- Users with disabilities were not considered for the study.
- Sample size: 30 house holds

Research tools

- Ergonomic audit
- Contextual enquiry
- Card sorting
- Shadowing
- Participatory concept building

Key research areas

- Consumables buying pattern
- Storage – utensils, consumables and appliances
- Material dispensing
- Cooking
- Dish washing
- Material transfer
- Kitchen environment – light, air and sound

Analysis:

Refer figure 1.2 & 1.3 for detailed analysis.

Key insights:

1. Highest movement was between the stove or cooking area and the sink because
2. People preferred to rinse everything before use (consumables and utensils).
3. Indian food has many greasy ingredients and involves a lot of kneading and mixing with hands, frequent hand wash becomes necessary.

4. Sink is usually kept at a distance from the cooking area as it is used to collect dirty utensils and should make enough space to accommodate a maid who usually washes them.

5. Platform and storage heights of established of modular kitchen brands were designed to fit European population and were too high (32-33") for the 50th percentile Indian woman.

6. None of the kitchens was ergonomically suited for forceful and repetitive task like chopping vegetables that require the elbow to be at right angles with the work surface.

7. Forgetfulness – gas leaks, touching hot surfaces and forgetting where things are kept, and the fear of slips, falls and dropping things keeps them away from the kitchen even if they want to cook.

Suggested Design Interventions:

Efficient layout:

standardization of heights and clarified environment. Various Layout explorations were done in the common Standardization of heights based on average Indian height has been done. Refer figure 1.4 & 1.5 for more details

- Overall Platform: 2.5 ft
- Maximum height of the shelves: 6 ft
- Height of the lower most shelve: 1.5ft.
- Club similar or related activities/ spaces

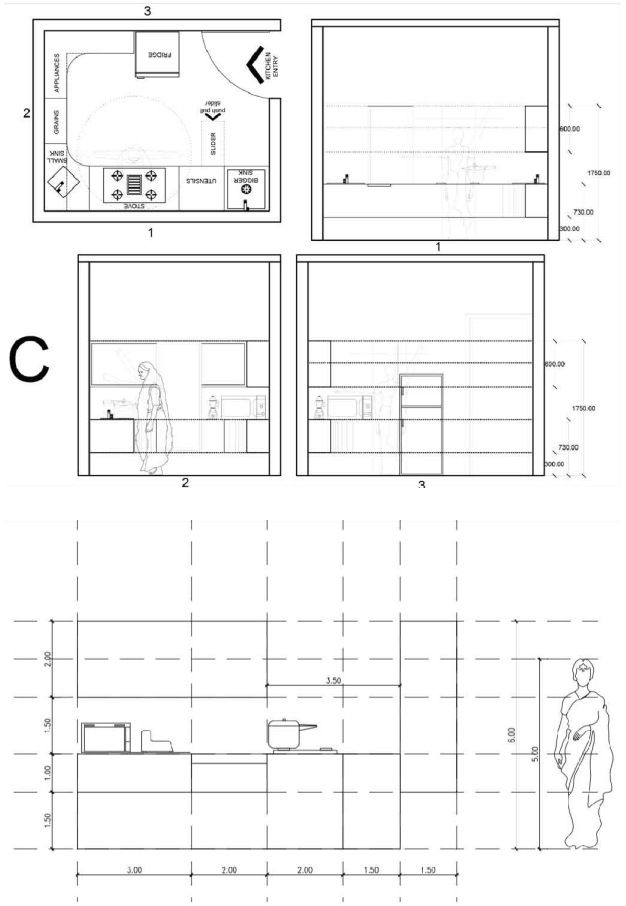


Figure 1.4. Efficient Layout

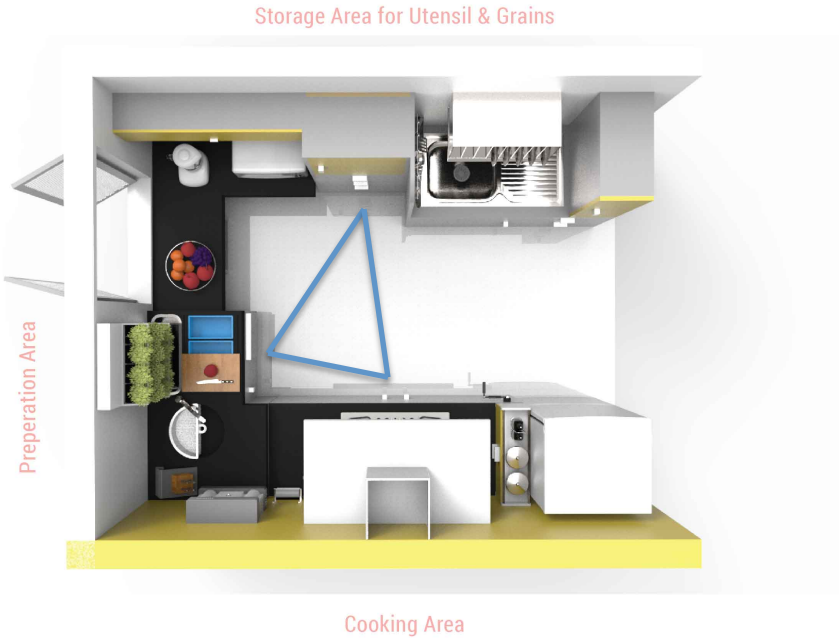


Figure 1.5. Final Layout Render

Utility Kitchen Sink:

near the preparation area for washing and cutting vegetables and avoid frequent trips to the main sink. Refer figure 1.6 for the utility kitchen sink.

- Utility sink avoids to frequent movement between the sink and preparation space.
- As the sink is provided only for preparation, it avoids the hygiene issues.
- Cutting mat with trays for collecting cut vegetables and small bin to collect vegetable waste while cutting.
- Height of the workspace 0.5ft higher than the rest to ergonomically suit the monotonous task of cutting vegetables.
- Sink with removable mesh containers to wash grains and vegetables

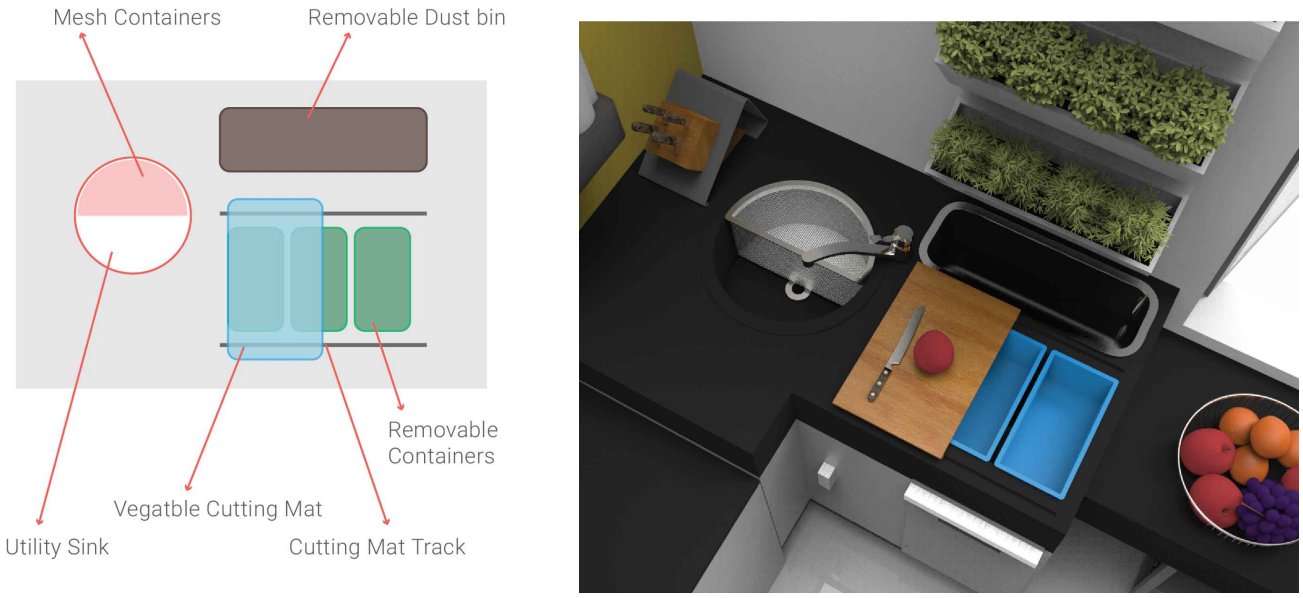


Figure 1.6. Utility Kitchen Sink

Upgraded Cooking Slab:

Simple height adjustable cooking slab is recommended to suit people of different heights. Minimum of 5 inch to suit the user's height and also to avoid fatigue. Refer 1.7 Adjustable Kitchen Slab

- Foldable roller to increase or decrease the height of the cooking platform.
- Varying platform height to suit ergonomic posture required for the task at hand.
- No storage space is suggested above the cooking platform as it increases the risk of contact with hot utensils or hazard.

Figure 1.7. Adjustable Kitchen Slab

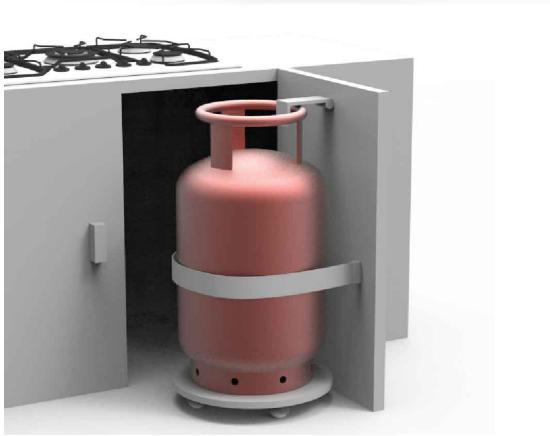


Figure 1.7. Gas Cylinder

Refer Figure 1.8 for Gas cylinder fastening system is proposed to avoid the stress on body to move the cylinder in and out of the cupboard.

Redefining Storage Space

Utensils storage cabinet is designed with the main sink to eliminate a separate temporary storage of washed and unwashed utensils. Enables easy grouping. Refer 1.6 for detailed image of Utensil Storage Cabinet.

- instant storage of utensils can be made as the main sink is below the utensil rack. No spillage of water on the floor.
- Grouping based on frequency of usage and hierarchy. Storage for keeping dishwashing items is also considered in the storage cabinet.

Figure 1.6. Utensil Storage Cabinet

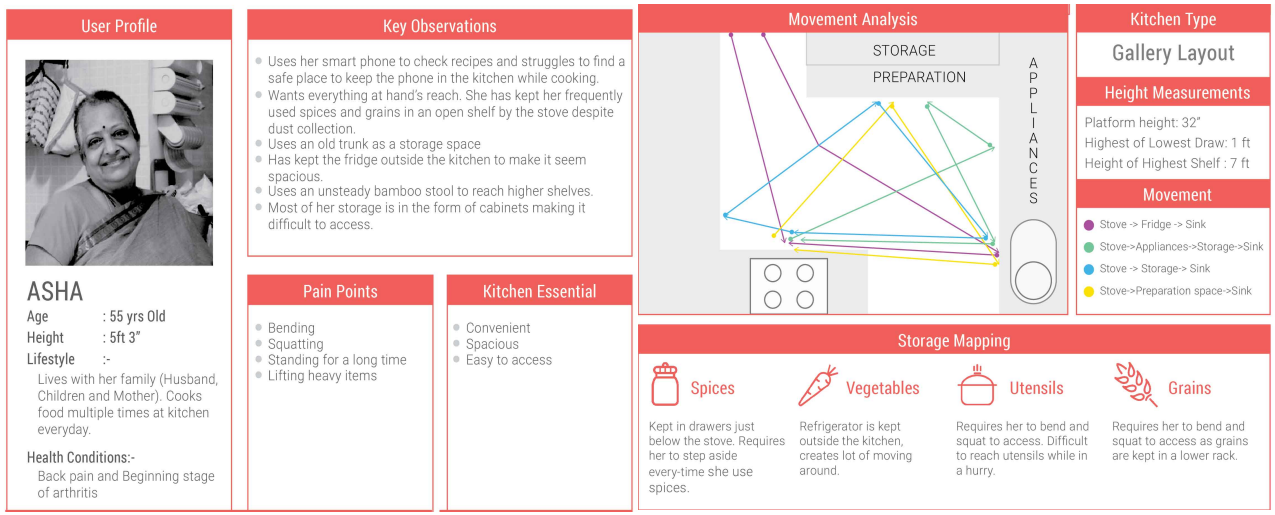


Figure 1.2 User Persona (left) Figure1.3 Detailed Analysis (Right)

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