

5. Mundal's Classes of Change: Principal and Important

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5.1 Introduction:

Methods of work simplification may be applied in all spheres of homemaking. The work simplification indicates that change and improvement in work methods are necessary in every home. A busy homemaker looking to save energy for other activities, a working homemaker who needs to reduce her chores at home, and a disabled homemaker who needs to manage her energy carefully can all use simple methods to make their tasks easier and more efficient. If work methods are systematic, equipment is efficient, and the work environment is suitable, tasks can be simplified. Work simplification involves using simple and easy methods to complete tasks.

The main principles are to achieve the most work in the least amount of time and energy, or to complete a given amount of work with minimal time and energy, while maintaining the same quality and standards. By organizing better, using helpful tools, and planning their time wisely, they can achieve their goals with less effort.

Researchers in home economics and related fields have applied A work-simplification techniques to enhance the efficiency of homemaking tasks.

Motion and time studies have been conducted on various household activities, such as Organizing tasks in a logical and efficient sequence to reduce wasted effort, using tools and equipment that enhance productivity and reduce the physical effort require, ensuring that the workspace is well-organized and conducive to efficient work.

Studies on work simplification for homemaking tasks show that every home can improve its work methods. These studies also reveal that the "best work methods" can vary widely between different households. Indeed, there are often multiple effective ways to accomplish many household tasks.

5.2 Meaning of Work Simplification:

Work simplification involves consciously seeking the most straightforward, efficient, and fastest methods to complete tasks, aiming to use minimal time and energy.

This technique emphasizes adopting practices that simplify and expedite work processes. Two, major points that can assist a homemaker in saving both energy and time are -

- A. **Work Simplification:** This entails adopting the simplest, easiest, and quickest methods for completing tasks, thereby reducing the consumption of time and energy.
- B. **Motion Mindedness:** This involves being aware of the movements required to perform a specific task and exploring possible ways to minimize these motions.

5.3 Principal of Motion Economic:

- A. **Use Both Hands in Unison:** Habitually, many people use only their dominant hand, typically the right hand, for most tasks. This overuse can reduce its efficiency over time. To avoid this, try to use both hands whenever possible, such as when lifting heavy objects or hanging clothes. This balanced approach distributes the workload and maintains efficiency.
- B. **Effective Routing:** Arrange your workspace so that tasks can be completed with minimal walking. Plan your work in advance to ensure you take the shortest paths, thereby reducing unnecessary movement and conserving energy.
- C. **Use Rhythmic Motions of Hand:** Repetitive actions benefit from rhythmic motions, which increase speed and efficiency. Gross and Crandall define rhythm as muscular performance that, with repeated movements at the same tempo, enhances work speed because continuous actions require fewer impulses. For example, when washing dishes or mopping the floor, use rhythmic motions to clean similar items in succession for greater efficiency.
- D. **Use Smaller Movements of Hand than Large Hand or Arm Motions:** Smaller hand movements conserve more energy than large hand or arm motions. Similarly, using smooth, continuous movements instead of jerky ones makes tasks easier and less tiring.
- E. **Use of Body Mechanics:** Adhering to the principles of body mechanics can significantly reduce the energy required for tasks and increase work output. This involves using your body in an efficient and safe manner to prevent strain and maximize productivity.

According to Gross and Crandall, “Work Simplification is accomplishing more work with given amount of time and energy or reducing the amount of either or both to accomplish a given amount of work”

Nickell and Dorsey defined Work simplification as “conscious seeking of the simplest, easiest and quickest method of doing work”. In other words, Work Simplification is defined as technique of accomplishing a task by using the least amount of time and energy.

According to Gilbreth, Thomas, and Clymer, work simplification is a commonsense approach to making work easier. They suggest that any type of work can be simplified by applying scientific management principles to time and energy. Improving household work methods involves a mindset shift and a commitment to change old habits. It's like any other improvement process—it takes time, effort, and a willingness to adapt. But the benefits can be significant in terms of efficiency and effectiveness in managing household tasks. Adopting a questioning attitude towards household tasks is key to simplifying and improving methods. Awareness of the potential benefits, such as reduced fatigue and increased efficiency, can be a powerful motivator for change. By realizing that there are better ways to accomplish tasks, homemakers can be spurred to devise more effective methods that ultimately lead to greater ease and productivity.

Breaking old habits is neither easy nor quick. It requires dedicated time, effort, and attention to learn new methods effectively. Having a genuine interest in changing old habits can make the process easier, as it provides the motivation needed to persist through the challenges of adopting new ways of working. The concept of classes of change was stated by Dr. Marvin Mundel's in 1940. Mundel's classification provides a structured approach to improving work methods, with changes ranging from basic motions to alterations in workspace and equipment, and even changes in the final product. Mundel has classified these changes into five types:

- Changes in body position and motion
- Changes in work arrangement and equipment
- Change in production sequence.
- Change in finished product.
- Change in raw material.

Gross and Crandall synthesized Mundel's five classes of changes into three overarching categories to streamline and simplify the understanding and implementation of workplace efficiency improvements. These categories focus on optimizing physical movements, the work environment, and the product itself.

- Changes in Hand and Body Motions.
- Changes in works and storage space and equipment.
- Changes in the product

5.3.1 Change in Hand and Body Motion:

Hand and body movements enhance work efficiency. By focusing on these motions, it is possible to identify various ways to save time and energy. Tasks can be performed with less effort through methods such as eliminating unnecessary steps, combining processes, optimizing the sequence and routing of work, enhancing skills, and improving body mechanics. This approach emphasizes the potential for significant improvements in productivity and effectiveness.

A. Motion in Hand:

Analyzing and modifying motions in everyday tasks can lead to greater efficiency and reduced effort. such as:

- **Eliminating Steps:** Rinsing dishes and letting them air-dry eliminates the need for wiping.
- **Reducing Tools:** Using fewer utensils during food preparation minimizes movement.
- **Combining Processes:** Using methods like adding all ingredients at once when baking or using cake mixes streamlines the process.
- **Orderly Stacking:** Arranging dishes in the order they will be washed or ironing sheets in a way that requires fewer motions when making the bed saves time.

- **Efficient Planning:** Careful planning before starting tasks can save many steps, such as combining trips to carry multiple items around the house.

B. Sequence of Work:

Optimizing the sequence of work to reduce steps and increase efficiency in household tasks. Key strategies include:

- **Movement or Pathway Charts:** Creating charts on a floor plan to visualize and analyze the paths taken during tasks helps identify unnecessary trips and distances. This aids in determining the most logical and effective routes.
- **Routing Changes:** Adjusting the routing of work can reduce steps and minimize unnecessary handling of equipment and supplies. For example, stacking dishes in a specific order near the sink to streamline washing, drying, and storing.
- **Task-Specific Routing:** More complex tasks like making muffins, serving meals, laundering, and cleaning require collecting, arranging materials, and clearing away afterward. Each task's routing needs separate study to find the most direct method.
- **Grouping and Combining Tasks:** Kitchen tasks, in particular, can often be grouped and combined to save time and effort. Proceeding with one operation until it is finished can minimize frequent changes in activities and walking.



Figure 5.1: Sequence of work

C. Skill in Work:

Developing skill in household work is crucial for enhancing efficiency and eliminating unnecessary motions. Skill, defined as "familiar knowledge" applied practically, can be cultivated in several ways:

- **Observation:** Watching others perform tasks can provide insights into efficient methods and techniques.
- **Sharing Responsibilities:** Collaborating with family members allows for the exchange of effective practices and tips, fostering a collective improvement in skill.
- **Familiarization:** Becoming well-acquainted with various tasks through repeated practice helps in developing proficiency.

The development of skill in performing homemaking tasks significantly reduces the time and energy required for daily chores. Experienced homemakers execute tasks with speed and fluidity, characterized by graceful and rhythmic motions. This reflects mental control and coordination. Rhythm, a fundamental aspect of daily life, can enhance efficiency. Observing a skilled homemaker reveals a seamless flow of movements, where each action transitions smoothly into the next. This rhythmic efficiency is evident in various tasks such as sweeping, vacuuming, dishwashing, batter mixing, vegetable slicing, and pastry rolling. Regardless of whether they work quickly or slowly, each homemaker exhibits a unique natural rhythm.

In repetitive activities, continuous movements are generally less fatiguing than angular or straight-line motions that involve sudden, sharp changes in direction, even if both types can be rhythmical. When each movement ends in a rounded manner, allowing the return stroke to seamlessly continue from the forward motion, one movement transitions smoothly into the next. This type of movement results in a significant economy of effort, reducing overall fatigue. Rhythmic work is also less tiring than non-rhythmic work because the "working bones" have double sets of muscles. When work is performed rhythmically, one set of muscles rests while the other works.

Conversely, when work is done tensely and awkwardly, both sets of muscles work simultaneously, leading to quicker fatigue. When someone performs a new task, they use considerable effort to overcome the difficulties associated with unfamiliarity.

D. Posture in Housework: Keeping body parts in alignment - Proper body alignment means positioning body parts correctly so that each part is centered over the base of support. This alignment is crucial for maintaining stability both in standing and sitting positions.

When any part of the body deviates from this alignment, additional muscular effort is required to maintain balance. This extra effort can lead to strain and fatigue, especially if the body is also engaged in other activities. Efficient muscle use is essential for performing household tasks without unnecessary strain. Activities such as sweeping the floor or lifting objects can be particularly strenuous on the back if done incorrectly. Such as -Sweeping: Instead of bending over to sweep, use a long-handled broom. This allows you to maintain an erect and stable posture, reducing back strain.



Figure 5.2: Posture in Housework

Substitute the use of back muscles with leg muscles when lifting objects from the floor. To lift properly, bend at the knees and thighs instead of bending at the waist. This technique helps in distributing the weight more effectively and reduces the risk of back injury.

Understanding the center of gravity is crucial when lifting, supporting, carrying, or reaching for objects. Here are the main principles:

- Keeping the Load Close to the Body- Reduces the strain on muscles and spine, enhances balance and control.
- Aligning the Center of Weight with the Body - Maintains balance, reduces the risk of injury.
- Avoid Twisting Movements -Twisting can lead to misalignment, increased strain, and potential injury.
- Carrying Loads on the Back -Keeps the load close to the body and distributes weight evenly.

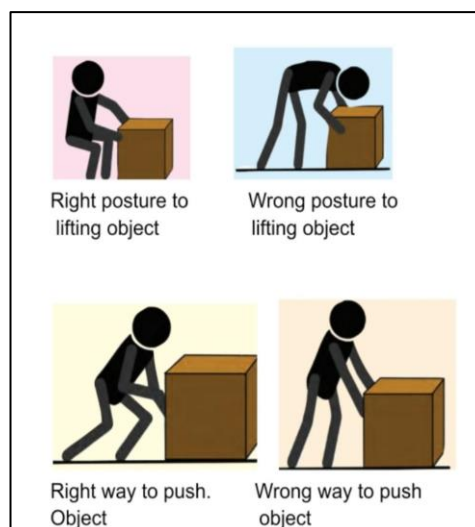


Figure 5.3: The Center of gravity is crucial when lifting, supporting, carrying, or reaching for objects

5.3.2 Change in Work and Storage Space and Equipment

This involves organizing storage space, rearranging large kitchen equipment, planning work surfaces of the right height and width, and adding new tools and equipment. Many changes can be made inexpensively and often with the creativity of a family member. Here are some questions to consider:

Is The Major Equipment Efficiently Arranged:

Studies show that changing the kitchen layout can save time and reduce steps. Improved arrangements can free up 45% of a homemaker's time and cut 91% of steps. Different kitchen shapes can also affect travel distances, suggesting ways to make new or old kitchens more efficient.

Are Work Surface Is Comfortable Height and Width?

Kitchen work surfaces should be at a comfortable height for the worker to promote good posture. Too low surfaces cause stooping, while too high surfaces require raised arms. Too wide surfaces make stretching necessary, all of which cause strain and fatigue. Good posture is achieved when work surfaces are adjusted to fit the worker's height. The best way to find the right height is to test different heights for comfort.

Is Sitting Comfortable and Supportive?

Chairs or stools of the right height allow a worker to sit comfortably while working at various kitchen tasks. Good seating should:

- Let the worker sit with feet on the floor or a footrest.
- Be low enough to avoid pressure behind the knees.
- Be shallow enough for easy bending at the hips.
- Have a moderate backward slope to prevent sliding forward.
- Include a backrest for lower back support.
- Have no horizontal bar lower than 6 inches above the seat, allowing proper back support.

Are Tools and Equipment Efficient?

Choosing the right tools and equipment is important for saving time and energy. Faulty tools, like a sticky egg beater or a dull knife, not only waste time but also cause frustration and fatigue.

Are Small Equipment and Food Supplies Tourist Near the Place of Use?

Store small equipment and food supplies where they will be used to avoid unnecessary walking and lifting. For example, keep skillets and seasonings near the stove, dishwashing tools near the sink, and bowls near the food prep area.

All tools and supplies should be easily accessible. Use adjustable shelves and avoid stacking to save time. Store frequently used heavy items at work surface level to reduce shoulder lifting.

Are Supplies and Tools Within Easy Reach?

Arrange supplies and tools within easy reach to simplify tasks. There is a normal working area for each hand, which is determined by the reach of the hands with the arms in a natural position. The overlapping section is best for tasks using both hands. When storing materials above the working surface, keep these areas in mind. Leave tools and equipment in the positions they will be used to avoid unnecessary handling.

5.3.3 Classes of Change in Product:

Mundel's classification of changes in products focuses on how modifications can improve efficiency and effectiveness in various settings, particularly in household management.

Simplifying household work through product changes requires evaluating resources and family housekeeping standards. Families often have established standards for finished products, passed down through generations, making them resistant to change. However, discussing the reasons for changes can help gain family acceptance and overcome reluctance to adopt simpler methods. Technological advancements have introduced many new materials designed to make household tasks easier, often necessitating acceptance of new standards. These materials save time and reduce effort. Changes in household products can involve using different raw materials, creating different products from the same materials, or altering both the raw materials and the finished product. Examples include:

- Different Raw Materials: Paper napkins and kitchen towels (avoiding washing and ironing), powdered coffee (replacing regular coffee), frozen peas (replacing fresh ones that need shelling), textiles requiring minimal ironing, and shortcut recipes mixed and baked in the same bowl.
- Different End Products from the Same Raw Materials: Baked apples instead of applesauce, and folding sheets and towels without ironing.
- Different Raw Material and Finished Product: Using woven grass or plastic table mats instead of linen tablecloths.

Effective household management involves continually assessing the time and energy costs of maintaining certain standards and making adjustments when these costs are too high.

5.3.4 Change in Finished Product:

Most families have certain preconceived standards for housekeeping. Habits are deeply ingrained and sometimes difficult to change. Careful thinking on the part of the homemaker, and their ways of persuading the family to accept new ideas, can permit changes in some of these ways. The worker might have to adjust their standards or expectations about how the finished product should look, taste, or be shaped and sized. For example, if the family accepts the finished product without any fancy decoration, it simplifies the task.

5.3.5 Change in Raw Material:

This change refers to using different raw ingredients while keeping the final product the same. For example, using paper napkins instead of cloth napkins saves the effort of cleaning. Utilizing ready-to-use mixes available in the market for certain recipes, or buying ready-made products such as spices, sprouted beans, pulses, frozen foods, and clothes made of new fibers, may be easier to maintain than traditional materials.

A combination of these types of changes, along with careful and imaginative thinking, willingness to modify existing work habits, and the ability to gain the support of the family, will go a long way toward making the tasks of the worker easier, quicker, and more satisfying.

5.4 Technique of Work Simplification:

Work simplification aims to enhance efficiency and productivity by studying and optimizing the motions and time required for task completion. This process relies heavily on observing, recording, and analyzing the movements of workers. Techniques used for this purpose can be classified into two major categories: Formal Techniques and Informal Techniques.

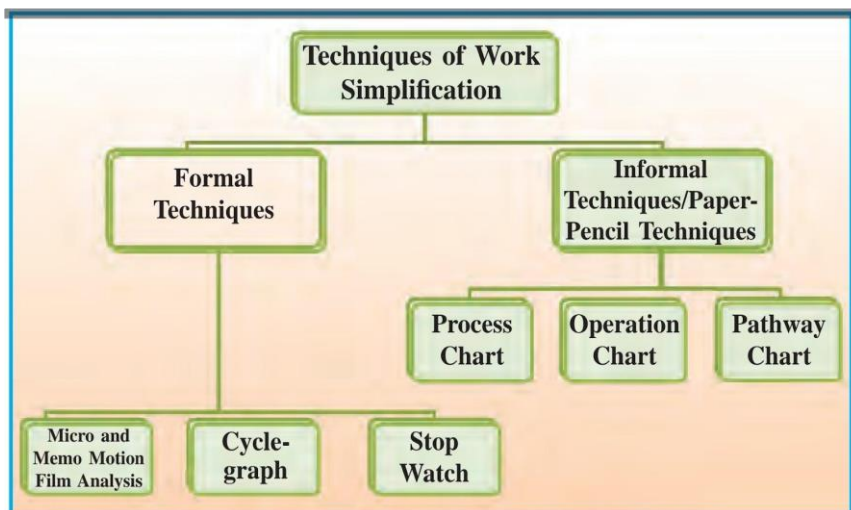


Figure 5.4: Technique of Work Simplification

5.4.1 Formal Technique:

Formal techniques in work simplification are distinguished by their use of specific equipment and devices, which makes them more accurate, effective, and scientific in studying motions. By employing formal techniques, organizations can gain precise insights into the efficiency of work processes, identify areas for improvement, and implement more effective work methods. These, techniques include Micro Motion and Memo Motion Film Analysis, Cycle-graph, and Stopwatch.

A. Micro Motion and Memo Motion Film Analysis:

These techniques involve creating a detailed and accurate analysis of tasks that can be filmed. They utilize motion picture or video film to record tasks under normal working conditions. A task is recorded on film, The recording is then analyzed by an expert. It can be reviewed multiple times by different experts if needed. These techniques focus on analyzing the motions of the hand or other parts of the body to identify inefficiencies and potential improvements. Due to their high cost, these techniques are typically not used for household tasks but are more common in industrial or commercial settings where detailed motion analysis is critical.

B. Cycle-Graph:

A cycle-graph is a photographic device used to register the pathway of light projected by a small electric bulb attached to a part of the body. In this process a small electric bulb is attached to a part of the body (e.g., a hand). The pathway of the bulb's light is photographed, creating a graph that shows the pattern of movements.

This technique is effective in analyzing the smoothness and rhythm of motions. It helps identify whether movements are smooth and rhythmic or non-rhythmic. Example: While ironing, an electric bulb attached to the hand can register the pathway of the activity, providing insight into the efficiency and potential improvements in the task.

C. Stopwatch:

The stopwatch technique involves recording the time needed to complete a specific task using a stopwatch. A task is timed from start to finish using a stopwatch. This timing can be integrated with other techniques to provide a comprehensive analysis. This technique helps create time awareness among workers and identifies how long each part of a task takes. It is effective in creating benchmarks and setting standards for task completion times, promoting efficiency and productivity.

5.4.2 Informal Technique:

Informal techniques, often referred to as Paper Pencil techniques, utilize simple tools like paper and pencil to record and analyze motions during task performance.

These methods are straightforward and cost-effective, making them suitable for studying various household tasks. Key informal techniques include Pathway Chart, Process Chart, and Operation Chart.

A. Pathway Chart:

Also known as the pin and thread/string method, this involves creating a scaled and proportionate floor plan of a workplace. Essential materials include a soft board, pins, and thread.

The floor plan is placed on the soft board, and pins are positioned at the points where a worker changes direction during their tasks.

The worker's movement path is tracked by winding the thread around these pins. After completing the task, the thread is removed, and the distance traveled by the worker is measured.

This data is analyzed to create a revised floor plan, incorporating suggestions for improvement. The length of the thread is then compared to draw conclusions about the study. Figures 5.4 illustrate the original and improved pathway charts.

B. Process Chart:

This is a detailed, step-by-step description of the work method used by a worker. It analyzes the worker's movements and activities to identify unnecessary steps. The following symbols are used in a process chart:

- Small Circle: Movement from one place to another.
- Big Circle: Operation.
- Square: Quality inspection with eyes.
- Triangle: Delay.
- Circle in Circle: Movement and operations simultaneously.

At least two people are needed to create a process chart: one to perform the work and another to observe and record it.

The analysis involves counting the frequency of each symbol, helping to identify areas for improvement.

Symbols Used in Process Chart:

Table 5.1: The Symbols and Their Meanings Used in A Process Chart.

Sr. No.	Symbol	Meaning	Description
1	Small Circle	Movement from one place to another place	Indicates a worker's movement between locations
2	Big Circle	Operation	Denotes an operation or task being performed
3	Square	Quality Inspection with eyes	Represents an inspection or quality check performed visually
4	Triangle	Delay	Indicates a period of delay or waiting
5	Circle in Circle	Movement and operations simultaneously	Shows simultaneous movement and operation activities

C. Operation Chart:

This chart is specifically designed to study hand movements in detail. It allows for a closer examination of the operations performed by the right and left hands. The chart uses three symbols:

- Small Circle: Represents hand movements.
- Large Circle: Indicates movements involving both fingers and hand together.
- Triangle: Denotes idleness of both fingers and hand.

To create an operation chart, at least three people are needed: one observer for the right-hand operations, another for the left-hand operations, and the worker performing the task. Separate charts are used for the right- and left-hand movements to provide a detailed analysis.

B. Symbols Used in Operation Chart:

Table 5.1: The Symbols and Their Meanings Used in Operation Chart

Sr. No.	Symbol	Meaning	Description
1	Small Circle	Movement of Hand	Tracks the movement of the hand alone
2	Large Circle	Movement of fingers and hand together	Captures movements involving both the fingers and hand
3	Triangle	Idleness of both fingers and hand	Indicates periods when both fingers and hand are idle

5.4.3 Importance of Work Simplification

- Increases Efficiency:** Streamlines tasks to reduce time and effort. For Example: Organizing kitchen tools by frequency of use so frequently used items are within easy reach, reducing the time spent searching for them.
- Reduces Fatigue:** Minimizes physical and mental strain by simplifying. For Example: Example: Using a lightweight cordless vacuum cleaner instead of a heavy traditional one to lessen physical strain during cleaning.
- Improves Productivity:** Enhances the amount of work accomplished in a given For Example: Meal prepping for the week by chopping vegetables and portioning meals in advance, which reduces daily cooking time.
- Standardizes Methods:** Establishes consistent and effective procedures. For Example: Implementing a consistent method for doing laundry, such as sorting clothes by color and fabric type before washing, to ensure efficiency and quality.
- Eliminates Waste:** Removes unnecessary steps and activities. For Example: Preparing a grocery list based on meal plans to avoid buying unnecessary items and reduce food waste.

- F. **Enhances Quality:** Maintains or improves the standard of work with less. For Example: Following a systematic cleaning routine for each room to ensure thoroughness and consistency every time.
- G. **Saves Resources:** Conserves time, energy, and materials. Example: Using energy-efficient appliances to reduce electricity and water usage while performing household tasks.
- H. **Facilitates Training:** Makes it easier to train others with standardized methods. Example: Creating a clear, step-by-step guide for new family members or hired help on how to perform specific household tasks, like operating the dishwasher or washing machine.
- I. **Boosts Morale:** Reduces frustration and increases satisfaction by making tasks more manageable. Example: Decluttering and organizing a workspace to create a more pleasant and less stressful environment, which can increase overall satisfaction with homemaking tasks.
- J. **Promotes Safety:** Creates a safer work environment by organizing tasks and tools efficiently. Example: Arranging tools and supplies in a garage or workshop so that sharp or heavy items are stored safely and within easy reach to prevent accidents.

5.5 Reference:

1. <https://ebooks.inflibnet.ac.in/hsp03/chapter/work-simplification/>
2. <https://www.yourarticlelibrary.com/home-management/home-science-work-simplification-methods-with-diagram-2/47798>
3. www.yourarticlelibrary.com
4. www.homescience10.ac.in
5. www.coursesonline.iasri.res.in
6. www.brainkart.com.