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Therefore we have established a policy of providing a source of supply to our clients and enrollees in our training programs. Our charges are essentially only the amount necessary to cover our costs plus handling and shipping. Certain forms may be available in Microsoft Excel format from our website at www.RichardMuther.com

Overview of Systematic Layout Planning (SLP)

Manufacturing Plant Example

RICHARD MUTHER & ASSOCIATES

Consultants in Industrial Management & Engineering

151 Village Parkway, Building 6, Marietta, GA 30067. Phone: 770-859-0161.
www.RichardMuther.com

About Richard Muther & Associates

Established in 1956 by Richard Muther, our firm has achieved an international reputation as planners of profitable industrial plants, warehouses, office and service facilities. Operating in the broad field of industrial management and engineering, we have experience in all aspects of facilities planning and operations improvement. Our services are delivered through leading-edge consulting, training, and research.

RMA consulting projects are conducted on the principle of *"helping the client help himself."* Using our proprietary, systematic methods, we enable client teams to get better results in record time. And over the course of an assignment, clients master our approaches for their future use. When needed, we will collect data, perform analyses, and make presentations for approval, but our preferred role is to organize, advise, coach, challenge, show by example, and audit the work being done. This keeps your investment low and builds the confidence and skills of your personnel. Our success rate on hundreds of assignments attests to the wisdom of this approach. We assist in the following activities:

- Plant & warehouse layout
- Material handling analysis
- Planning for lean and cellular manufacturing
- Master site planning
- Office space planning
- Site location & selection
- Long-range planning & facilities strategy
- Consolidation & relocation planning

For more information, please contact us at:

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RMA training courses are conducted in-plant and through leading universities and trade associations. These have been attended by thousands of managers and engineers in 20 countries of the world. Each work course is based upon one or more of our systematic, step-by-step techniques. We offer formal certification in our more popular methods, and license our materials for continuing use by qualified and certified instructors. We currently offer in-plant seminars on more than a dozen topics. Among the most popular:

- Warehouse & Distribution Center Layout
- Systematic Planning for Manufacturing Cells
- How to Plan for Rearrangement & Expansion
- Long-Range/Strategic Planning of Industrial Facilities

RMA research projects have included a number of original surveys on management and engineering practices. We also arrange benchmarking and study missions to help our clients improve their facilities management practices.

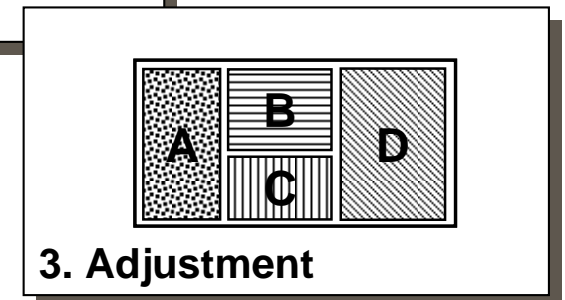
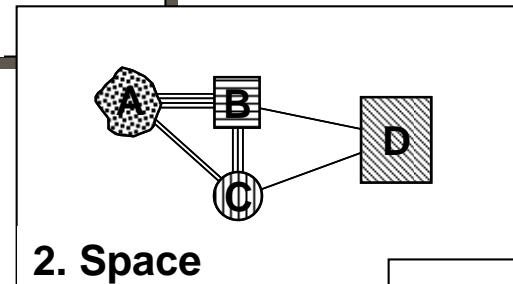
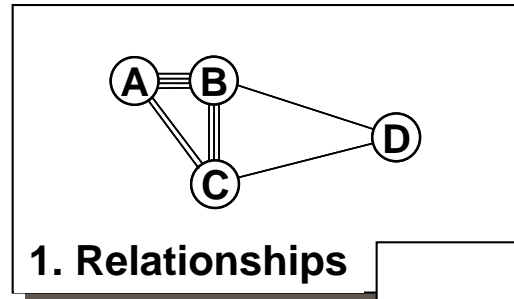
Our research has resulted in the publication of 9 books, with translations into more than 20 language editions. We have authored over 100 technical papers and presentations, and a dozen chapters for handbooks and encyclopedias. Our associates have served as guest lecturers at the Massachusetts Institute of Technology, Georgia Tech, The Swedish Royal Institute of Technology, and several other universities.

Members of our firm have been recognized with citations and awards from leading institutions and professional societies including: the Materials Handling Award of the Society for the Advancement of Management; the Honor Award from the Materials Handling & Management Society; the Engineering Citation Award from the Society of Manufacturing Engineers, and the Gilbreth Medal for outstanding contributions to industrial engineering.

Main Points

1. All layout planning rests on the three fundamentals of:
 - a. Relationships between the activities in the layout.
 - b. Space for each activity-area, in amount, kind, and shape.
 - c. Adjustment of relationships and space into an effective plan.
2. By applying the three fundamentals – *in the order shown* – the planner assures better decisions and layouts.

Fundamentals of Layout Planning



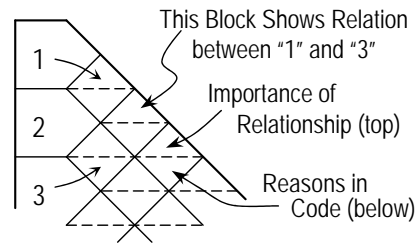
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Notes

Space sq. m.	Combined Relationships (Flow and Other/Service)	
1200	1	Cut
800	2	Treat
800	3	Sub Assembly
1200	4	Final Assembly
800	5	Storage incl. Rec. & Ship
400	6	Test
400	7	Office incl. Services
5600	Total in Square Meters	

Veebildem A.G. – Activity-Relationship Diagram



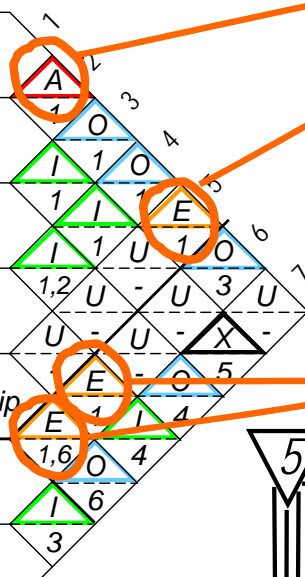
Code	REASON
1	Flow of Material
2	Ease of Supervision
3	Convenience
4	Production Control
5	Dust & Fumes
6	Material Control

"Closeness"
Rating

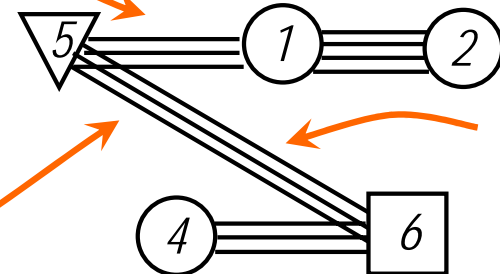
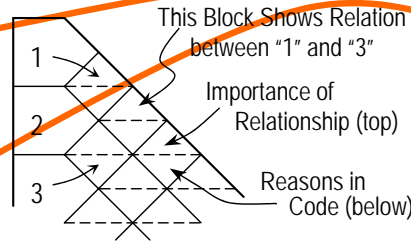
Value	CLOSENESS	No. of Ratings
A	Absolutely Necessary	
E	Especially Important	
I	Important	
O	Ordinary Closeness OK	
U	Unnecessary	
X	Not desirable	
Total = $\frac{N \times (N-1)}{2}$		

Problem: Using the data above provided by the Veebildem A.G. planning team, follow the SLP procedure to develop an Activity Relationship Diagram in the space provided on the right.

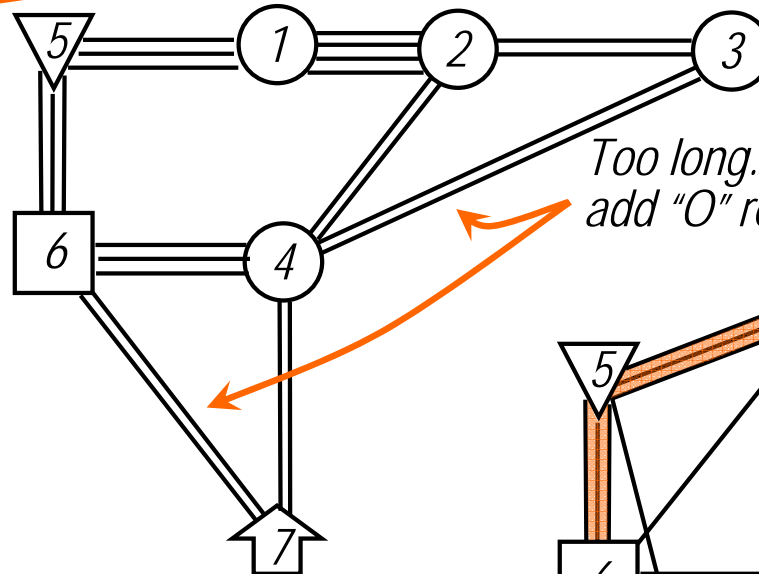
Space sq. m.	Combined Relationships (Flow and Other/Service)	
1200	1	Cut
800	2	Treat
800	3	Sub Assembly
1200	4	Final Assembly
800	5	Storage incl. Rec. & Ship
400	6	Test
400	7	Office incl. Services
5600	Total in Square Meters	



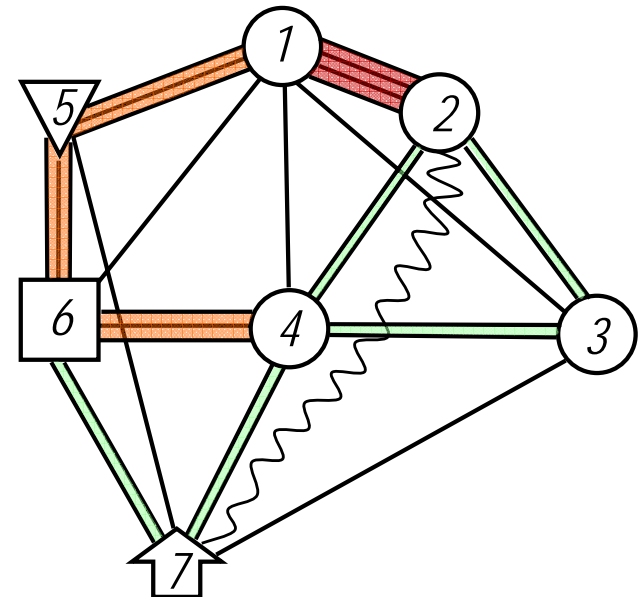
Veebildem A.G. – Activity-Relationship Diagram



Too long.
Redraw and
add "I"
relationships



Too long. Redraw and
add "O" relationships



Problem: Using the data above
provided by the Veebildem A.G.
planning team, follow the SLP
procedure to develop an Activity
Relationship Diagram in the
space provided on the right.

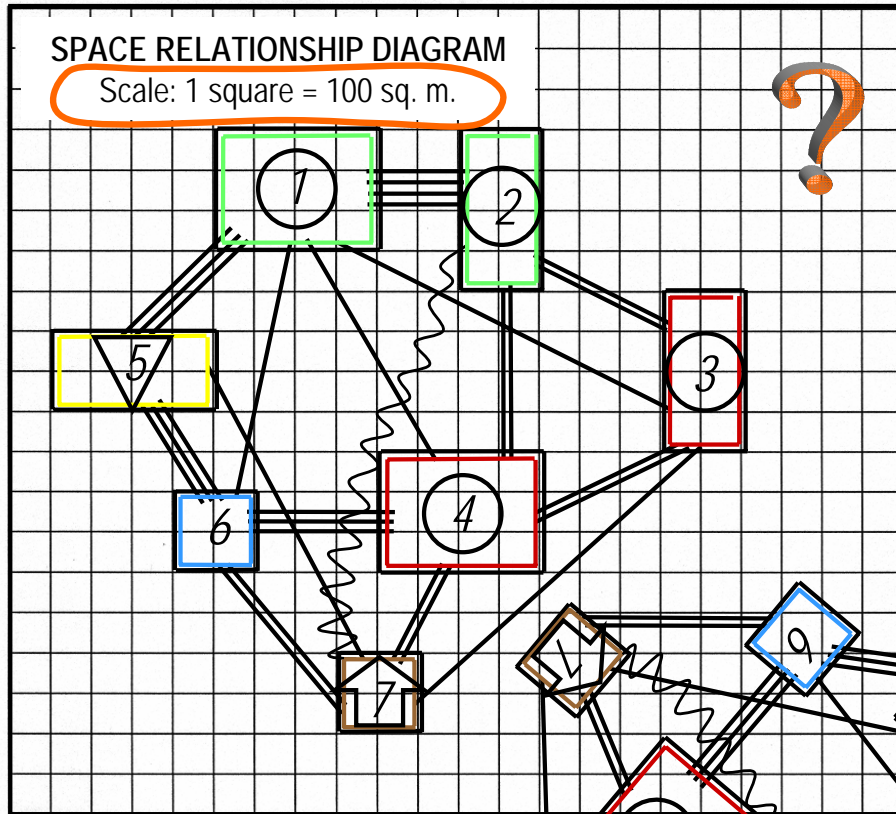
Code	REASON
1	Flow of Material
2	Ease of Supervision
3	Convenience
4	Production Control
5	Dust & Fumes
6	Material Control

"Closeness"
Rating

Value	CLOSENESS	No. of Ratings
A	Absolutely Necessary	1
E	Especially Important	3
I	Important	5
O	Ordinary Closeness OK	5
U	Unnecessary	6
X	Not desirable	1
Total = $\frac{N \times (N-1)}{2}$		21

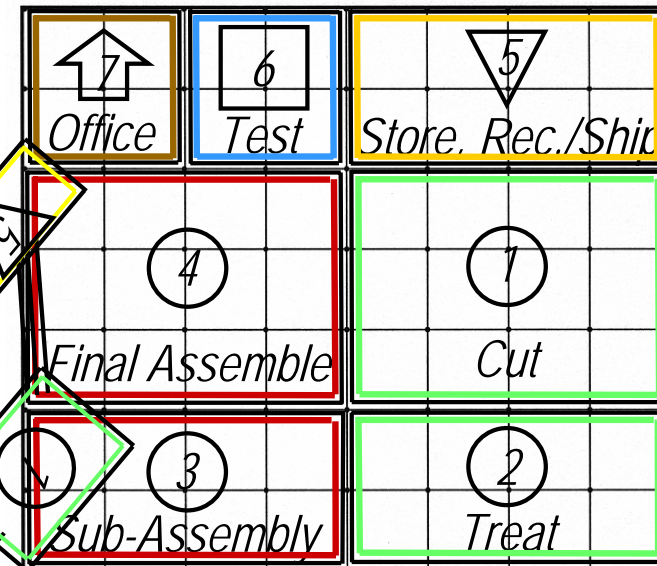
Veebildem A.G. – Space Relationship Diagram & Layout

- Problem:** (a) Construct a Space Relationship Diagram on the grid below. Use the activity relationship diagram prepared on 7141-1 and the space data provided, and follow the SLP procedure.
 (b) Then develop a block layout to fit the new building being constructed for Veebildem A.G.
 Explain why your layout is best.



Assume activities 5 & 7 must have direct access to street. Doors can be located wherever needed as building is not yet completed. (Note the change to a larger scale).

LAYOUT



(Note: Aisles need not be shown)

VEEBILDEM A.G.
 New Building

Total Area
 5600 sq.m.

Scale:

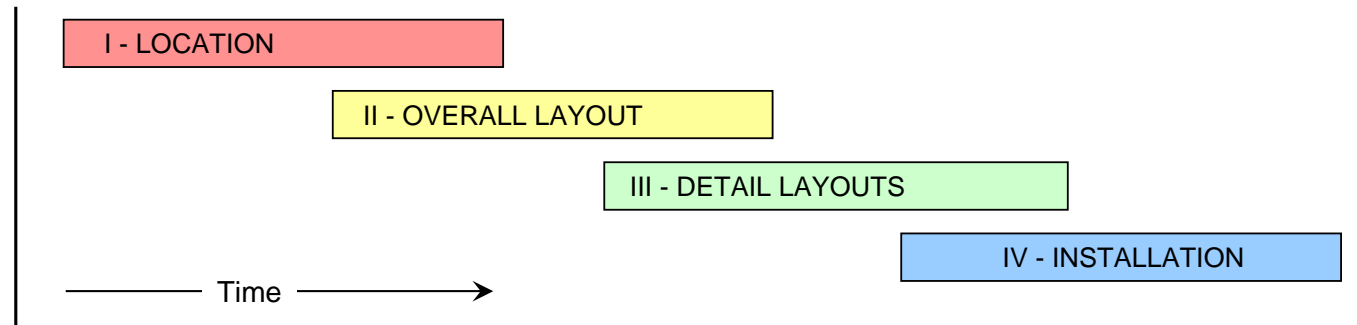
1 square = 100 sq.m.
 1 grid width = 10 m.

Explanation of the layout plan:

Main Points

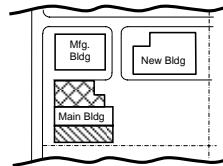
1. As each project runs its course – from initial stated objective to installed physical reality – it passes through four sequential and phases. For best results, the phases should overlap.
2. Phase I and Phase IV are frequently not part of the layout planner's specific role and are often performed by others. In a sense, they "frame" the strictly planning phases II and III.
3. Phase I considers situations and conditions *outside* our problem area, over which we may have little or no control. Yet these "externals" may influence or constrain our plans in Phases II and III.

The Phases of Systematic Layout Planning



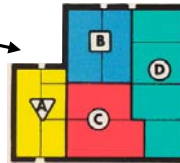
Phase I:

Establish the location of the area to be planned. Determine space available and surrounding influences.



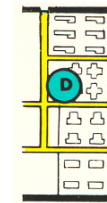
Phase II:

Plan the arrangement of activity-areas and departments. Define main aisles.



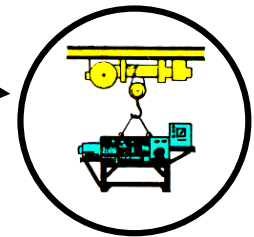
Phase III:

Plan the arrangement of specific machinery and equipment, ready to install.



Phase IV:

Prepare drawings and specifications; obtain and install equipment; train workers; follow through.



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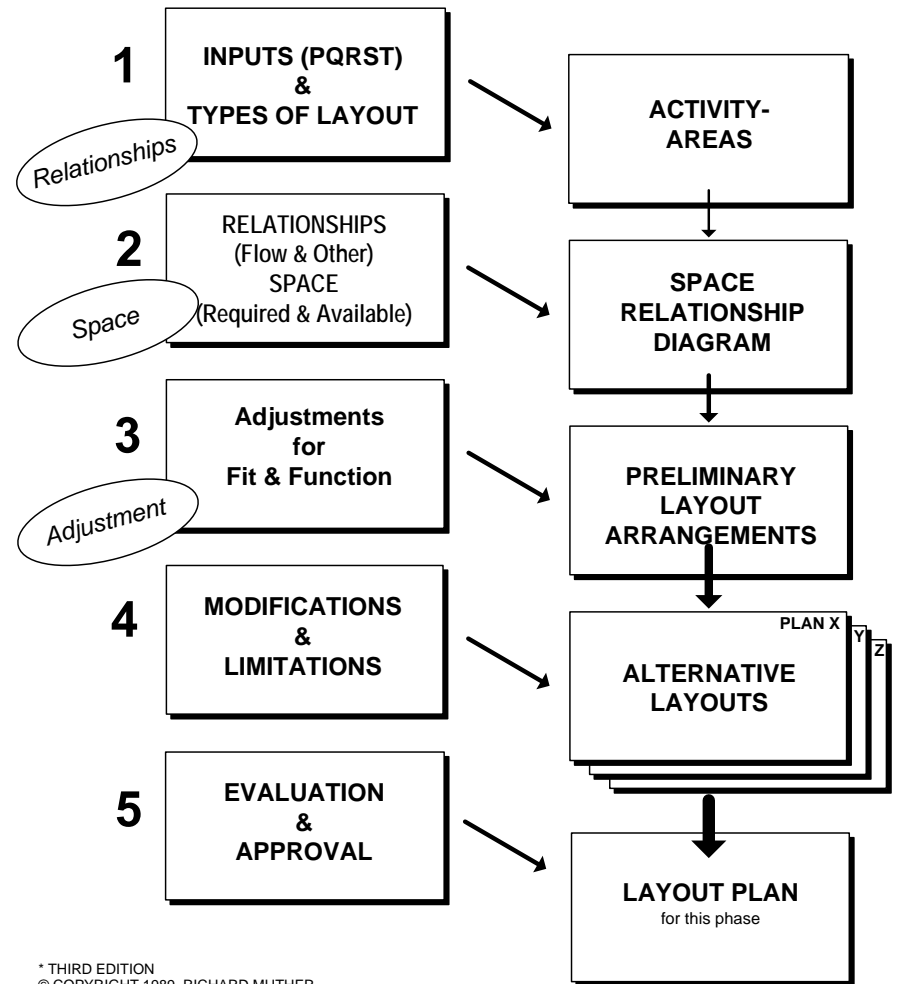
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Notes

Main Points

1. The SLP Pattern of Procedures is a five-section series of procedures resting squarely of the three fundamentals of *relationships*, *space* and *adjustment*.
2. The Pattern applies to both Phase II, Overall Layout, and Phase III, Detail Layouts.
3. The left-hand boxes of the pattern represent data collection and analysis.
4. The right-hand boxes represent synthesis and output of results.
5. The SLP Pattern requires that two or more alternatives be developed and evaluated before a plan is approved.
6. The more complicated the problem, the more useful and time-saving this pattern becomes.

Systematic Layout Planning Pattern*



* THIRD EDITION
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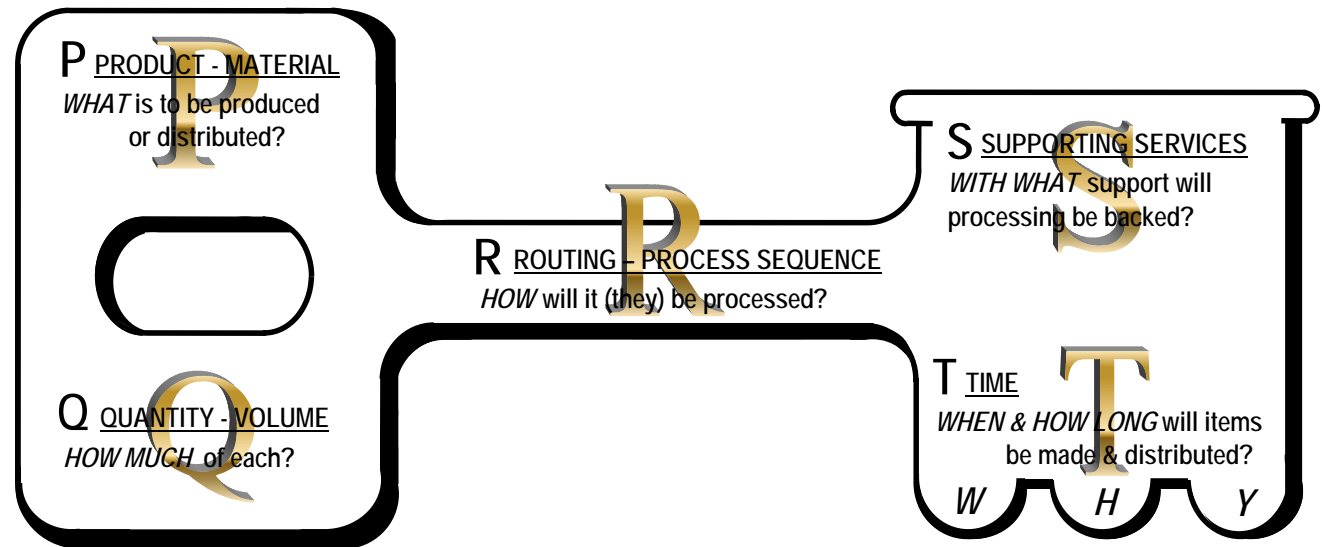
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Notes

Main Points

1. Facilities planning requires five types of key input data.
2. For ease of recall, the five key inputs are designated by the five-letter sequence: P-Q-R-S-T. These stand for:
 - *Products* (or materials or services)
 - *Quantities* (sales volumes & inventory)
 - *Routing* (or processes of necessary operations)
 - *Supporting Services* (for people, processes and information systems)
 - *Timing* (operating hours, seasons, urgency...)
3. The facilities planner must collect data from others for each of the five key inputs.
4. When collecting data, be sure to challenge its correctness and underlying assumptions, especially regarding “R” the routing or process.
5. This act of challenging is symbolized by the letters W-H-Y on the teeth of the key.

Key Inputs



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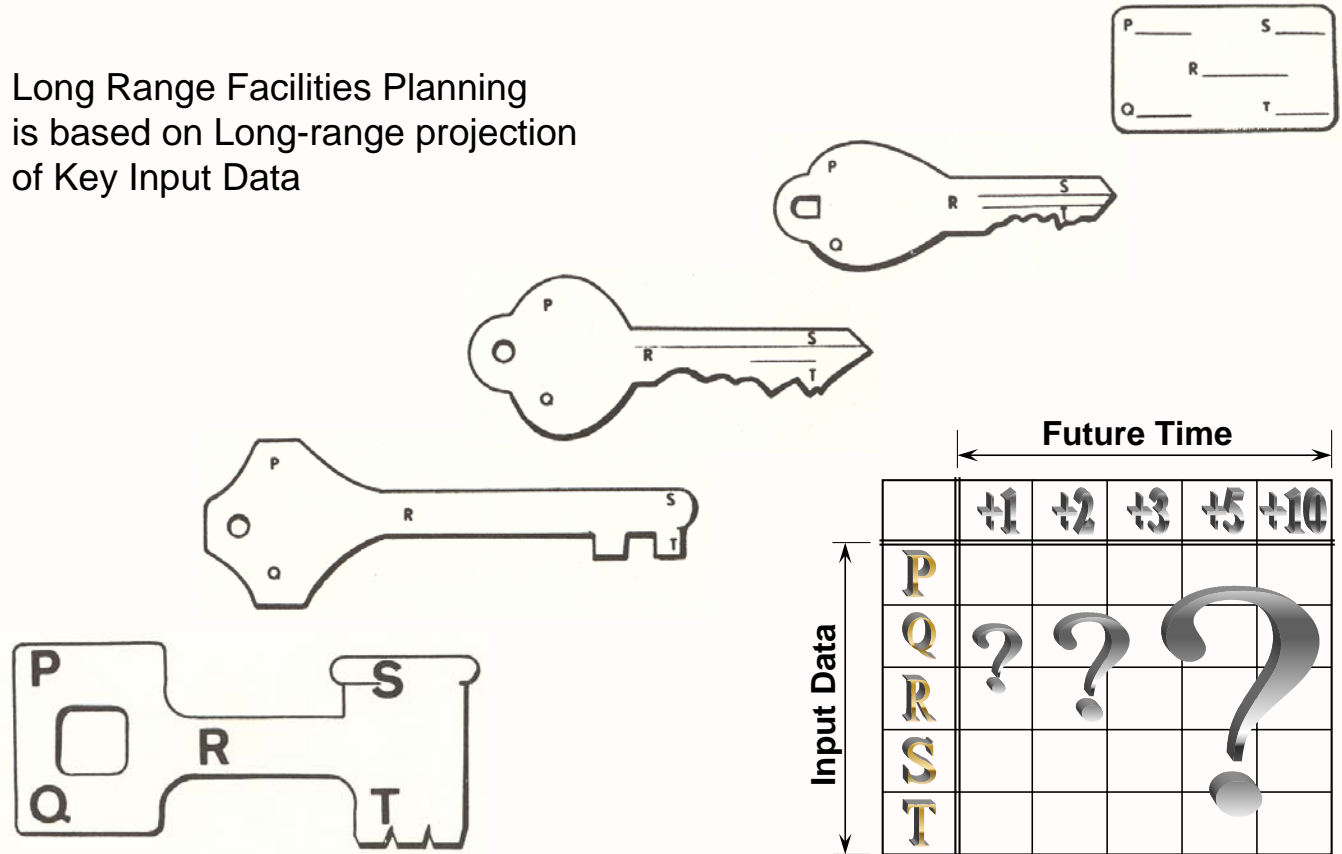
Notes

Main Points

1. Key inputs are always changing and evolving.
2. Projecting key inputs is essential when planning major capital investments with long useful lives.
3. Projecting key inputs requires a seat at the table where business strategies and plans are made.
4. Since long-range projections and access to business strategy are often sensitive, be prepared to educate senior management on your need to know.

Projecting Key Input Data

Long Range Facilities Planning
is based on Long-range projection
of Key Input Data



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Notes

1	RECEIVING & RAW PAPER STORAGE	FLOW-OF-PRODUCT WEDNESDAY
2	RECEIVING & SHIPPING	
3	WAREHOUSING & GENERAL STORAGE	
4	PRESS ROOM	
5	CUTTING & SCORING	
6	CHRISTMAS CARDS	

FLOW-OF-MATERIAL PROCESS CHART
 PRODUCTION OF POSTERS, CLASSIC CHRISTMAS,
 WEDDING & PERSONALIZED STATIONARY CARDS

ART PRINTING INC.
 PROJECT # 100 BT 10
 APRIL 3

LEGEND:
 NOTE: INTENSITY OF FLOW INDICATED BY WIDTH OF LINE
 0" 1" 2" 4" 8" 16" 32"
 PULLEY LEADS PER HOUR
 NUMBER IN BRACE SYMBOLS IDENTIFY ACTIVITY AREAS

PROCESS FLOW:
 1. **RAW MATERIALS** (32" line)
 2. **TRASH STORAGE** (32" line)
 3. **RAW PAPER** (32" line)
 4. **PRESS ROOM** (32" line)
 5. **CUTTING SCISSORS** (32" line)
 6. **TRASH STORAGE** (32" line)
 7. **CLASSIC CARDS BOX #1** (32" line)
 8. **CLASSIC CARDS (STANDARD PROD.) STORAGE** (32" line)
 9. **TRASH STORAGE** (32" line)
 10. **CRUSH PICTURE & PACKAGING** (32" line)
 11. **POSTER ORDER PICKING & PACKAGING** (32" line)
 12. **TO SHIPPING** (32" line)

ACTIVITY AREAS (in braces):
 {1} PRESS CARDS MOVIE
 {2} WEDDING STATIONERY BOX PROJECT
 {3} PERSONALIZED STATIONERY BOX PROJECT
 {4} CLASSIC CARDS BOX #1
 {5} CLASSIC CARDS (STANDARD PROD.) STORAGE
 {6} CRUSH PICTURE & PACKAGING
 {7} POSTER ORDER PICKING & PACKAGING

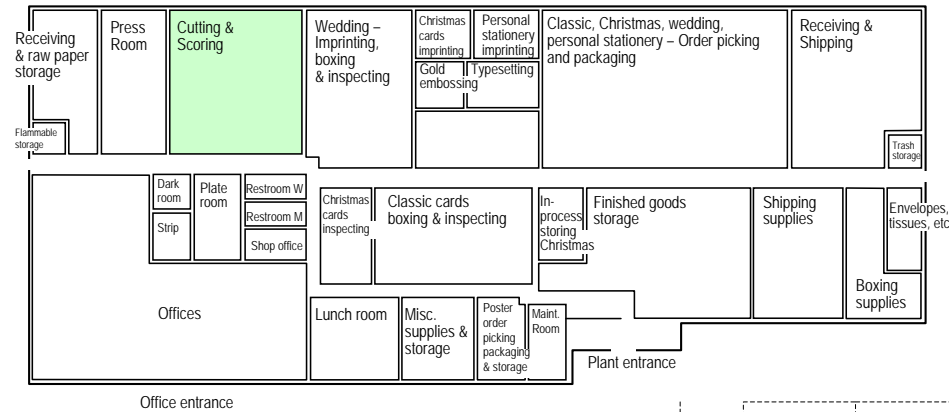
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COPYRIGHT 2005. RICHARD MUTHER & ASSOCIATES – SLP OVERVIEW

Overall (Block) Layout and Detail (Equipment) Layout Plan

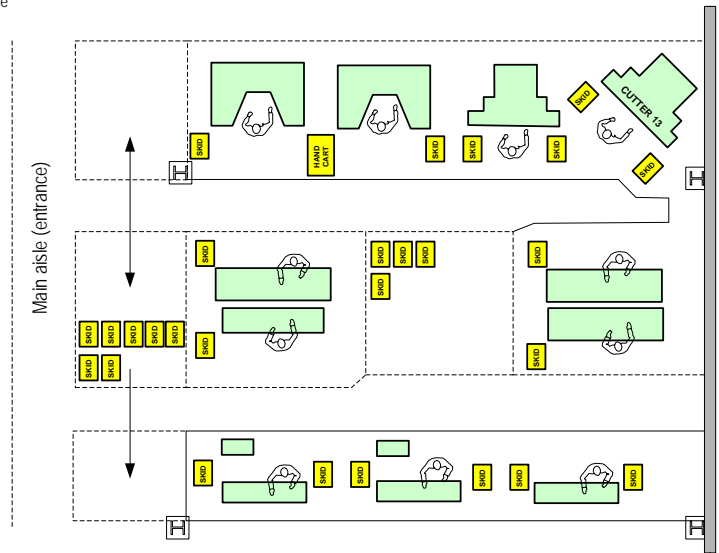
Main Points

1. The distinction between block and detail layout is essential in Systematic Layout Planning (SLP).
2. The purpose of block layout planning is to rapidly explore several significantly different ways to arrange the total space available – often an entire building or floor, or a large department that has sub-areas within it. This assures that the best overall arrangement is selected.
3. The purpose of detail layout planning is to arrange equipment within the chosen block plan.
4. Detail layout is time-consuming and wasted when its overall arrangement is rejected. By approving a block plan first, time spent on details is well-spent.
5. Equipment layouts tend to draw reviewers into the details, where they may overlook block-level alternatives.
6. The best equipment layout may not overcome inefficiencies caused by a poor block plan. For this reason, SLP devotes an entire phase to assuring that the best overall plan has been selected.
7. In practice, block and detail planning overlap. Some detail layout must be done during block planning to assure that sufficient space and adequate overall dimensions have been provided for each block activity-area.



Above is an overall or block layout for a plant producing greeting cards. The layout at right is a detail layout of machinery and equipment for one of the “blocks”: the cutting and scoring department

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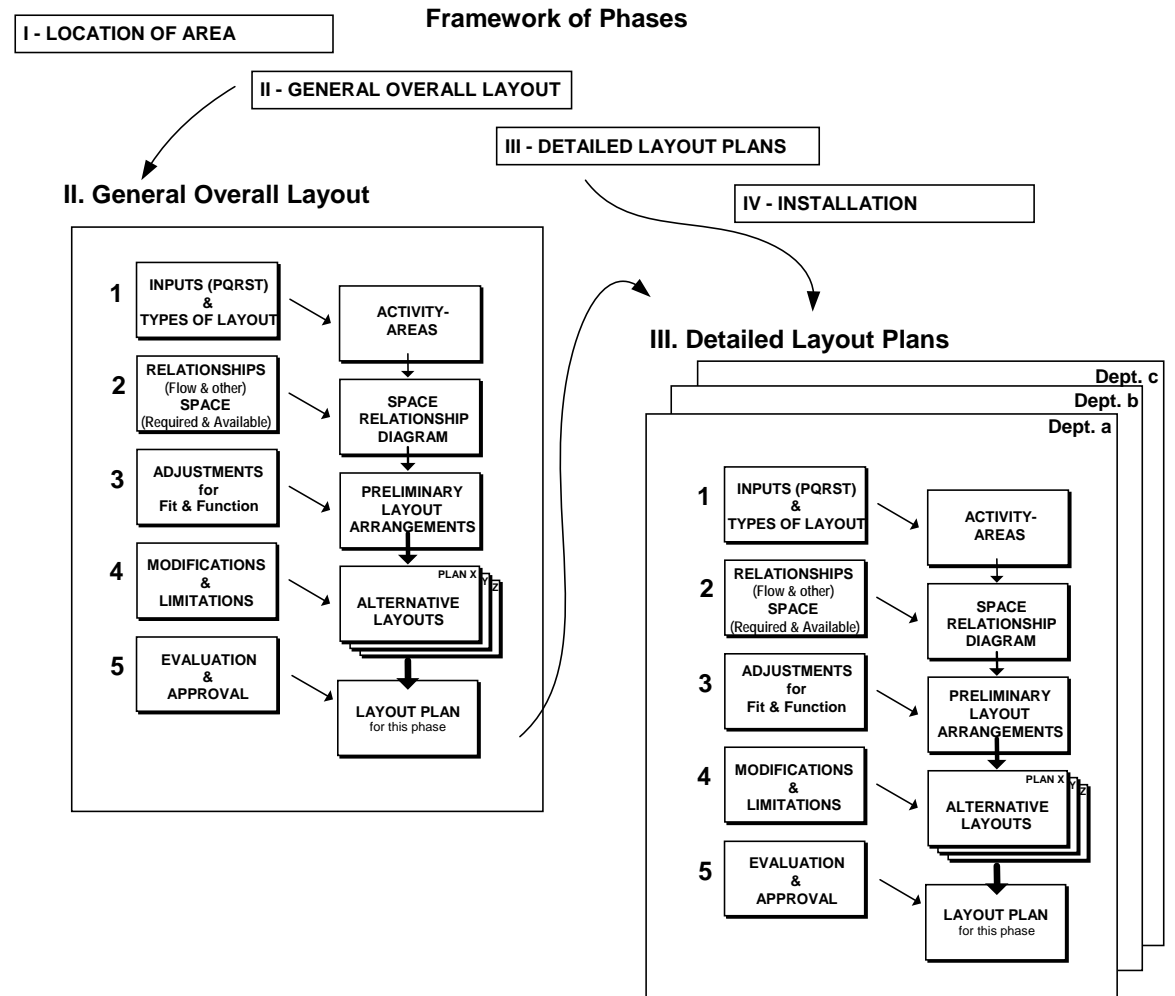
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Notes

Main Points

1. The SLP Pattern of Procedures applies to both Phase II, General or Overall Layout, and Phase III, Detailed Layout Plans. That is, the same steps are followed although the degree of application will be different in the two phases.
2. Phase II is devoted to planning the sizes and arrangement of areas or departments in the layout.
3. Phase III is devoted to arranging machinery and equipment within each area or department in the overall plan.
4. With its overlapping phases and repeating pattern of procedures, SLP enables the planner to tackle problems of any size or complexity.

The Pattern Repeats



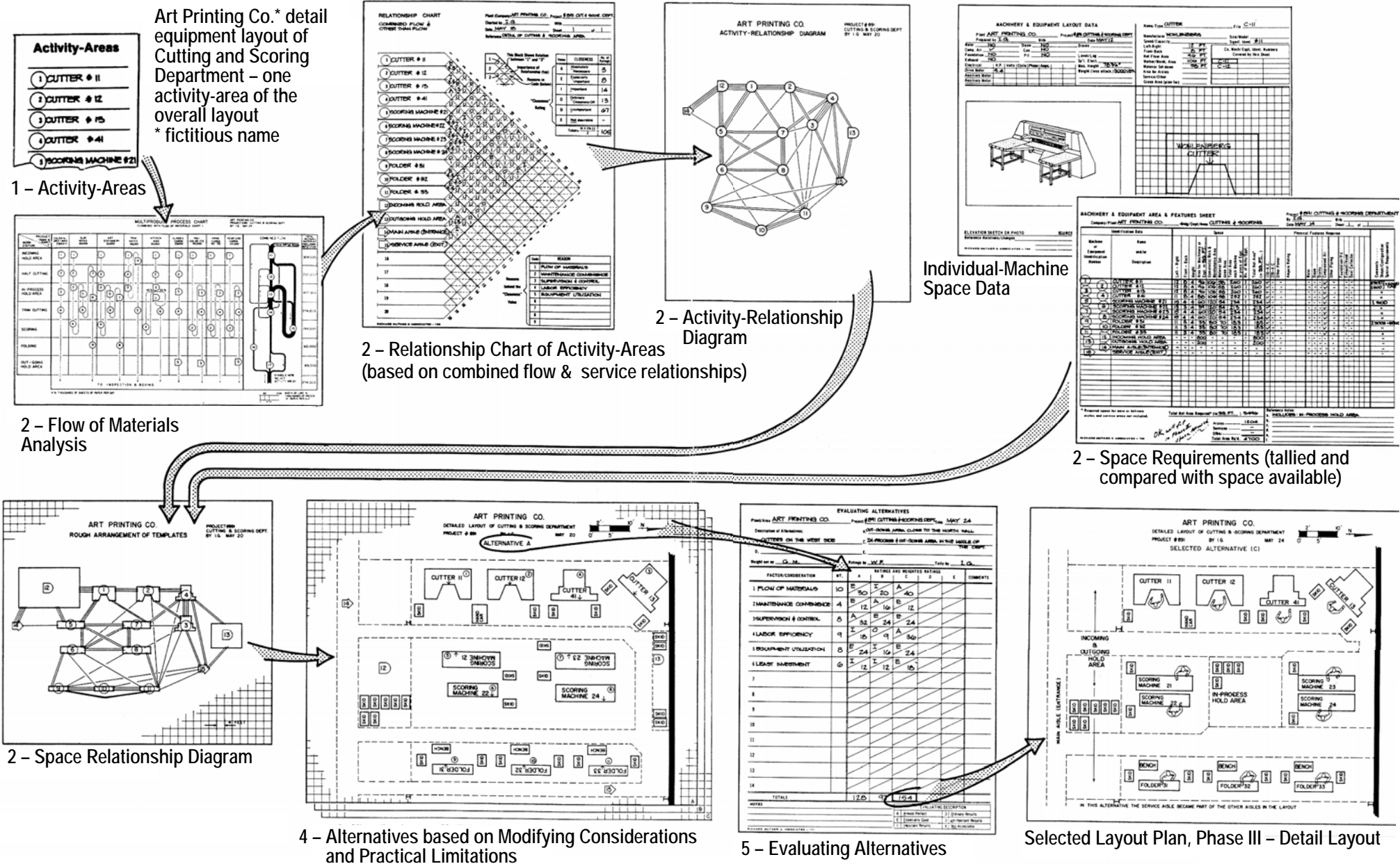
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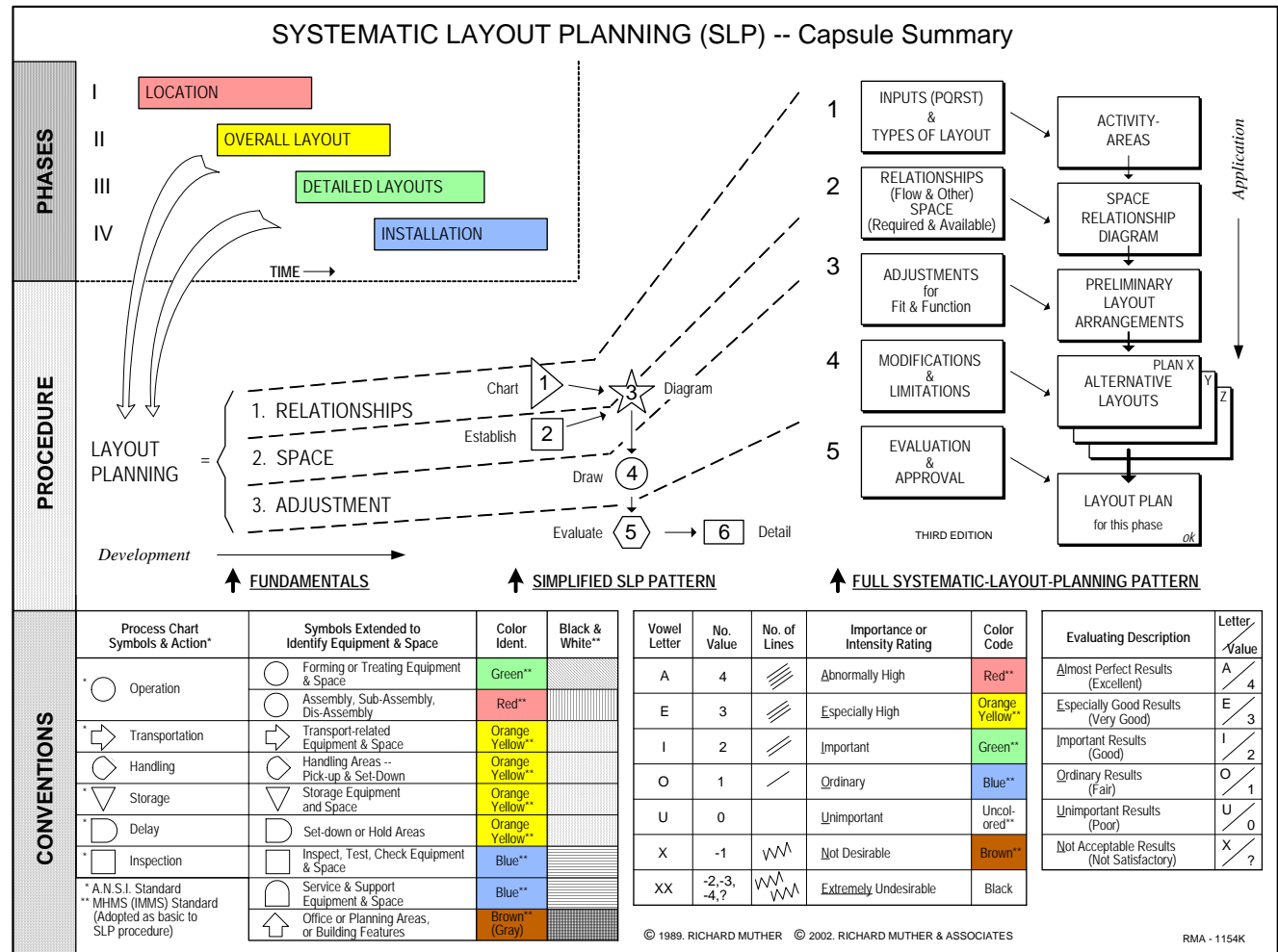
Notes

EXAMPLE OF SYSTEMATIC LAYOUT PLANNING (SLP) PHASE III DETAIL LAYOUT PLAN THIRD EDITION



Main Points

1. Systematic Layout Planning (SLP) is an organized, universally-applicable approach to any layout planning project.
2. SLP consists of:
 - Framework of Phases
 - Pattern of Procedures
 - Set of Conventions
3. SLP was first published in the 1960 by Richard Muther. It is widely taught, has been translated into nine languages, and is used throughout the world.



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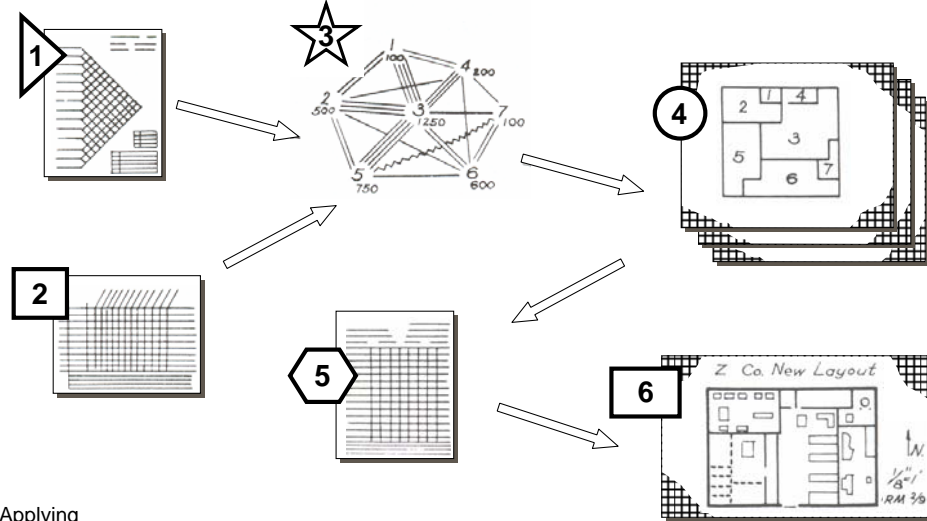
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Notes

Main Points

1. Simplified Systematic Layout Planning is a set of six procedures to follow when laying out an area. It is suited to smaller projects that do not require the full S.L.P. treatment.
2. Basically, any layout involves:
 1. Relationships between various functions or activities.
 2. Space in a certain amount and kind for each activity.
 3. Adjustment of these into a layout plan.
3. The six steps of Simplified S.L.P. follow these three basic elements; and the six steps form a pattern shown symbolically here.
4. Each of the six steps carries its own easy-to-note symbol:
 1. **Triangle** –triangular-shaped relationship **chart**.
 2. **Square** –square feet and physical features.
 3. **Star** –diagram connecting activities at different **points**.
 4. **Circle** –**round** and round to adjust the layout diagrammed.
 5. **Hexagon** –examine from **all sides**; evaluate all factors.
 6. **Rectangle** –layout plan on **sheet of paper** or building print.

SIMPLIFIED SYSTEMATIC LAYOUT PLANNING....



Instructions for Applying
SIMPLIFIED SYSTEMATIC LAYOUT PLANNING



– Chart the Relationships



– Establish Space Requirements



– Diagram Activity Relationships



– Draw Space Relationship Layouts



– Evaluate Alternative Arrangements



– Detail the Selected Layout Plan

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Notes
