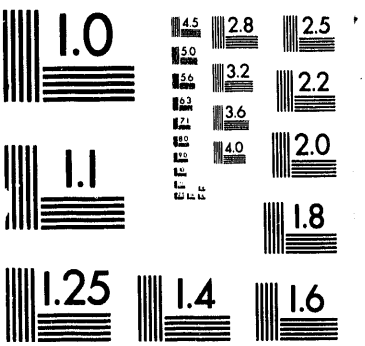
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PNL-SA-22737

# USING MULTI-DISCIPLINARY STRATEGIC MASTER FACILITIES PLANNING FOR ORGANIZATIONS EXPERIENCING PROGRAMMATIC RE-DIRECTION

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Presented at
Human Factors and Ergonomics Society
37th Annual Conference
October 11-15, 1993
Seattle, Washington

Work supported by
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

## ABSTRACT

# Using Multi-disciplinary Strategic Master Facilities Planning for Organizations Experiencing Programmatic Re-direction

Facility master planning is critical to the future productivity of a laboratory and the quality of worklife for the laboratory staff. For organizations undergoing programmatic re-direction, a master facility planning approach linked to the organization's strategic planning process is even more important. Major changes in an organization such as programmatic re-direction can significiantly impact a broad range of variables which exceed the expertise of traditional planning teams, e.g., capacity variability, work team organization, organizational culture, and work process simplification.

By expanding the diversity of the participants of the planning team, there is a greater likelihood that a research organization's scientific, organizational, economic, and employees' needs can be meshed in the strategic plan and facility plan. Recent recommendations from facility planners suggest drawing from diverse fields in building multi-disciplinary planning teams: architecture, engineering, natural science, social psychology, and strategic planning (Gibson,1993). For organizations undergoing significant operational or culture change, the master facility planning team should also include members with expertise in organizational effectiveness, industrial engineering, human resources, and environmental psychology. A recent planning and design project provides an example which illustrates the use of an expanded multi-disciplinary team engaged in planning laboratory renovations for a research organization undergoing programmatic re-direction.

The purpose of the proposed poster session is to present a multi-disciplinary master facility planning process linked to an organization's strategic planning process or organizational strategies. The specific objectives of the poster session are:

- to describe a laboratory planning and design project which used an expanded multi-disciplinary team
- to present lessons learned
- to outline an expanded multi-disciplinary strategic master facility planning process.

The poster session will use visual materials to present the issues raised in the proposal. The visual materials will illustrate:

- linear programming
- linked master facility planning and strategic planning
- multi-disciplinary planning team membership and expertise
- major contributions of the different team members during planning and design
- the design features of the sample receiving, preparation, and storage lab which represent input from the varied team members
- the SRPS laboratory prior to and after renovation

# Using a Multi-disciplinary Master Facilities Planning Team for Organizations Experiencing Programmatic Re-direction

## 1.0 Introduction

Facility master planning is critical to the future productivity of a facility and the quality of worklife for the facility's staff. For organizations undergoing programmatic re-direction, a master facility planning approach linked to the organization's strategic planning process is even more important. A number of organizational factors affect the success of new and renovated facilities in the planning and design processes as well as the completed facility. "Facility planning always occurs within a strategic context - sooner or later, stated or implied, by plan or by default" (Hornik, 1992, p. 16).

Major changes in an organization such as programmatic re-direction can significantly impact a broad range of variables which exceed the expertise of traditional planning teams, e.g., capacity variability, work team organization, organizational culture, and work process simplification. By expanding the diversity of the participants of the planning team, there is a greater likelihood that a research organization's scientific, organizational, economic, and employees' needs can be meshed in the strategic plan and facility plan. Traditionally, facility planning teams include a facility programmer, project manager, architect/engineer, code consultant, financial consultant/cost analyst, equipment consultant, and site consultant. Recent recommendations from facility planners suggest drawing from diverse fields in building multi-disciplinary planning teams: architecture, engineering, natural science, social psychology, and strategic planning (Gibson,1993).

For organizations undergoing significant operational or culture change, the master facility planning team should also include members with expertise in organizational effectiveness, industrial engineering, human resources, and environmental psychology. A recent planning and design project provides an example which illustrates the use of an expanded multi-disciplinary team engaged in planning laboratory renovations for a research organization undergoing programmatic re-direction.

## 2.0 Purpose

The purpose of the proposed poster session is to present a multi-disciplinary team master facility planning process linked to an organization's strategic planning process or organizational strategies. The specific objectives of the poster session are:

- to describe a laboratory planning and design project which used an expanded multi-disciplinary team

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- to present lessons learned

- to outline multi-disciplinary team roles in a strategic master facility planning process.

The poster session will be based on a visual presentation of the issues raised in the proposal. The visual materials will illustrate:

- linked master facility planning and strategic planning
- multi-disciplinary planning team membership and expertise
- major contributions of the different team members during planning and design
- the design features of the sample receiving, preparation, and storage lab which represent input from the varied team members
- the SRPS laboratory prior to and after renovation

## 3.0 Background

The scientific operations of the Hanford Site in southeastern Washington have changed substantially in the past few years. The Department of Energy (DOE) site has turned from the production of weapons-grade nuclear materials towards the development and application of cutting-edge technologies for environmental restoration and the clean-up of sites contaminated by radioactive and hazardous materials. The requirements inherent in this changing mission differ significantly from the requirements placed previously upon the analytical chemistry laboratories and differ extremely from the requirements of the 1950's when the labs were designed. In addition, the technical aspects of today's chemistry operations vary significantly from previous operational requirements. The older laboratories built in the early 1950's were designed around a repetition of standard modules, into which all analytical work was fit. In designing PNL's analytical chemistry laboratories of the 1990's, individualization of design, targeted toward very specific analytical applications has provided more productive workspaces than a "generic" laboratory design approach .

In order to fully support the change in mission at Hanford, the DOE's Pacific Northwest Laboratory (PNL) operated by Battelle-Northwest is re-directing and upgrading a portion of its operations, the environmental analytical chemistry capabilities. The Analytical Chemistry Laboratory (ACL) Upgrade Project focused on four primary goals to meet the programmatic re-direction:

- *develop new analytical capabilities*
- *expand capacity to meet projected 400% increase in sample load*
- *improve process efficiency*
- *develop new technology .*

The Laboratory selected three means of attaining the primary goals: 1) facility renovations ($34 million), 2) instrumentation acquisitions ($18.5 million), and 3) productivity enhancements ($2.5 million).

## 4.0 Facility Planning and Design Approach

The Upgrades Program team faced significant challenges from the magnitude of the changes in operation, the goal of creating an exemplary laboratory system within the DOE laboratory system, and the desire to design an architecturally exceptional workspace in the existing 1950's buildings. The following sections outline the planning process and team used to program the SRPS laboratory, describe the lessons learned from the process, and outline the use of an expanded multi-disciplinary team for planning facilities for organizations undergoing programmatic re-direction.

## 4.1 SRPS Laboratory Planning Process

When the ACL Upgrades planning team turned their attention to planning and designing the centralized sample receiving, preparation, and storage laboratory (SRPS), the design and research process problems exceeded the design solutions used in the previous state-of-the-art laboratory renovations. At this point, the Program Manager enrolled a human factors/environmental psychologist to help analyze work flow and complete a functional design program. The SRPS planning team adopted a linear programming process modeled after CRSS's Problem Seeking model (1987) - defining goals, facts, concepts, needs, and developing problem statements. Throughout the process, the ACL Upgrades Program Manager expanded the team beyond a traditional planning team composition to obtain needed expertise. Team members added at different stages of the planning process or those involved in concurrent and related improvement activities are indicated in italics.

| PROCESS | TEAM |
|---|---|
| Establish **Goals** | Core: PM, PP&C manager, analytical chemistry group leaders, human factors/environmental psychologist<br>Ad hoc: Architect |
| Collect and Analyze **Facts** | Core: PM, PP&C manager, human factors/environmental psychologist<br>Ad hoc: Architect, analytical chemistry group leaders |

| | |
|---|---|
| | Concurrent analysis and problem solving: *Human resources specialist* - communication patterns, job & task descriptions, *Industrial engineer* - in house industrial engineer developed partial laboratory work flow and work load analysis |
| Uncover and Test **Concepts** | Core: PM, PP&C manager,, human factors/ environmental psychologist, architect<br><br>Consulted with:<br>*Industrial/organizational psychologist* and *industrial engineer, analytical chemistry group leaders* |
| Determine **Needs** | Core: PM, PP&C manager, human factors/ environmental psychologist, *architect* |
| State the **Problem** | Core: PM, PP&C manager, analytical chemistry group leaders, human factors/ environmental psychologist, *architect* |

## 4.2 Lessons Learned

Lessons learned from the SRPS relate directly to the composition of the planning team and the importance of linking master facility planning and strategic planning.

1. During the process of collecting and analyzing information about the existing sample receiving, preparation, and residual sample storage processes and the anticipated operation of the SRPS, it became clear that optimum solutions to a variety of SRPS lab design issues depended on changes in overall ACL operations. For example, projected liquid hazardous waste storage space within the SRPS was estimated at accommodating 6-8 large carboys waiting for transfer to the waste handling area. Valuable laboratory floor space could be saved by changes in the ACL waste handling operation, i.e., increased frequency of waste removal from the individual labs.

*Recommendation* : For laboratory issues which depend on the operation of the larger facility or organization, collect and analyze information about the process at the system level. Explore the current operation, planned changes, and the potential for changes to the process which might impact lab design.

*Recommendation* : Include an industrial engineer on the master planning team for process research laboratories and facilities, in general, which house process industries.

2. Work flow planning should be coordinated with an examination of the organizational structure. During the process of planning the centralization of sample receiving and sample storage for three different technical analytical chemistry groups (inorganic, organic, and radiological chemistry), a series of difficult questions were raised:

- Who will staff the lab?
- To what technical group will the SRPS lab report?
- Which technical roup is responsible for the lab?

*Recommendation* : Examine larger organizational issues in conjunction with facility planning.

*Recommendation* : Use simultaneous or linked master facility and strategic planning and analysis (Ramseur, 1992) to allow concurrent examination of interdependent information and issues which impact facilities design and the ultimate success of the operation of the facility, particularly for organizations undergoing programmatic re-direction.

*Recommendation* : Include an organizational effectiveness expert on the master facility planning team for organizations undergoing programmatic re-direction.

### 4.3 Linked facility master planning and strategic planning

A facility master plan linked to the organization's strategic plan or which documents the organization's strategies enables the planning team to program and design a facility which will better suit the organization's and employees' needs.
The following figure relates a facility master planning process to a strategic planning process (Dahan, F.W., Ramseur, J.D., Hornik, J.W., & Graves, R.G; 1992). A key difference between a linear facility programming process and the linked strategic planning process lies in the scope of the information gathering and analysis activities. The facility master plan also relies on the composition of the multi-disciplinary team which directs information gathering, analyzes information, develops design options and operational scenarios, test the options and scenarios, performs a detailed analysis, synthesizes the results and collaborates on the program design and evaluation, and evaluates planning process and outcome.

**Linked facility master planning and strategic planning**

| Facility Master Planning | Scope | Strategic Planning |
|---|---|---|
| **Identification of objectives, knowns and unknowns and** | | **Identification of objectives,knowns unknowns** |
| *(Establish Goals)* | | |

**Team Formation**

Program Manager
Architect
Environmental Psychologist/
Ergonomist
Organizational psychologist
Financial consultant/Cost analyst
Human Resources

**Preliminary Analysis**

(*Collecting & Analyzing Facts* )

Strategy
Business Demand
Technology
Regulation
Human Resources
Organizational strategies
Location
Finance

**Develop Performance Measures**

**Form Scenarios**
**Development**

(*Uncover Concepts*)

**Detailed Analysis**

(*Testing Concepts)*

Strategy
Business Demand
Technology
Regulation
Human Resources
Organizational strategies
Location
Finance

**Synthesis**

(*Determine Needs* )
(*State the Problem*)

**Team Formation**

**Preliminary**
**Strategic Analysis**

**Develop**
**Measures**

**Testing &**

**of Strategic Options**

**Detailed Strategic**
**Analysis**

**Refined Strategic**
**Direction**

| **Design Decision** | **Organizational Strategy** |
|---|---|
| **Planning Process and and Post Occupancy Evaluation** | **Planning Process Strategic Changes** |

## 5.0 Multi-disciplinary Team Roles

The following list identifies the members of a multi-disciplinary master facility planning and design team some of the areas of expertise offered by and responsibility held by each member.

| | |
|---|---|
| Program Manager | Maintain project vision, oversee schedule and cost, coordinate planning and design team, represent the client organization, report the project, coordinate programmer access to the organization |
| Architect | Safety, work flow, aesthetics, spaciousness, ventilation, quality of worklife, lighting, occupational health, design concepts to support mission, selection of environmentally appropriate products |
| Environmental Psychologist/ Ergonomist | Functional design requirements, laboratory layout, visual space, fume hood design, reach envelopes, storage capacity, casework design, environmental perception, quality of worklife, functional adjacencies, work flow, productivity |
| Industrial engineer | Work volume description, cycle time, work layout, quality control, productivity |
| Organizational Effectiveness | Team organization, management style, organizational culture, communication patterns, quality of worklife, staffing, productivity |
| Human Resources | Job descriptions, management-employee interaction, organizational culture, communication patterns, productivity |

## 6.0 Conclusions

The likelihood of creating an optimal facility that meets an organization's varied needs is increased greatly by linking the facility master planning process and the organization's strategic planning process and by expanding the diversity of the master planning team. For organization's undergoing programmatic re-direction,
the need for linking the strategic and facility master planning processes is paramount. By involving organizational effectiveness specialists and work process experts, essential information can be gathered and integrated into the facility planning and design process which will ensure a better match between the organization and its facilities.

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