The Cost of Facility Development:

A Comparative Analysis of Public and Private Sector Facility Development Processes and Costs

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ABSTRACT

Due to the concerns of local, state and federal public officials over the cost and quality of facilities, interest in understanding why public university buildings appear to, and/or actually cost more than private sector buildings is high. This monograph responds to these concerns by comparing cost, quality and time factors of selected public and private sector facilities in the State of Wisconsin. Using a multiple case study method, several factors affecting project costs are investigated: (a) organizational context of design decision-making, (b) facility development process, (c) project scope, and (d) project outcomes. Five matched pairs of public institution/private commercial buildings are comparatively analyzed to determine if private sector project development is less expensive that public sector project development, and if so, why.

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EXECUTIVE SUMMARY

Within the context of tighter constraints on capital expenditures, building program administrators are increasingly criticized by those who perceive unjustifiable higher cost public buildings relative to comparable private buildings.

Due to the Department of Facility Development's (DFD) concerns over the cost and quality of facilities, the DFD is interested in understanding why public buildings appear to, and/or actually cost more than private sector buildings. The University of Wisconsin-Milwaukee School of Architecture and Urban Planning (SARUP) responded to a DFD request for a proposal to study these concerns of the state building program.

The study analyzed five matched pairs of public institution/private owner-occupied commercial buildings in the State of Wisconsin to determine if private sector project development is less expensive that public sector project development, and if so, why.

Using a multiple case study method, four primary factors affecting project development and associated costs were investigated: (a) organizational context of design decision-making, (b) facility development process, (c) project scope, and (d) project outcomes. After a lengthly search for comparable buildings, five matched pairs were chosen:

	Public Facility	Private Facility
1	DNR Building, Milwaukee, WI	Warzyn Building, Madison, WI
2	Waukesha State Office Building, Waukesha, WI	FIserve Building Brookfield, WI
3	Stores/Extension Services Facility, Madison, WI	Electromotive Facility Milwaukee, WI
4	Allied Health Center UW-Eau Claire	Clark Hall Nursing School Marquette University, Milwaukee, WI
5	McPhee Physical Education Facility, UW-Eau Claire	Beloit Physical Education Facility, Beloit College

Data collection included conducting individual and group interviews, and collecting relevant archival materials (organizational records, contract documents, specifications, and project records). Data analysis consisted of identifying similarities and differences across matched and comparison levels of analysis for each case pair. Three project outcomes were measured: time (project duration), facility development complexity, and several categories of project costs (building, construction and project costs, site development, design and supervision, and change order costs).

Once the project outcomes of time, complexity and cost were documented, a comparative analysis was undertaken. Factors of Complexity that differed between the paired cases were identified as possible reasons or potential contributors to differences in project duration (time) and costs. Specific examples from the case studies are highlighted to illustrate how these Factors of Complexity may have affected project duration and costs.

There are a large number of factors that influence the cost and time required to design and construct building projects. The research instrument used in this study analyzed issues of complexity relative to time and cost outcomes and identified primary factors that caused differences in project duration and cost for the cases sampled. The study identifies those factors that are particularly responsible for outcome differences between public and private buildings. There are two main conclusions of this study based on the findings:

Conclusion #1

Operating within a complex process leads to a complex project that requires more time and higher costs.

While this statement may seem to be obvious, the findings in this study provide supporting evidence and put forth case examples where the questions of *how much longer* and *how much more* are answered. Structures and Procedures and Methods of Contracting were identified as being more complex more often in the Public sector cases and resulted in longer project durations, and higher General, Mechanical/Plumbing, and Design & Supervision costs. While differences in Design & Supervision have small effect on the Total Project Cost, differences in General and Mechanical/Plumbing costs have significant effect as together they comprise the majority of a building's Total Project Cost. All of the Public facilities followed a more complex development process resulting in generally more complex building projects that in 4 out of 5 cases took longer to build (on average, 80% longer to design and 101% longer to construct) and in 4 out of 5 cases cost more (on average, Total Project Cost/GSF was 11% more).

The simple summary statistic — public buildings cost 11% more — fails to identify several fundamental causes for wide variation in cost differentials. Fundamentally, there are significant qualitative differences in buildings — primarily evident in terms of project complexity — that result in cost differences. These complexities include, for example, public policies requirements that protect the public interest, more complex and unique building requirements, different time lines and life cycle goals, and the accepted level of probability for project failure.

Conclusion #2

"Top-line factors" significantly influence Public Sector decision-making procedures resulting in a project that is more complex that requires more time and higher costs but has greater public accountability.

A tension exists between so-called "bottom-line factors" and "top-line factors." Bottom-line factors are those factors solely associated with costs, while top-line factors are those associated with social or community benefits and issues of public accountability. Bottom-line factors are more dominant in the motives of private sector development whereas top-line factors are more significant in the public sector. At one level, the objective or motive in both public and private sector owners is the same; getting a product of value. The criteria for *what is value* however, is clearly different between public and private sectors–a difference that must be considered when comparing public buildings to private buildings. Is the owner's objective to build at the lowest possible cost, or to build at the best possible cost commensurate with good design, safety standards and long-term life cycles?

Knowing the motive for development is critical to understanding why these factors vary between public and private sectors. This study has looked at both issues, bottom-line and top-line, one is quantitative in nature, the other is qualitative. The exact linkages between differences in these two bodies of data are difficult to pin-point, but critical in understanding why some buildings cost more than others. In examining complexity (in terms of both development process and physical form) and various components of cost and time simutaneously, the findings reveal the trade-offs between time and cost outcomes and public accountability. For example, while Public sector buildings generally took longer and had higher Total Project Costs/GSF, Change Orders/GSF were smaller (on average, 23% less) and in 3 out of 5 cases Change Orders constituted a significantly smaller percentage of Total Project Cost than its Private Sector match.

In 4 cases, the public buildings cost more. The important question is why these costs differences occurred and whether or not they are appropriate. That is, are these comparable projects providing the same level of environmental quality — or is the public paying for more (or less) relative to the private sector. In general, it appears that public sector building may pay a little more, but they also get more — in terms of durability and conformance to societal goals.

The standards for public and private buildings are different — and this allows private sector buildings to be built faster, with more compromises (albeit well-chosen trade-offs) and to accept a higher level of risk for failure. If public building programs had the same flexibility the costs would probably be comparable. Poor public buildings could be built for less money — but only if the public were willing to accept the same standards and risks as evident in the private sector. This is unlikely.

Consequently, future research should focus on what qualities are being purchased by the public and whether those qualities are worth the apparent additional premium. If not, the additional qualities (and the public polices that mandate them) should be reconsidered.

Several of the architects and contractors that were interviewed in this study indicated that state work did not offer them much opportunity for large profits but were 'bread and butter" kinds of jobs that provided stability in a firm's practice. Longer project durations (due to more structured procedures and policies) were identified as the primary reason for lower profit margins. This is simply indicative of the state getting more for each dollar that it spends on buildings. The public sector should not be a "cash cow" for the the private sector to make great profits from–this is simply not in the public interest. Providing a stable foundation for firms to depend on in leaner construction periods and making use of each public dollar going to those firms, however, is acting responsibly.

SECTION 1

INTRODUCTION TO THE STUDY

1.0 Introduction

1.1 Overview

As inflation and competition for public funds places more restrictions on public building programs, the desire to control project costs becomes the central focus of decision making. Within the context of tightening budget constraints, building programs are often subject to criticism due to the apparent higher costs of public facilities relative to private development. For example, during the course of this study, the higher costs for construction and maintenance of public university buildings was a frequently cited perception among facility managers, administrators and trustees.

Background of the Problem

The topic of economy and efficiency in the state building program has been discussed for some time between the University of Wisconsin-System Administration, UW-Madison, UW-Milwaukee, and the Division of Facilities Development (DFD) in the Department of Administration (DOA). Motivated by a concern for understanding why public university buildings appear to cost more than private sector buildings, the Division of Facilities Development and the Division of Capital Budget and Architectural/ Engineering Services of the University of Wisconsin-System have expressed an interest in investigating state building practices. One of the concerns is the extent to which the Wisconsin state building program in general, and the UW-System building program in particular, have contributed to, or are partially responsible for, perceived and/or actual problems of cost and quality control.

Due to the DFD and UW-System's shared sense of concern over the perceived deficiencies of the state building program, and concerns over the cost and quality of facilities that they are able to construct, the DFD requested the UW-Milwaukee School of Architecture and Urban Planning (SARUP) conduct an objective outside assessment of the building practices which may lead to a set of recommendations aimed at improving perceptions of the program.

Purpose of the Proposed Study

The goals and purposes of this study include:

(a) identifying and analyzing problems and issues within the UW-System and state building program which can begin to resolve the concerns of the DFD, the legislature and the public-at-large related to the high costs of facility development; and,

(b) analyzing the issue of whether Wisconsin private commercial sector development is less expensive than comparable Wisconsin state public sector development, and why.

(c) if private development is less expensive than comparable public sector development, identifying potential factors and conditions within the building process, or with the building product, which account for more expensive buildings in the Wisconsin's public sector, and why.

(d) providing recommendations for improving the efficiency of the state building program, building increased flexibility into the process, and positively affecting the quality of future building projects.

1.2 Premises and Hypotheses

This section presents the premises and hypotheses of this study.

An initial premise of the study states that different organizations' expectations of their buildings' purposes and intents lead to different facility development processes and decisions, resulting in observed cost differences.

A second premise of this study is that the facility development process being followed to initiate, design and implement building projects affects the final project outcomes in terms of time, cost and quality of the constructed product.

Following these two premises and the implications of the study framework (see Figure 1), this study hypothesizes that

(a) due to the state's administrative processes, intentions and expectations for building, public building projects take longer to develop than private projects, subjecting public projects to more uncertain longer-term economic fluctuations,

(b) public institutions see the development of public buildings as a long-term investment, in contrast to private sector development which focuses more narrowly on short-term return on investment,

(c) as a result of a long-term investment focus, public institutions place more attention on building life-cycle analysis, program requirements, and durable high quality building systems and materials than does the private sector.

1.3 Outline of Report

This report is divided into three sections. Section 1 presents an introduction to the study, a critical literature review of the recent studies that focus on comparative cost analyses of public and private facilities, and a description of the methodology used in the present study. Section 2 presents a detailed comparative analysis between and across the five paired case studies. Section 3 offers discussion and conclusions based on the previous comparative analysis.

2.0 Review of the Literature

2.1 Overview

After providing an overview of the issues involved in building costs, this section reviews the most recent studies that have investigated building cost differences between public and private facilities. Studies to be reviewed include: the Stanford University Study (Kershner, 1987); The Princeton University Value Study (Ballinger, 1990); University of Wisconsin-System Administration (Jenson & Hardesty, 1991); General Services Administration Cost and Performance Study (Hanscomb and Associates, 1976); and the Higher Education Colloquium on Science Facilities Task Force on Academic Facilities Costs (Higher Education Colloquium, 1993).

According to a report by McIntick (1986) estimates from the construction industry concerning the cost difference between federal projects and privately owned structures of similar size ranges any where from 4% to 15%. A frequent speculation is that special laws and conditions increase costs. It is further speculated that stringent requirements for public accountability may also influence cost levels adversely when viewed against the greater procurement flexibility available to the private sector.

There are a number of factors other than building hardware and configuration that may impose on costs on public sector projects which do not have an impact on many private sector projects. These issues are at present a matter of speculation and hypothesis; hypotheses that have not been tested by empirical research. Factors that have been discussed in the literature (Chiu, 1990; Hanscomb and Associates, 1976; McIntick, 1986; NRC, 1991) are summarized below :

1. Legislative enactments

Legislative enactments include labor standards such as Davis-Bacon Act, Equal Employment Opportunity Act; environmental protection laws for water, air, noise pollution control, proper land use, waste disposal requirements, protection of historic buildings; and safety requirements such as OSHA requirements.

2. Building life-cycle costs

Public buildings are designed to last longer than typical private projects increasing the first costs of government projects with respect to private projects. Durability of buildings is an explicit design criteria of many government related projects. As a result, life-cycle costs become a major design consideration in these projects. The argument is that first costs may be higher for government building projects (e.g. materials chosen cost more but require less maintenance attention), but operating costs over time will be less than private sector buildings.

The lack of building life-cycle cost analysis in current development practice, and its role in potentially decreasing project costs over the long term, are well documented in both public and private sectors. The role of life-cycle cost analysis in analyzing building cost comparisons has not been looked at in the literature. A recent report conducted jointly by the Federal Construction Council and the Building Research Board (N.R.C., 1991) summarizes an expert panel inquiry which formulated criteria and recommendations for using life-cycle cost analysis in building design in an effort to improve government agency building development. Designers and owners of buildings recognize that there are many trade-offs which can be made during planning and design which can affect initial construction costs, recurring operations and maintenance costs, and building performance.

Substantial obstacles to implementing life-cycle cost control in practice include: (1) failure of designers to include life-cycle cost goals in their design criteria; (2) failure of owners or managers with short-term responsibility of a building to consider effectively the longer-term impact of their decisions on the building's O&M requirements; (3) general desire of many decision makers to minimized their initial expenditures in an effort to increase return on investment, and/or meet budgetary restrictions; and (4) lack of data and accepted industry standards for describing the maintenance effect and operational performance of building components (N.R.C., 1991).

3. Profit Incentives

Profit incentives may have an affect on private building costs that is missing from public projects: in short, the motives for development are radically different. The motives for development on the private sector is focused on short-term investment opportunities, while the public sector focuses on long-term investment and public accountability.

4. Low-bid construction contracts

The use of low-bid construction contracts may actually add to costs versus reducing them. The process by which low bids are obtained may actually reward less qualified contractors to win contracts consequently compromising the quality of construction management, generate delays and/or change orders and reduce the quality of the final constructed product.

5. Specification restrictions

Government projects often require non-proprietary specifications while private sector projects often specify companies and trade names and accept "as equals."

6. Documentation

Governmental processes require very complex and bulky documentation during all phases of the process, while the private sector streamlines the documentation process in favor of expediency. The volume of documentation required often discourages prospective bidders from competing with contractors that have learned how to manage the system.

7. Procurement policies and standards

Policies and standards are driven by public accountability. A system of open competitive bidding is seen as the most expedient way to facilitate a process that demonstrates to the public at large that facilities are being procured at the best possible price. This process has as a result evolved into a system of extensive rules, regulations and documentation at all levels of government. By contrast the private sector has a greater degree of flexibility in adopting methods and procurement strategies that reduce costs. The principle difference between public and private sector development strategies has to do with the freedom private sector developers have to negotiate direct with a construction manager or contractor, or to limit bidding lists by pre-qualification. It is often argued that negotiation and pre-qualification usually insure better workmanship, as well as, the selection of a responsible contractor leading to better prices and product quality. At the same time, it is argued that the solicitation of open bids in fact reduces cost, but at the expense of performance.

The selection of design consultants is also a lengthy and complicated selection process based upon experience, ability, resources and suitability for the project as well as price, while in the private sector there is a tendency to select consultants on the basis of reputation and ability with relationships between corporations and architects lasting several generations with the same firm.

Design decision-making is another related issue which ultimately affects cost outcomes. The choices which are made and the timing in which they are made can drastically affect project costs. To illustrate, Chiu (1990) studied the links between corporate office facility investment decision-making and building performance investigating case studies to identify cost effective methods to achieve better building performance. The findings indicated that developers make design decisions based on inadequate information, and do not sufficiently understand the impact of the early decisions on final building performance. In addition, Chiu found that developers and designers learn about building performance in an insufficient way from their previous projects. Office tenants do not always know their alternatives and often settle on what they can afford without looking at better choices.

8. Project Duration (Time)

Significant time differences can be observed in all phases of the development process between public and private sectors. Extended periods of time are taken up in all forms of approval processes from project inception to occupancy: approvals for funding, program, conceptual design, design development, construction documents, bidding and contracting as well as construction change orders. Time could be seen as a more critical for speculative developers motivated by the possibility of the loss of rental or additional interest. Issues of time are not as easily translated into dollars lost in public projects. Time does come into play with the inflation of costs of construction due to increases in the costs of supplies, materials, labor and equipment. Delays in construction can cost the owner with respect to inflation. When budgets are set early on in the procurement process and time is allowed to slip by the dollar does not stretch as far. Players in the construction game often use delays to justify cost overruns that may have been due to other less acceptable reasons.

9. Tax considerations

All investment decisions have tax implications — often based on accepted accounting procedures that devalue long-term or life-cycle costs and benefits — that may have the effect of minimizing the incentives that private developers may have for improving building quality and thus assist in reducing the cost of their buildings.

10. Cost control procedures

The private sector builds for the purpose of making a return or profit on an investment, while the government builds to satisfy a physical space need on the part of its agencies. The objectives of both sectors are different and as a result, the public sector will be at a disadvantage when it comes to cost control with respect to the private sector whose dominant mode is one of reducing costs, while maintaining minimal acceptable standards. The public sector on the other hand attempts to optimize its investment in favor of agency needs first and to do this at a publicly acceptable price.

Responsibility for cost control in the private sector is retained by the developer or owner with the assistance of the construction manager or architect, while in the public sector responsibility for cost control is often abdicated by the agency transferred to the designer or construction manager who do not generally have reputations as comprehensive project cost control experts.

11. Options for Project Cancellation

Another point is that many private sector buildings never get to or leave the drawing table if initial cost estimates and even if bids are found to be unacceptable with respect to return on investment. On the other hand, public sector generally has little latitude as to whether to build or not; a physical space problem exists and it must be resolved through some strategy. Often, public agencies lease badly needed space, taking the costs out of their operating budgets until new space becomes available.

Because of these differences in approaches to budgetary planning, public and private sectors often manifest different attitudes toward the budgetary process: private sector developers realize greater penalties for exceeding costs and greater benefits if a project comes in under budget, while the public sector often regards budgets as minimums and accept the probability of exceeding them.

These speculations have not been subject to systematic empirical investigation. Whether any of these factors lead to any better or lower prices in the private sector is open to question. The remainder of this chapter reviews what is known empirically concerning cost differences between public and private facilities in the U.S.

2.2 Stanford University Study

Kershner (1987) conducted a study of how Stanford University buildings compared to other buildings, both institutional (private) and non-institutional (commercial). Data was collected through telephone surveys and presented in comparative tables and graphs. The problems connected with developing a methodology used to judge the validity of a building's comparative cost include units of measurement for cost comparison (cost per gross vs. net square foot, construction vs. total project cost) uniqueness and level of complexity of the buildings (number of program requirements) and categories of analysis (cost/gross sq. ft. vs. building components). In an effort to generalize beyond the sample of Stanford buildings, it was suggested that buildings at Stanford were comparable in cost to other university buildings due to the fact that the complexity of the Stanford buildings was comparable to those on other university campuses.

Although the study found that educational institutional buildings were 15-30% more expensive than non-institutional buildings, there were "definitive and usually justifiable reasons for the additional cost" (Kershner, 1987; 29). Reasons the author cites for this difference in cost include the educational institution's more complex program requirements, longer expected life of buildings, concern for unified campus aesthetics and limited location choices. Several recommendations are forwarded to achieve greater cost effectiveness such as analyzing the quantity of program needs, analyzing the quality of building systems, considering generic-design approaches, selecting cost-conscious professionals, making use of value engineering, selecting the proper contracting method, and being attuned to market conditions (season, shortages, and local conditions).

The Stanford study, as reported, did not explicitly compare specific private institutional buildings against specific commercial buildings, but instead conducted a comparison based on average costs between institutional and non-institutional buildings. It is not known how large the sample of the study was, nevertheless the average cost comparisons method provides an opportunity for a more generalized conclusion about cost comparisons than the specific comparative building case study matching approach may allow. Generalization can also be seen as a disadvantage of the average cost comparisons method in that specific reasons for cost outcomes cannot be identified in much depth as is possible with the comparative building approach. Finally, the Stanford study did not look beyond outcome project cost data in making comparisons. Many underlying factors which may affect cost such as organizational factors (organizational structure, management styles) and building delivery processes and procedures were not addressed.

2.3 Princeton University Value Study

The Princeton University Value Study (Ballinger, 1990) compared five building types on campus (laboratory, library, computer sciences, pool, and economics building) to nine other educational institutions (University of Michigan, Oklahoma State, University of Pennsylvania, Brown University, Penn State University, Harvard, Cornell, U.C.L.A. and the University of North Carolina). Similar to the Stanford study the comparisons were based solely on building construction costs and project costs. Overall, the study revealed that Princeton is paying consistently more for facilities than the average of 38 respondents: $268.9/SF vs. $176.2/SF for a total premium project cost of $92.7/SF. Reasons cited for this difference included Princeton's policy of site selection which maintains optimum functional adjacencies and increases site costs due to difficult infill site strategies, selection of prestigious architects to develop distinctive, high-quality buildings, emphasis on systems selection standards for long-term economics, use of construction management services in lieu of lump sum bidding, and acceptance of add alternates and change orders to enhance further building function and quality.

In the examination of the five projects, Ballinger (1990) sought to understand the processes that led to the results through in-depth interviews with the specific project managers as well as site visits to each building. From these interviews and site visits the report focuses on three areas of the design process, namely, project formation, contracting methods and specifications/ standards. "Value premium categories" were used to identify patterns of policy decisions which may lead to premium costs: site selection, architectural quality (selection of renowned architects), systems, project delivery, and add alternates.

The Princeton study is unique in that an attempt was made to look at the processes and procedures as well as the values behind the cost differentials to answer the questions of why their buildings cost so much more than comparable institutions.

2.4 The University of Wisconsin- System Administration Study

In response to the Regents discussion about costs of facilities for university versus the private sector Jenson and Hardesty (1991) conducted a preliminary case comparison study between several university laboratories and a single private sector laboratory of a Madison-based environmental consulting and engineering firm. The goal of the study was to identify additional reasons for the apparent difference in costs between public and private buildings.

Comparisons were based on total construction costs measured in 1989 dollars. While six of the eight university laboratory buildings (ranging from $102/ASF to $220/ASF) compared to the private laboratory ($127/ASF) were more expensive in terms of assignable square footage, seven of the eight were lower in terms of gross square feet. The different set of conclusions drawn by this study between ASF and GSF highlights the problem of what constitutes a measure of cost, in this case, the definition of assignable square footage.

Several design standard differences reported between the private and the university laboratory (RMT) include:

1. Wage rates: The state requires wage rates which are reported in the specifications; while RMT used a non-union contractor who was able to pay lower labor rates.

2. Site selection: The campus land is restricted and usually dictates a smaller building footprint vs. RMT which built on a more generous lot size.

3. Vertical construction: Due to limited land the university is forced to build vertically requiring stronger and more fireproof structural systems and requires vertical ducting systems versus RMT which can build one story buildings, requires no vertical risers and can be constructed with multiple trades working concurrently.

4. Internal layout for worker/space needs: University labs have a higher density of casework for stations than RMT.

5. Material quality standards: Levels of construction quality dictated by DFD are higher (brick exterior w/ masonry back up) than RMT (exterior metal stud back-up w/ stucco)

6. HVAC: University campus buildings are heated and cooled by central systems with direct return ducts which require balancing between return and supply versus RMT which uses inexpensive roof top HVAC units with open ducts in ceiling which require no balancing.

Some other general reasons why state facilities may cost more than private sectors cited in the report include the tendency of the state to build facilities which promise up to 100 years of life and therefore the time allowed for planning is significantly longer, the quality of materials selected is higher, and the construction bidding process is more rigid in its guidelines than private sector development.

The U.W.-System Administration study is a step forward in the direction of finding additional reasons for cost differentials in its analysis of the comparative practices of the public and private sector. One limitation of the study is that it cannot generalize beyond the cases presented. Only one building type was analyzed with only one single private commercial building. The usefulness of the study is its conceptual emphasis on the general differences between the motivations of public versus private sector development practices. The study helps frame part of the research problem faced by state agencies when confronted with the claims that private commercial development is more cost effective. There are many hidden costs and consequences to both approaches to development which must be made explicit in a study which attempts to determine the relationships between time, cost and quality.

2.5 General Services Administration Cost and Performance Study

The Cost and Performance Study, conducted by Hanscomb (1976) of Greenwich, Connecticut, compared a cross section of five federally and six privately constructed office buildings. The privately constructed office building sample included three multi-tenant speculative buildings and three owner-occupied buildings. For comparative purposes, actual costs of each building were analyzed into UNIFORMAT categories and indexed to 1976 dollars using Boeckh's construction cost index.

Extensive statistical, performance and specification data was assembled on each building.

The majority of the report concentrates on comparisons of construction costs only since project cost information for private sector projects was difficult to obtain. From the comparative data analysis of the projects in the study sample it was found that there is a difference in the cost for Federal buildings. It was found that private owner-occupied buildings cost on average $34.22/GFA while Federal buildings cost on average $46.30/GFA for a difference of $12.08/GFA or 35.3% greater.

Reasons for the differences include four areas:

1. Scope: Federal buildings have more in them than private sector counterparts (e.g., interior tenant work, special facilities and features). The study recommends transferring cost responsibility for interior tenant work to user agencies, leaving GSA to constructing open office space. This strategy does not necessarily offer any real cost savings.

2. Quantitative: Federal projects require more quantities of materials and components to enclose the same given floor area (e.g., their plan forms and geometric layouts). The study recommends limiting floor to floor heights and setting efficiency ratios for designers at the outset of the project. The study concluded that if Federal projects in the study achieved the same rate of efficiency as the average of the private projects then a reduction of 7% in total cost could be realized. The result will be the speculative developer's "box" which is the most cost effective form for office building construction.

3. Qualitative: Federal buildings demand higher performance and specify better quality. The study suggests that cost variances can be eliminated by simply reducing acceptable standards. There are obvious trade-offs with this approach.

4. Unidentified Causes: Those causes that cannot be attributed to any one of the factors above, or which may arise due to intangible factors (e.g. legislative factors, specification restrictions, extensive documentation, restrictive procurement policies required to establish reasonable levels of public accountability, and additional time during preconstruction stage for approval and processing of projects). The study concluded that even though it was difficult to quantify with any degree of accuracy or support, nonetheless, there are "grounds to believe that certain of the restrictions and conditions under which Federal construction must be carried out do not help in insuring that the best price is obtained in the market place.

2.6 Higher Education Colloquium on Science Facilities Task Force on Academic Facilities Costs

The conclusion reached by the Higher Education Colloquium (1993) was that academic science and engineering facilities could be procured and built more efficiently and that universities can learn from their corporate counterparts. The report bases its findings on a major survey questionnaire (multiple choice and narrative responses) which was sent to 100 respondents and had an 81% return rate. Respondents included nine research-intensive corporations, 16 architectural and engineering design firms, 59 public universities, and 30 private universities. The Task Force examined differences between corporate and academic practice, effects of laws and regulations, and effects of technological change.

"In one comparison, based on composite construction data for a research facility, the time taken to the midpoint of the construction period was twice as long for the academic facility as for the corporate one. That translated into an inflationary cost escalation that was three times greater for the academic facility than for the corporate one. Nevertheless, laws and regulations sometimes prevent universities from using corporate construction practices usually considered sound. Universities generally believe that building and life-safety codes are worth the extra costs they entail, and they appreciate the necessity of conforming to zoning regulations....State controls on public universities, the Task Force finds, are the most counterproductive influences on the construction of research facilities. They tend to impose time-consuming procedures of marginal value. Commonly they require universities to accept construction bids from any bidder, regardless of competence."

The task force noted that comparison analysis must recognize (a) the effects of different missions of academic and corporate institutions, (b) facility-specific factors such as requirements imposed by location, (c) various laws and/or regulations prevent universities of adopting construction practices regarded as sound in the corporate world, and (d) different building delivery systems such as construction manager, design/build and general contractor approaches.

The Task Force identified only one specific comparison of an academic facility with a corporate research facility. It involved SmithKline Beecham Corporation (SKB) and Princeton University. Two molecular-biology facilities were compared which had similar size and programs and missions. Construction cost for the SKB facility completed in 1983 was $143/GSF, while the Princeton facility completed in 1986 cost $206/GSF without taking the effects of inflation into account. (which SARA Systems, Inc have assumed 5.1%/year average for construction projects in the US during the past 75 years).

"Some reasons for the difference are plain. Princeton wanted distinctive treatment of all four exterior walls of its building, whereas all but the entry facade of the SKB building are relatively simple brick facades. Hence the exterior skin cost Princeton $27/SF $14 more than it cost SKB....The costs of structure/foundations, equipment/finishes, HVAC/plumbing, and electrical systems totalled $146/SF for Princeton and only $109/SF for SKB." The reason? Princeton payed premium prices for longer life cycles in building. The Task Force claims that inflation a big factor: an example of the time value of money.

The Task Force also suggested that another counterproducive influence on construction of research facilities are state controls on public universities: consultant selection, diffusion of responsibility in project management, state legislation, series of review procedures, state-imposed mechanisms all creating delays in the process with the attendent costs.

The report concludes with a number of recommendations and a set of principles and guidelines for implementing efficient building methods, which include:

- assigning to one person the responsibility for building or renovating a research facility;

- paying greater attention to the time value of money as it relates to streamlining approval processes for the construction of facilities;

- fostering the sharing and joint use of facilities by considering efficiency of use campus wide, not just department by department;

- obtaining trade data on trends in space planning and programming from designers, consultants, and seminars;
- revising methods of awarding contracts for the construction of major facilities;
- and establishing a national data bank on the planning, costs, and procurement of facilities for science and engineering.

The report stresses the advantages of centralized control of design and construction along the lines of the corporate model. It calls for analyses based on life-cycle costs as well as initial costs; designing for adaptability of space and utilities; prequalifying consultants and contractors and establishing replacement reserves for new or renovated facilities.

2.7 Summary

There are many issues which must be addressed when attempting comparative cost analyses of building projects. The Stanford University Study emphasized the need to have similar comparisons between measurement of unit costs, develop appropriate categories of analysis, and consider the level of complexity of program requirements. The Princeton University Value Study is unique in that it went beyond the simple comparisons of cost to investigating the impact of project formulation strategies prior to design, the design process itself, contracting methods and standards and specifications on final cost outcomes. The University of Wisconsin-System Administration Study, was unique in that it framed a series of unrecognized issues in need of further research. Several issues not explicitly discussed in the studies, namely the impact of life-cycle costing and design decision-making on final cost and quality outcomes, are additional factors which should be investigated.

The present proposal combines as well as extends the previous studies in several ways:

1. Acknowledges the need to investigate a variety of building types to gain a clearer sense of how cost and quality are affected.

2. Analyzes cost not only in terms of gross square footage, construction and project costs, but also in terms of operations and maintenance costs and life-cycle cost.

3. Emphasizes the differences between both public and private educational institution's and private commercial sector's facility development processes and design decision-making practices.

4. Unlike all the previous studies, the present study emphasizes a two-tiered matching process, the first with reference to organizational context factors such as organizational type and structure, and development experience, and the second with reference to project scope such as building size, configuration and complexity, as well as, locational factors and site conditions, in addition to construction materials and building systems.

3.0 Methodology

3.1 Overview

This section presents the research approach taken in the study, the research design, sampling and sampling techniques, and the study framework procedures, followed by a guide to the case study comparison reports in Section 2.

Initial meetings, between the researchers and the DFD/UW-System staff, defined and developed the case study framework from which a pilot study was conducted.

The supervising committee then identified several projects that could act as case studies. During the course of this review members of the researcher team consulted with various DFD and/or UW System staff to gain a better understanding of the problems and issues associated with using the specific projects for comparison. The primary goal of this activity was to establish a common baseline understanding of the overall process and issues involved and to insure a consistency between the variables used for the study.

The project was divided into two distinct phases, each with its own set of findings and conclusions. At the completion of each stage, the case study framework was reviewed with the supervising committee and revised as necessary prior to being implemented in the subsequent phase. The scope of work for the two phases is as follows:

Phase I.
The first phase consisted of testing the validity of the study framework by conducting a pilot study comparing a public and private facility. Based on the results of the pilot study, the research team reported to the supervising committee on the viability of the case study framework, revising the framework as necessary.

Phase II.
The body of the case study investigations were conducted using the revised case study framework. The five pairs of comparable case study projects were identified, data was collected from the four leveled matching/comparing strategy, then analyzed. This document presents the findings of this analysis.

3.2 Approach

The methodology or approach adopted for the study was derived from the nature of the questions being asked. In order to determine if, in fact, public sector buildings do cost more than private sector buildings, an analysis of comparative quantitiative cost data would be required. Several issues would have to be addressed in the collection of this data: first, what level of detail should be collected to make a valid comparison, and second, what level of detail is possible in collecting data as a result of poor project documentation, the lack of memory on the part of project players, or simply the lack of willingness to cooperate in providing cost data (as is often the case with private owners and developers).

Understanding why public sector buildings may cost more than private sector buildings necessitated collecting a set of interpretative or qualitative data from a variety of sources: the literature on construction practices, the general experience of experts in construction practice, the experience of players and the documented reasons in the sample cases studies, as well as the researchers' own professional experiences. The trustworthiness of such qualitative data in explaining reasons why buildings cost more would be dependent on the level of cooroboration obtained across various sources. The time and resources required to gather this qualitative data limited the ability of the research team to investigate a large sample of buildings.

The objective of the study, then, was to make some linkages, some assignment of qualitative findings (reasons why) with quantitative findings (cost differentials). Establishing the linkages between differences in these two case study "databases" we believe is critical to understanding and ultimately explaining why some buildings cost more than others. Looking at quantitative outcome measures alone will not help us understand why these differences exist. By the same token, from qualitative data we can derive some interesting theories about why buildings cost more, but we can not test them without knowing if actual quantitative differences exist in the sample we are investigating. This study represents a first attempt at finding patterns and links between these two distinct, and sometimes contradictory sets of data to determine what factors are worthy of further investigation.

Due to the considerations and research objectives outlined above, a comparative case study was chosen as the most appropriate method or approach to answering the questions being raised. The case study allows for in depth documentation of project conditions and processes that lie behind costs. The advantage of this approach is that a more comprehensive evaluation of the reasons why can be documented and unearthed. The limitation of this approach is that the study cannot generalize beyond the cases being investigated. However, findings from this study can serve to focus attention on the most critical factors, as well as, generate hypotheses for further research.

3.3 Research Design

A multiple-case study analysis was chosen as the research design best suited to explore the research questions generated from initial discussions with DFD, UW-System and the literature review.

Previous studies have compared building pairs according to a limited number of building variables, such as square footage or building type. The investigators of this study were concerned with identifying paired cases which could be compared across a wider series of variables, in an effort to examine the inherent complexities associated with each paired case. The case studies investigated the historical background and current status of both the facility itself and the organization which occupies the facility. Detailed background descriptions of each case provides an opportunity to compare buildings across several levels of analysis simultaneously.

Case studies were chosen for investigation according to how well they matched certain groups of factors established for comparison, such as organizational context and project scope (see Figure 1). Five pairs of case studies, each representing different building types, were chosen on the basis of how well they matched in terms of **organization** and **project scope**.

Data collection included conducting individual and group interviews, and collecting relevant archival materials (organizational records, contract documents, specifications, and project records). Data analysis consisted of identifying similarities and differences across matched and comparison levels of analysis for each case pair.

3.4 Sample and Sampling Techniques

The sample of building projects from which the study drew upon to find comparables included all buildings in the University of Wisconsin-System, buildings leased or owned by the State of Wisconsin, as well as comparative private buildings near these public facilities. In addition, private educational institutions within the state were considered for comparison with the state's public buildings. The sample of private commercial development projects considered for comparison to UW-System projects included only owner-occupied buildings within the State of Wisconsin. (No speculative building developments were considered in the sample in an effort to increase the validity of the match with state-owned buildings). When feasible, projects were chosen which were located geographically near each other and constructed about the same time period.

Comparable facilities were not randomly sampled, but were chosen based on a set of predetermined criteria:

1. the ability of the research team and/or supervisory committee to find a comparable matched set of facilities,

2. facility type,

3. the ability of the research team and/or supervisory committee to find individuals familiar with the facility development process conducted for the building,

4. the location of the facility was implicitly limited to, but not exclusive of, southeast Wisconsin,

5. a facility no more than 10 years old,

6. owner-occupied.

The subgroups of the sample were divided into five representative facility types which characterize a variety of facility development. From these subgroups, facility were selected based on how well they matched the remaining the case study criteria.

3.5 Study Framework & Procedures

This section presents the matching/comparison strategy which acted as the framework for conceptually and operationally organizing this study. Public sector buildings were compared with private institutional and commercial sector buildings on the basis of a two-tiered matching strategy (see Figure1). Data was collected from a total of four levels of analysis: the organizational context, facility development process, project scope and project outcomes. The matching strategy allowed for the matching of paired buildings at levels one and three and comparison of them at levels two and four. A general outline of each of the four levels of analysis are as follows (see Appendix C for the full master questionnaire):

1. Organizational Context

The first phase of the process of **matching** identified comparable organizations from which to draw a set of buildings. The organizations were matched as closely as possible based on several factors:

a. *Organizational Structure*: size of staffed employees; levels of management; number of departments.

b. *Organizational Experience*: level of facility development experience; number of buildings which are currently owned, operated, and managed by the organization; amount of capital expenditures allocated for management of facilities per year.

c. *Organizational Function*: the stated goals and mission of the organization; relation of organizational goals to facility development.

2. Facility Development Process

Once the organizations were matched, information concerning the facility development process was **compared**:

a. Procedures followed during the facility development process: feasibility planning, definition of scope, staff/consultant selection, design development and review, construction documents and estimates, bids and negotiation, construction and project management, occupancy and facility management.

b. Consultant selection process: participants in the facility development process.

c. Decision-making: key decision makers during each phase in the project.

d. Project budgets: relationship and effect on design concepts, design and construction decisions.

e. Evaluation of process: Overall perceived effectiveness of the facility development process for case; expectations of process followed for specific project compared to general project experience of the organization.

3. Project Scope

Next, the overall project parameters for all case study building projects were **matched** as closely as possible. Project scope items were the controlling factors for comparing case study pairs. The scope items that were identified for matching included:

a. Documentation: building program, drawings, specifications and project files for this project.

b. Building performance standards: special established building performance/durability or quality/finish standard requirements.

c. Location factors/site conditions: advantages or disadvantages of the location or site conditions and context; relative cost market; parking accommodations; grading/clearing.

d. Size/form/configuration: total square footage, per floor square footage, footprint, floor area ratio, efficiency ratio, number of stories, overall building configuration; special design features; compact or loose organization on the site.

e. Construction materials & building systems: construction type; structural, mechanical, and enclosure systems; anticipated design life; level of finish.

f. Occupancy: total occupancy; primary users of the facility; daily pattern of building use.

4. Project Outcomes

Finally, once all five case study pairs were successfully matched the outcome variables were compared. These dependent variables included:

a. TIME
The total time (project duration) to deliver the building from project inception to occupancy was documented and compared between cases. For the purposes of comparison, the eight facility development stages referred to above were collapsed into three distinct activities: the planning process, the design process and the construction process. The planning process collapsed stages 2.1-2.3; the design process collapsed stages 2.4-2.5; and the construction process collapsed stages 2.6 and 2.7 (see Appendix B for a description of these stages).

b. COMPLEXITY
Complexity, as it is used in this study, should be understood as the recognition of a large number of interacting considerations, elements and factors that make up the process of delivering a building. In this study complexity is organized into a taxonomy of eight factors. These factors were derived from an analysis of the qualitative data and found to be the most salient defining categories of complexity. The data between projects were then compared with respect to these attributes to identify qualitative differences. A facility development complexity profile was used to measure and compare the degree of complexity of each project to narrow the field of possible factors associated with time and cost differentials. The project profile operationally defines eight attributes of "complexity": descision-making structure and procedures, methods of contracting, major incidents, program, location factors and side conditions, number of studies, building configuration, construction materials and specifications (see Table 1). The combined score of the attributes provides an indicator of the complexity of the project that can be correlated with time and cost factors.

c. COST
Data collection and grouping : Cost data was collected from project records, final certificates of payment (AIA Document G702), contractors' line itemized invoices, and owners' project close-out summaries (when available). Data was

screened line-by-line and cost items were uniformily grouped in four cost levels:

(1) **Building Construction Cost (GMPE)** comprised of General, Mechanical, Plumbing, and Electrical;

(2) **Construction Cost** comprised of Building Cost + Site Development Costs (demolition/excavation and paving/landscaping);

(3) **Total Project Costs** comprised of Construction Cost + Design & Supervision Fees (A/E fees, DFD/DSFM fees for public facilities and other fees);

(4) **Change Order Costs** for General, Mechanical, Plumbing, Electrical and Design & Supervison.

Cost Adjustments/unit Cost Conversion: Public facility development costs were adjusted for inflation and location to the completion year and location of the Private facility using Means Local Cost Indexes and Location Factors.

Because total costs would obviously not be comparable measures, the data was converted to unit costs in dollars per gross square foot ($/GSF) for the four cost levels (Building Cost/GSF, Construction Cost/GSF, Total Project Cost/GSF and Change Order Cost/GSF). Comparison of costs per net assignable square foot was considered to address building efficiency issues (net-to-gross ratios) however, calculation of net assignable areas for each case proved to be too difficult with the available program information and different procedures for calculating net assignable areas.

Cost data was also examined in other ways. Building Cost analyses included the relative distribution of General, Mechanical, Electrical and Plumbing Costs as percentages of Building Cost. Design & Supervision costs were calculated as a percentage of Construction Cost (standard method in the architecture and construction industry) and Change Order Costs were calculated as a percentage of Total Project Cost. (The cost analysis for each case can be found in Appendix A: Case Study Descriptions)

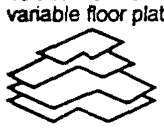
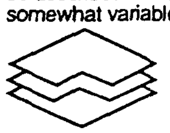
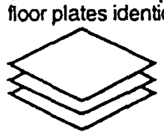
Comparison: The $/GSF at each cost level were then compared for each case pair. In addition to $/GSF comparisons, costs were analyzed in other ways. The relative distribution of General, Mechanical, Electrical and Plumbing Costs as a percentage of Building Cost was compared in each pair and generally confirmed program matching. Design & Supervision costs as a percentage of Construction Cost were compared. Change Order Costs as a percentage of Total Project Cost were compared as possible indicators of development process efficiency.

d. COMPARATIVE ANALYSIS

Once the project outcomes of time, complexity and cost were documented, a comparative analysis was undertaken. Factors of Complexity that differed between the paired cases were identified as possible reasons or potential contributors to differences in project duration (time) and costs. Specific examples from the case studies are highlighted to illustrate how these Factors of Complexity may have affected project duration and costs.

Figure 1: Matching/Comparison Strategy

Table 1. Facility Development Complexity Profile: Operational Definitions

Attributes	*Scale of Complexity* **3 (High)**	**2 (Moderate)**	**1 (Low)**
Facility Development Process			
(1) Decision-making Structure & Procedures	Procedures are explicit, differentiated, and followed strickly as possible. Major budgetary, project scope, and design decisions made at several differentiated management levels within the client organization.	Procedures are explicit and followed when appropriate; more flexible. The majority of budgetary, project scope, and design decisions made by a building committee.	Procedures are implicit and are negotiated with each project depending on circumstances and context. Few levels of decision-making; The majority of budgetary, project scope and design decisions made in an integrated way by a single owner or owner representative.
(2) Methods of contracting	Conventional: multiple prime contractors; A/E hired as owner representative.	Modified conventional: single prime contractor hired as owner representative.	Design/build: contractor/ developer responsible for total project on a turn-key basis.
(3) Major Incidents	Several significant incidents occurred evidenced by documentation in project records.	A few significant incidents occurred evidenced by documentation in project records.	Little or no significant incidents occurred evidenced by documentation in project records.
Project Scope			
(4) Program	The program consists of a number of highly specialized and diverse requirements.	The program consists of a balance of specialized and stardardized requirements.	The program consists primarily of standardized requirements.
(5) Location factors and site conditions	All three or four factors below apply	One or two factors below apply	None of the factors below apply.
<u>Infill site</u>	Is the project located on an infill site? yes/no		
<u>Demolition</u>	Does the project require building demolition? yes/no		
<u>Addition/renovaton</u>	Is the project an addition, and/or include renovation work? yes/no		
<u>Site size</u>	Is developed site significantly larger than that required to optimally accommodate occupancy? yes/no		
(6) Number of stories	More than two floors	Two floors	Single floor
(7) Building configuration	The building configuration can be described as having highly variable floor plates. 	The building configuration can be described as having somewhat variable floor plates. 	The building configuration can be described as prizmatic (all floor plates identical). 
(8) Construction materials and specifications	The project consists of high quality institutional-grade construction materials and specfications.	The project consists of medium quality, commercial-grade construction materials and specifications.	The project consists of lower quality, residential-grade construction materials and specifications.

3.6 Guide to Case Study Comparison Reports

The remainder of this report consists of five individual case study pairs and a summary of an across case analysis. Each of the five case study pair chapters is presented in two parts. The first part presents the criteria for **matching** the case study pair from a standpoint of both organizational context and project scope. The second part presents the **comparison** criteria from which these two buildings were analyzed. The following subsections give a detailed description of the procedures followed in each case study.

Part 1: Matching

Project Descriptions
Each case study pair is presented in summary form in a side-by-side format consisting of building photographs, project team, year constructed, overall gross square footage and adjusted project costs.

Matching: Functional Plans
Floor plans and summary program element gross square footage (i.e. office, instruction, support, etc.) for each case study pair are presented in a side-by-side format.

Matching: Organizational Context
The organizational context matched along three specific areas: organizational struction, experience and function. In the *Remarks* column the match is judged to be either *Comparable, Moderately Comparable* or *Not Comparable.*

Matching: Project Scope
The project scope was matched according to several criteria: program scope, location factors/site conditions, size/form/configuration, construction materials and building sytsems, and occupancy patterns and characteristics. In the *Remarks* column the match is judged to be either *Comparable, Moderately Comparable* or *Not Comparable* similar to the organizational context matching process.

Part 2: Comparison

TIME

Comparison: Facility Development Process
A detailed description of the facility development process is presented for each case in a side-by-side comparison consisting of major events that occurred during the eight design stages.

Comparison: Project Duration Profile
The project duration profile consists of a comparative analysis of the facility development process collapsed to three phases: planning, design and construction.

COMPLEXITY

Comparison: Facility Development Complexity Profile
The facility development complexity profile consists of a comparison of project profiles with respect to the eight attributes of "complexity" operationally defined above. Beneath this profile is a description of the profiles in narrative form.

COST

The cost analysis for each case pair is comprised of four levels of comparison: Building Cost (GMPE), Construction Cost, Total Project Cost, and Change Order Cost. The cost comparison section begins with a cost summary profile followed by tables and charts that detail cost differences.

Comparison: Facility Development Cost Profile
This summary chart identifies the percentage by which the Public facility cost MORE or LESS than the Private facility in terms of Building Cost (GMPE), Site Development Cost, Design & Supervision Cost, Total Project Cost, and Change Order Cost. Positive percentages indicate the Public facility cost MORE and negative percentages indicate the Public facility cost LESS.

Comparison: Building Costs
This analysis indicates Building Cost component differences in $/GSF and as a percentage by which the Public facility cost MORE or LESS than the Private facility. The chart depicts the comparison as well as the relative portion of Building Cost that each component comprises (further identified in the Building Cost Distribution table).

Comparison: Construction Costs
This analysis indicates Construction Cost component differences in $/GSF and as a percentage by which the Public facility cost MORE or LESS than the Private facility. The chart depicts the comparison as well as the relative portion of Construction Cost that each component comprises.

Comparison: Total Project Costs
This analysis indicates Total Project Cost component differences in $/GSF and as a percentage by which the Public facility cost MORE or LESS than the Private facility. The chart depicts the comparison as well as the relative portion of Total Project Cost that each component comprises. The table at the bottom compares Design & Supervision fees as a percentage of Construction Cost (standard method in the architecture and construction industry).

Comparison: Change Order Costs
This analysis indicates Change Order Cost component differences in $/GSF and as a percentage by which the Public facility cost MORE or LESS than the Private facility. The chart depicts the comparison. The table at the bottom compares Change Order cost as a percentage of Total Project Cost (a possible indicator of development process efficiency).

COMPARATIVE ANALYSIS

Findings
This table summarizes project duration and cost findings by categories of complexity identified as potential reasons for duration and cost differentials.

Discussion
Following the table of findings, the discussion elaborates on the identified Factors of Complexity with narrative examples from the case studies being compared.

SECTION 2

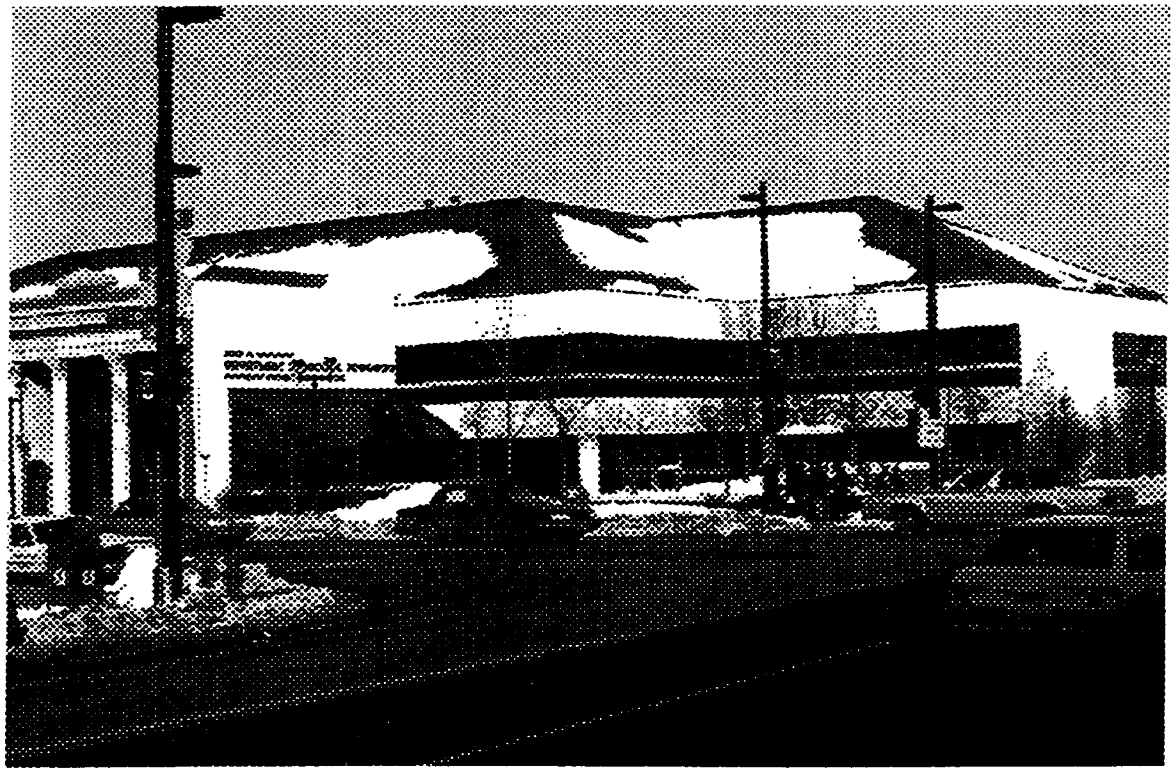
COMPARATIVE ANALYSIS

CASE 1: COMPARATIVE ANALYSIS

Public Sector Case Study #1-1:
Department of Natural Resources Southeast Headquarters Building

Private Sector Case Study #1-2:
Warzyn Corporate Headquarters Building

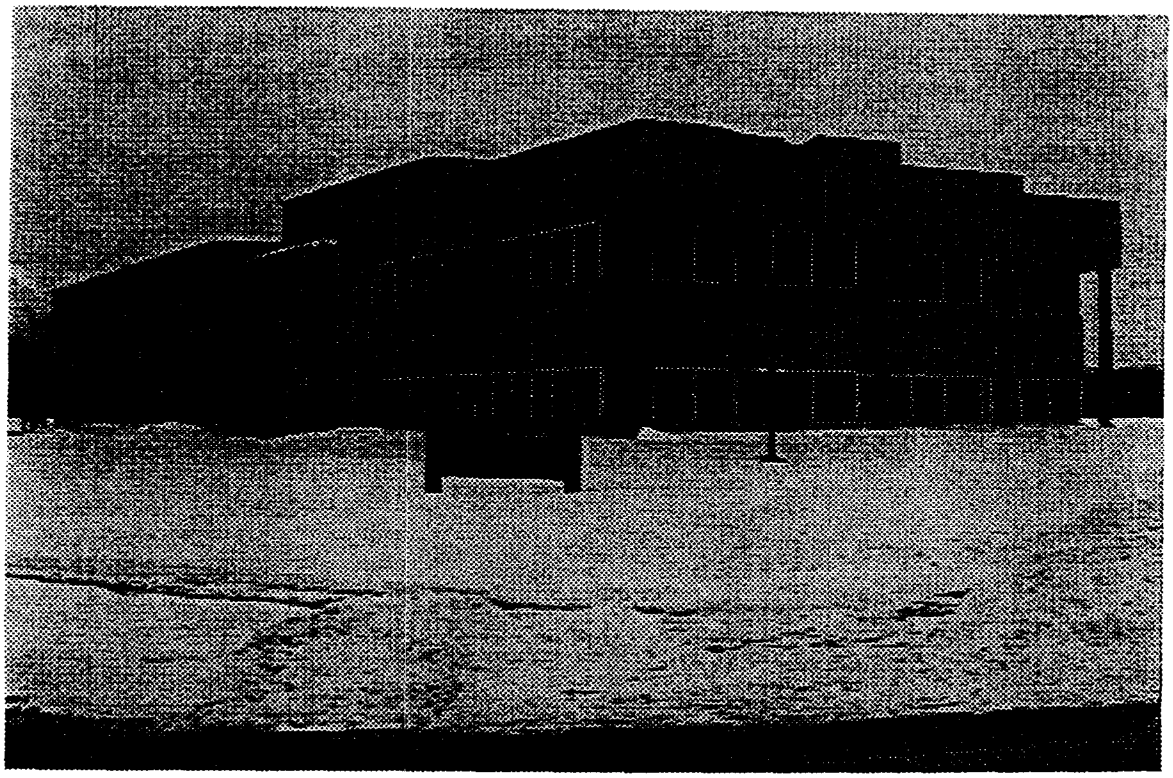
Public Sector Case Study #1-1
DNR SOUTHEAST HEADQUARTERS BUILDING



Client	Department of Natural Resources , Southeast District, Milwaukee, Wisconsin, and the State of Wisconsin, Department of Administration, Division of Facility Development, Madison, Wisconsin
Architect	Plunkett-Keymar-Reginao
General Contractor	Bell-Reichl, Inc.; Franklin, Wisconsin
Project Description	
Program	The program is functionally divided into three equal areas resulting in a three leveled building. Laboratory, storage and building services are located in the basement. Administration, law enforcement, resource management and public meeting spaces, areas of high public accessibility, are on the ground floor. Environmental protection, largely an open-landscaped office area, is located on the second floor.
Year Constructed	1982
Gress Square Footage	48,049 GSF
Project Costs*	
Building Cost	$ 3,064,463
Construction Cost	$ 3,247,396
Total Project Cost	$ 3,549,479

* Adjusted to 1986 construction costs in Madison using means local cost indexes.

Private Sector Case Study #1-2
WARZYN CORPORATE HEADQUARTERS BUILDING



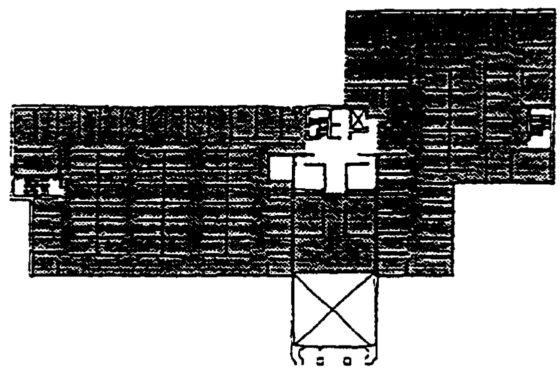
Client	Warzyn Engineering, Inc.
Architect	Potter, Lawson & Pawlowsky, Inc.
General Contractor	Findorff Construction
Project Description	
Program	The program provides for two levels of open office space for administrative office functions and basement laboratory space to accommodate environmental engineering testing.
Year Constructed	1986
Gross Square Footage	31,585 GSF
Project Costs	
Building Cost	$ 1,449,943
Construction Cost	$ 1,547,600
Total Project Cost	$ 1,701,200

MATCHING: FUNCTIONAL PLAN

DNR Southeast District Headquarters Building
Case Study #1-1

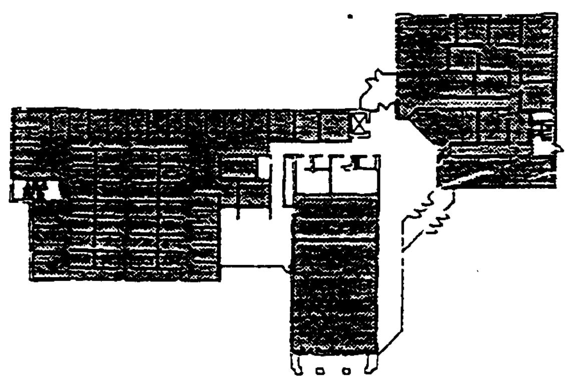
Second Floor

Office:	15,735 GSF
Lab:	0 GSF
Support:	1,584 GSF
Total:	**17,319 GSF**



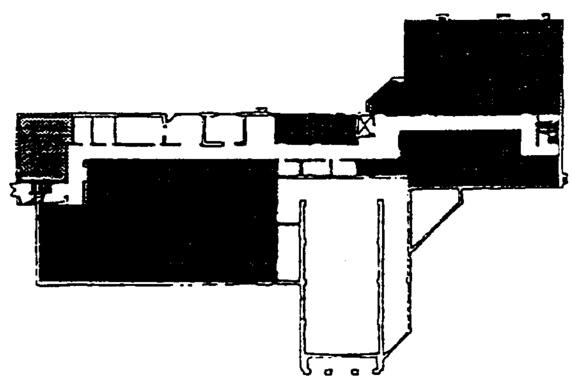
Ground Floor

Office:	13,153 GSF
Lab:	0 GSF
Support:	4,235 GSF
Total:	**17,388 GSF**



Basement

Office:	470 GSF
Lab:	9,790 GSF
Support:	3,082 GSF
Total:	**13,342 GSF**



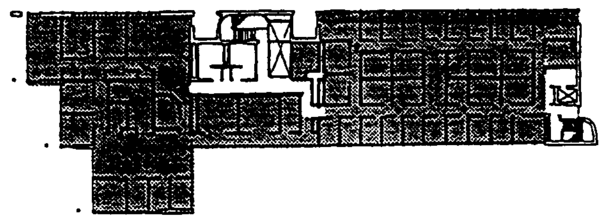
Grand Total 48,049 GSF

MATCHING: FUNCTIONAL PLAN

Warzyn Corporation Headquarters Building
Case Study #1-2

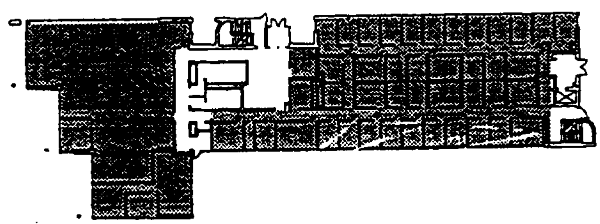
Second Floor

Office:	9,278 GSF
Lab:	0 GSF
Support:	1,137 GSF
Total:	10,415 GSF



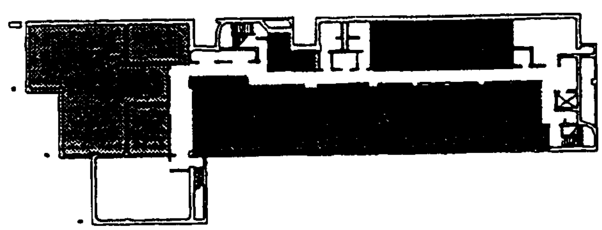
Ground Floor

Office:	8,407 GSF
Lab:	0 GSF
Support:	2,008 GSF
Total:	10,415 GSF



Basement

Office:	2,328 GSF
Lab:	5,795 GSF
Support:	2,632 GSF
Total:	10,755 GSF



Grand Total 31,585 GSF

MATCHING: ORGANIZATIONAL CONTEXT

The organizational context matched along three specific areas: organizational struction, experience and function. The following table summarizes the matching criteria for organizational context:

Organizational Context Match Criteria	DNR Case Study #1-1	Warzyn Case Study #1-2	*Remarks*
Structure	Bureaucratic, multi-tiered public state agency	Private partnership with departmentalized structure	***Not Comparable:*** *Very different organizational structures: one vertically oriented, the other horizontally oriented.*
Experience	DNR established in 1967. Have limited experience with office building type: DNR-SEH is the Southeast District's first office facility developed The primary development experience for this project can be accounted for by the DFD.	Warzyn created a building partnership in 1977 which was independent of the Warzyn Corporation, responsible for the Warzyn Building This building was the largest single structure Warzyn had experience with at the time.	***Moderately Comparable:*** *Level of development experience very similar, but DNR has the benefit of significant DFD experience.*
Function	Mission: environmental protection Motives for development: unanticipated program changes; new involvement in urban environmental issues	Currently provides environmental engineering services to the private sector Primary function at the time of construction: 75% environmental, 25% civil.	***Comparable:*** *Focus of both organizations on various aspects of environmental issues/concerns*

MATCHING: PROJECT SCOPE

The project scope was matched according to several criteria: building program, construction materials and building systems. The following table summarizes the matching criteria:

Project Scope Match Criteria	DNR Case Study #1-1	Warzyn Case Study #1-2	Remarks
3.1 Program Scope Office Laboratory Support Total	 29,358 61% 9,790 20% 8,901 19% 48,049 GSF	 20,013 63% 5,795 19% 5,777 18% 31,585 GSF	***Comparable:*** *Program comparable by percentage*
3.2 Locational Factors/Site Conditions	• urban setting • relatively high crime rate area • surface parking (70 stalls) • city donated, cleared and prepared land • free on any subsurface conditions	• office park setting • surface parking • triple net lease on land • surface parking (148 stalls) • free of any subsurface conditions	***Not Comparable:*** *Site setting not well matched.*
3.3 Size/ Form/ Configuration	• L -shape • two story • exisiting building on site retained	• only slightly L-shaped • two story • new construction	***Moderately Comparable:*** *building size, form and configuration. DNR however required the integration of an existing structure into the design*
3.4 Construction Materials & Bldg Sys.			
Foundation	12" concrete foundation walls	12" concrete foundation walls	***Comparable***
Structural System	One-way concrete joist floor slab	Structural steel structure w/ 8" precast concrete floor slab	***Comparable***
Exterior Wall System	6" pre-cast concrete panels w/ 1" insulated glass/ 3.5" batt insulation	6" pre-cast concrete panels w/ 1" insulated glass/ 2" rigid insulation	***Comparable***
Interior Wall Constr	5/8" GWB w/ 3 5/8" metal studs	5/8" GWB w/ 3 5/8" metal studs	***Comparable***
Finishes	Carpeting, paint, acoustical ceiling tile	Carpeting, paint, acoustical ceiling tile	***Comparable***
Roof System	Standing seam metal roof	Rubber membrane roof w/ rigid insulation	***Not Comparable***
Mechanical System	Variable air volume system w/ hot water perimeter radiation and gas fired boiler	•Roof top air handling units and forced air system	***Not Comparable:*** *Different systems used, but require similar performance in terms of lab conditions*
Electrical System	Standard	Standard	***Comparable***
Plumbing System	Standard	Standard	***Comparable***
3.5 Occupancy Patterns/ Char.	Current occupancy: 185 staff	Current occupancy: 125 staff	***Comparable***

COMPARISON: FACILITY DEVELOPMENT PROCESS

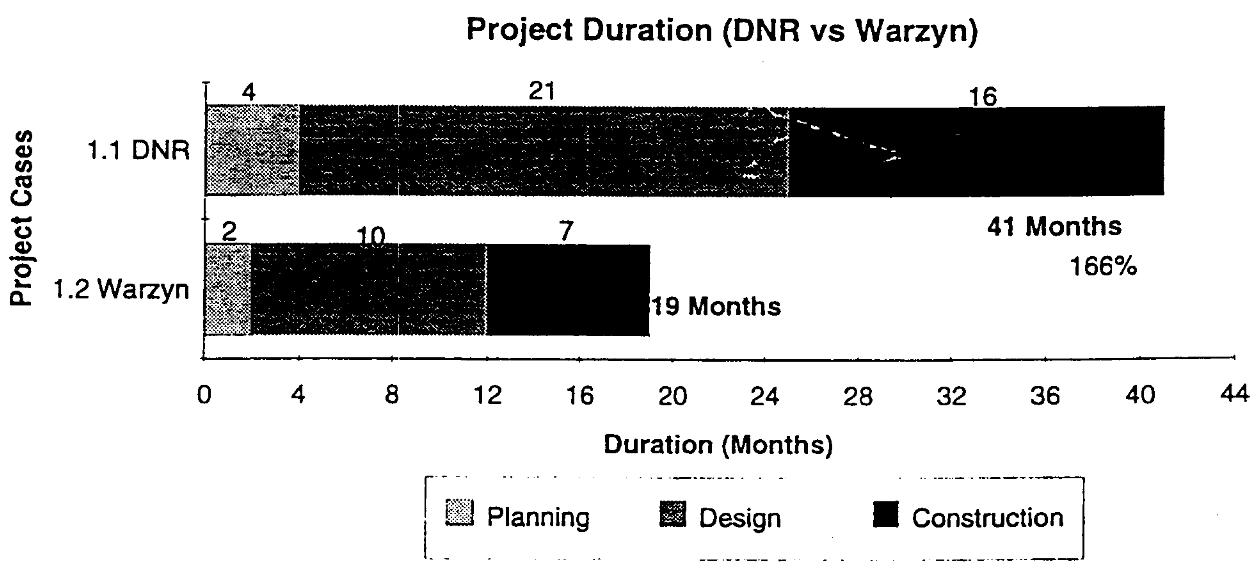
The following is a summary comparison of the major activities which took place during the Facility Development Process:

Facility Development Process	DNR Case Study #1-1 Date	Event	Warzyn Case Study #1-2 Date	Event
2.1 Feasibility Planning	1979-81 Biennium	Recommended the project as part of the State's Milwaukee/Waukesha Office Buildings complex at a cost of $2,752,000.	N/A	N/A
	4/23/80	Building Commission action authorized the release of $60,000 in Building Trust Funds for the preparation of the Concept & Budget Report.		
2.2 Definition of Scope		(See below under 2.4)	4/84	Request for Proposal sent out
2.3 Staff/ Consultant Selection	8/12/80	Plunkett-Keymar-Reginao architects retained to provide consulting services	6/84	RFPs received Retained Findorff/ Potter-Lawson Began negotiations with the City of Madison and the University of Wisconsin with respect to an Industrial Revenue Bond.
2.4 Design Development & Review	8/80	Initiation of Design Work	7/84	Design Development begun
	2/81	Completion of Environmental Impact Statement	10/84	Design Development drawings complete
	3/81	Completion of the Concept & Budget Report		
	3/15/81	Natural Resources Board Approval of the Concept & Budget Report		
	4/28/81	Concept & Budget Report submitted to DSFM for review		
	5/81	Concept & Budget Report submitted to the Building Commission for approval and release of $90,000 Building Trust Funds and authority to plan, bid and construct the project at a cost of $3,244,230		
	6/2581	Building Commission approval of the Concept & Budget Report and authorization to bid and construct (the DSFM delayed the submission of the Concept & Budget Report)		
2.5 Construction Documents & Estimates	7/81	Construction Documents begun	10/84	Construction Documents begun
	12/7/81	Competition of DOSFM Constructio n Document Review	2/85	Construction Documents complete.
	1/21/82	Final Review		
2.6 Bids & Contract Negotiations	2/11/82	Bid Date	N/A	(Contract negotiated at inception of project design and planning stages - see above)

		3/16/82	Bid Opening	12/84	Agreement with lending institution on industrial development revenue bond
		5/25/82	Award of Contracts	2/14/85	Signed contract with lending institution for bond Ground breaking
2.7	**Construction & Project Management**	5/25/82	Construction Begins	4/85	Construction Begins
		9/13/83	Date of Substantial Completion	11/85	Date of Substantial Competition
2.8	**Occupancy & Facility Management**	9/19/83	Building occupied	11/85	Building occupied
		9/21/83	Dedication Ceremonies		

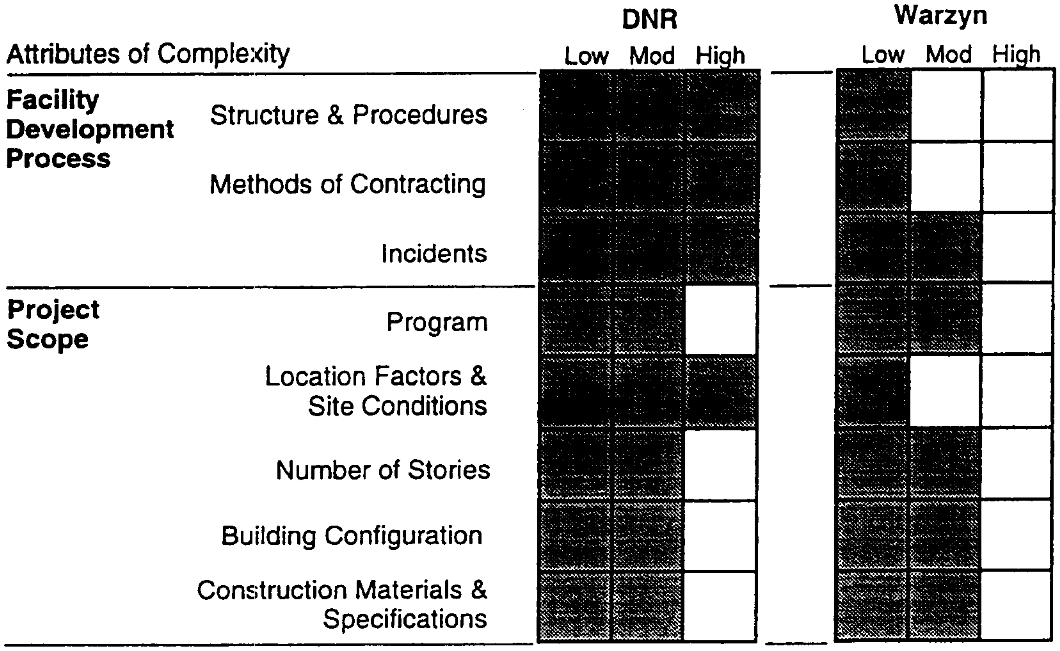
COMPARISON: PROJECT DURATION PROFILE

The following is a comparison of the duration of planning, design and construction activities that took place during the Facility Development Process.



COMPARISON: FACILITY DEVELOPMENT COMPLEXITY PROFILE

Profile Comparison: DNR/Warzyn

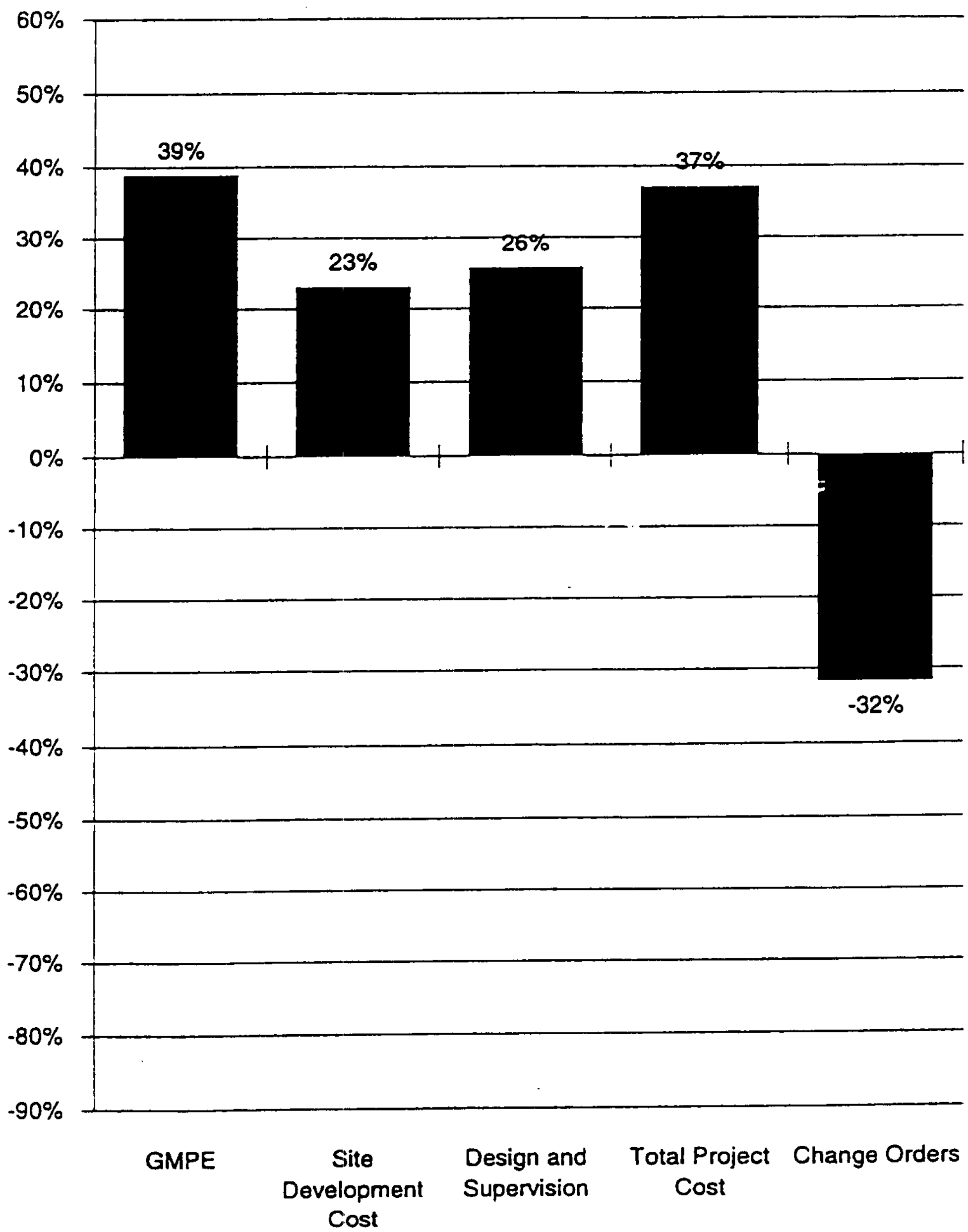


Attributes of Complexity	DNR	Warzyn
Structure & Procedures	The DNR project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD and DNR agency.	Warzyn followed procedures implicitly and were negotiated according to the circumstances and context of the relationship with the developer. There were few levels of decision-making. Major budgetary, project scope, and design decisions were made by a single owner representative.
Methods of Contracting	The method of contracting followed for the DNR project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process.	The method of contracting followed for the Warzyn project was design/build: A contractor/developer was hired through an RFP process, delivering the project on a turn-key basis.
Incidents	During the DNR project there were several significant incidents that occurred as evidenced by documentation in the project records: delays in concept and budget report, state mandated statutory requirement to consider life-cycle costs on building systems, roof code approval process and a delay in construction completion.	During the Warzyn project there were a few significant incidents that occurred as evidenced by documentation in the project records: a substantial change order for mechanical system redesign during construction.
Program	The DNR project program consisted of a balance of specialized and standardized requirements: laboratory space and office.	The Warzyn project program consisted of a balance of specialized and standardized requirements: laboratory space and office.
Location Factors & Site Conditions	The DNR project was located on an urban infill site, required demolition of existing structures, and involved addition, renovation to other existing structures.	The Warzyn project experienced no major location factor or site condition problems.
Number of Stories	Two floors + basement	Two floors + basement
Building Configuration	The DNR building can be described as having somewhat variable floor plates.	The Warzyn building can be described as having somewhat variable floor plates.
Construction Materials & Specifications	The DNR building consists of medium quality, commercial-grade construction materials and specifications.	The Warzyn building consists of medium quality, commercial-grade construction materials and specifications.

COMPARISON: FACILITY DEVELOPMENT COST PROFILE

The following summary chart identifies the percentage by which the public facility cost MORE or LESS than the private facility across the following five cost categories:

Case 1: DNR-Warzyn

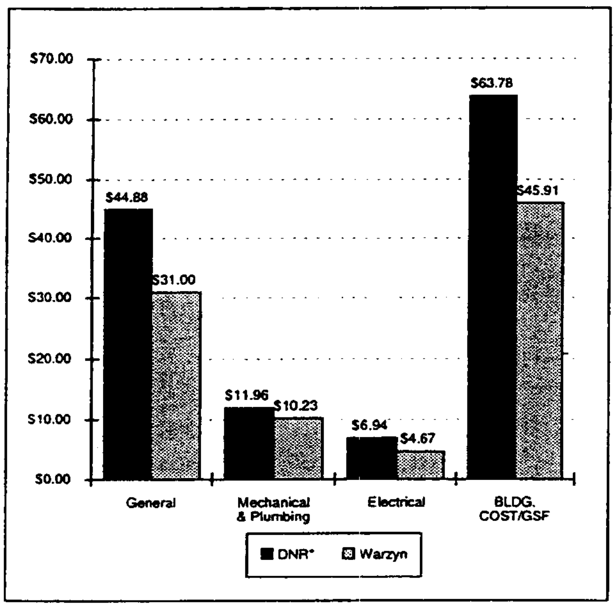


COMPARISON: BUILDING COST

	DNR*	Warzyn
Gross Square Feet	48,049	31,585
Year Constructed	1982	1986

BUILDING COST	DNR*	Warzyn
General	$2,156,499	$979,129
Mechanical & Plumbing (a)	$574,626	$323,164
Electrical	$333,337	$147,650
Bldg. Cost Subtotal	$3,064,463	$1,449,943

BUILDING COST/GSF	DNR*	Warzyn	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
General	$44.88	$31.00	$13.88	45% MORE than the Private Facility
Mechanical & Plumbing (a)	$11.96	$10.23	$1.73	17% MORE than the Private Facility
Electrical	$6.94	$4.67	$2.26	48% MORE than the Private Facility
Bldg. Cost/GSF Subtotal	$63.78	$45.91	$17.87	**39% MORE than the Private Facility**



BUILDING COST DISTRIBUTION	DNR*	Warzyn
General	70%	68%
Mechanical & Plumbing (a)	19%	22%
Electrical	11%	10%
	100%	100%

* *Adjusted to 1986 construction costs in Madison using Means Local Cost Indexes*

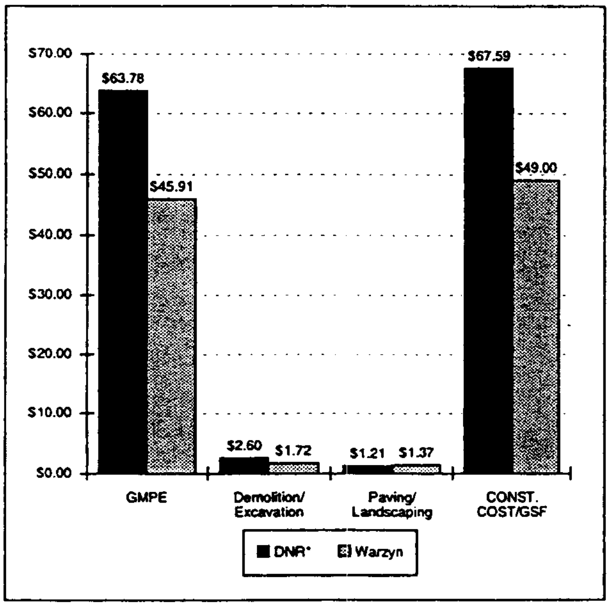
(a) *Combined Mechanical and Plumbing costs (breakdown unavailable for Warzyn)*

COMPARISON: CONSTRUCTION COST

	DNR*	Warzyn
Gross Square Feet	48,049	31,585
Year Constructed	1982	1986

CONSTRUCTION COST		
GMPE	$3,064,463	$1,449,943
Demolition/Excavation	$124,932	$54,407
Paving/Landscaping	$58,001	$43,250
Const. Cost Subtotal	$3,247,396	$1,547,600

CONSTRUCTION COST/GSF	DNR*	Warzyn	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$63.78	$45.91	$17.87	39% MORE than the Private Facility
Demolition/Excavation	$2.60	$1.72	$0.88	51% MORE than the Private Facility
Paving/Landscaping	$1.21	$1.37	($0.16)	(12%) LESS than the Private Facility
Const. Cost/GSF Subtotal	$67.59	$49.00	$18.59	**38% MORE than the Private Facility**



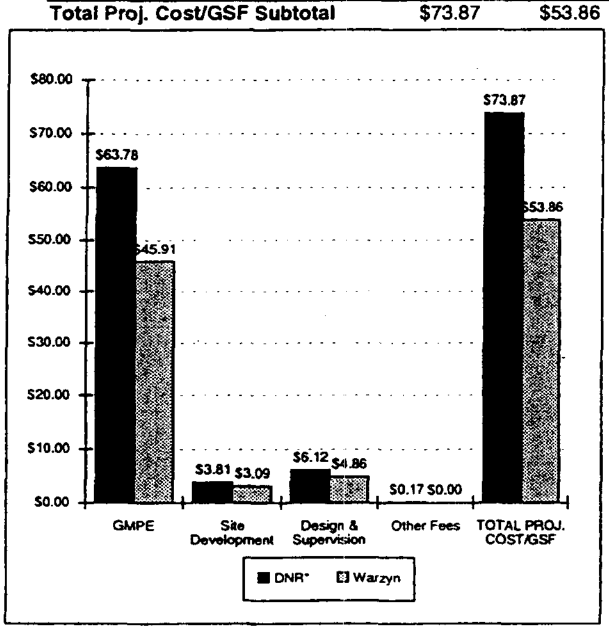
* *Adjusted to 1986 construction costs in Madison using Means Local Cost Indexes*

COMPARISON: TOTAL PROJECT COST

	DNR*	Warzyn
Gross Square Feet	48,049	31,585
Year Constructed	1982	1986

TOTAL PROJECT COST	DNR*	Warzyn
GMPE	$3,064,463	$1,449,943
Site Development	$182,934	$97,657
Design & Supervision	$293,995	$153,600
Other Fees	$8,088	
Total Proj. Cost	$3,541,391	$1,701,200

TOTAL PROJECT COST/GSF	DNR*	Warzyn	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$63.78	$45.91	$17.87	39% MORE than the Private Facility
Site Development	$3.81	$3.09	$0.72	23% MORE than the Private Facility
Design & Supervision	$6.12	$4.86	$1.26	26% MORE than the Private Facility
Other Fees	$0.17		$0.17	MORE than the Private Facility
Total Proj. Cost/GSF Subtotal	$73.87	$53.86	$20.01	**37% MORE than the Private Facility**



DESIGN AND SUPERVISION FEE AS A PERCENTAGE OF CONSTRUCTION COST	DNR*	Warzyn
DFD	1.9%	
A/E	7.2%	9.9%
Total	9.1%	9.9%

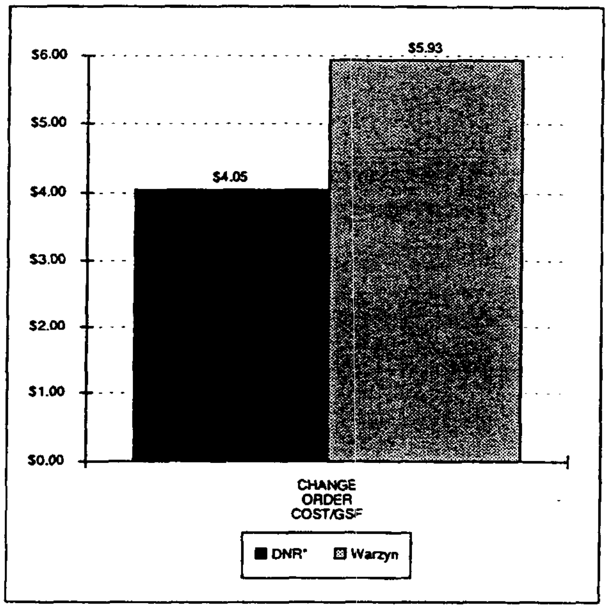
* *Adjusted to 1986 construction costs in Madison using Means Local Cost Indexes*

COMPARISON: CHANGE ORDER COST

	DNR*	Warzyn
Gross Square Feet	48,049	31,585
Year Constructed	1982	1986

CHANGE ORDER COST	DNR*	Warzyn
All Change Orders (a)	$210,082	$187,424

CHANGE ORDER COST/GSF	DNR*	Warzyn	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
All Change Orders (a)	$4.05	$5.93	($1.88)	(32%) LESS than the Private Facility



% OF TOTAL PROJECT COST	DNR*	Warzyn
All Change Orders (a)	5.9%	11.0%

* *Adjusted to 1986 construction costs in Madison using Means Local Cost Indexes*

(a) *For all categories (breakdown unavailable for Warzyn)*

FINDINGS

The following table summarizes (a) project duration (for design and construction phases) and cost findings, and (b) categories of complexity that were identified as potential reasons for differences in project duration and cost. Filled cells (grey boxes) identify the potential factors that explain the findings on the left. [On the following page, an explanation for each factor identified in the table below is proposed.]

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences in the Case

Project Duration and Costs	Structure & Procedures +	Methods of Construct. +	Incidents +	Program	Location & Site +	No. of Stories	Bldg. Config.	Constr. Materials
PROJECT DURATION Project duration (design and construction only) lasted 118% LONGER for DNR (37 months) than for Warzyn (17 months).	■	■	■					
GENERAL COSTS General construction cost 45% MORE per gross sq. ft. for DNR ($44.88) than for Warzyn ($31.00).	■	■	■		■			
MECHANICAL COSTS Mechanical/plumbing construction cost 17% MORE per gross sq. ft. for DNR ($11.96) than for Warzyn ($10.23).	■	■	■					
PLUMBING COSTS (see mechanical costs above)	■	■	■					
ELECTRICAL COSTS Electrical construction cost 48% MORE per gross sq. ft. for DNR ($6.94) than for Warzyn ($4.67).	■	■						
SITE DEVELOPMENT COSTS Site development cost 23% MORE per gross sq. ft. for DNR ($3.81) than for the Warzyn ($3.09).					■			
DESIGN & SUPERVISION Design and supervision services cost 26% MORE per gross sq. ft. for DNR ($6.12) than for Warzyn ($4.86) YET constitute a SMALLER percentage of construction cost for DNR (9.1%) than for Warzyn (9.9%).		■						
CHANGE ORDERS Change orders cost 32% LESS per gross sq. ft. for DNR ($4.05) than for Warzyn ($5.93) AND constitute a SMALLER percentage of total project cost for DNR (5.9%) than for Warzyn (11%).			■					

DISCUSSION

The following discussion elaborates on the factors identified in the previous table as contributing to differences in project duration and cost in this case study:

Structure & Procedures

The DNR organizational structure and facility development procedures involved a ***more complex*** *set of decision-making steps and layers than Warzyn.*

The DNR project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD and DNR agency. While, Warzyn followed procedures implicitly and were negotiated according to the circumstances and context of the relationship with the developer. There were few levels of decision-making. Major budgetary, project scope, and design decisions were made by a single owner representative. These differences in structure and process are identified as possible reasons for greater project duration, general, mechanical, plumbing, and electrical costs.

Methods of Contracting

The method of contracting adopted for the DNR project created ***more complex*** *inter-organizational relationships than the Warzyn project.*

The method of contracting followed for the DNR project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process. The method of contracting followed for the Warzyn project was design/build: A contractor/developer was hired through an RFP who was responsible for delivering the total project on a turn-key basis. This difference in the method of contracting are identified as possible reasons for greater project duration, general, mechanical, plumbing, and electrical costs, as well as design supervision service costs.

Incidents

The DNR project had ***more*** *significant incidents than Warzyn that complicated the process.*

During the DNR project there were several significant incidents that occurred as evidenced by documentation in the project records: delays in concept and budget report, state mandated statutory requirement to consider life-cycle costs on building systems,.roof code approval process and a delay in construction completion. During the Warzyn project there were a few significant incidents that occurred as evidenced by documentation in the project records: a substantial change order for mechanical system redesign during construction. These differences in the number of incidents are identified as possible reasons for greater project duration, general, mechanical, and plumbing costs, as well as change orders.

Location Factors & Site Conditions

The DNR encountered ***more complex*** *location factors and site conditions than Warzyn.*

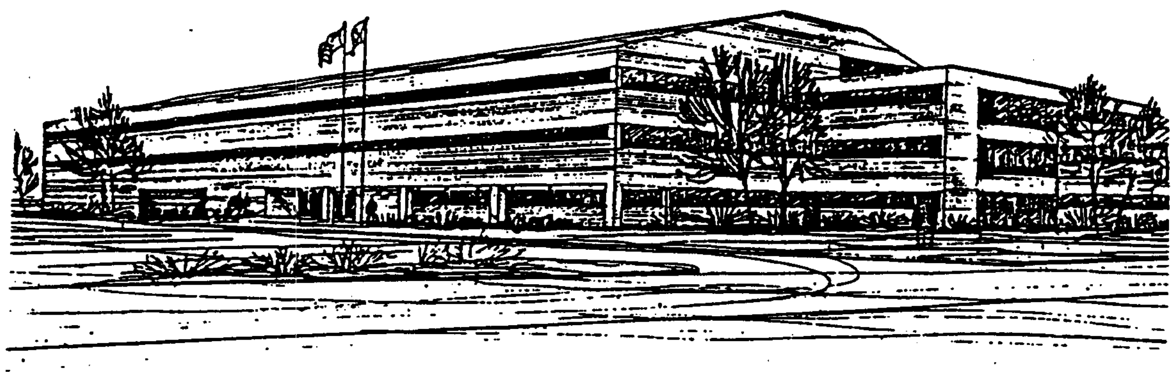
The DNR project was located on an urban infill site, required demolition of existing structures, and involved addition, renovation to other existing structures. The Warzyn project experienced no major location factor or site condition problems. These differences in location factors and site conditions are identified as possible reasons for greater general and site development costs.

CASE 2: COMPARATIVE ANALYSIS

Public Sector Case Study #2-1:
Waukesha State Office Buildling

Private Sector Case Study #2-2
FIserv Corporate Headquarters Building

Public Sector Case Study #2-1
WAUKESHA STATE OFFICE BUILDING



Client	State of Wisconsin, Department of Administration, Division of Facility Development, Madison, Wisconsin
Architect	Brust-Zimmerman, Milwaukee, WI
General Contractor	A. Guenther & Sons Co., Inc., West Allis, WI
Project Description	
Program	The program called for a four story, reinforced concrete structure housing office and support functions. The building consolidated into one facility the District offices of the DOT, Health and Human Services, Industry, Labor and Human Relations, and Revenue Office, Labs, records, storage, data processing, cafeteria, conference rooms, receiving and shops.
Year Constructed	1983
Gross Square Footage	103,911 GSF
Project Costs*	
Building Cost	$6,653,397
Construction Cost	$6,948,433
Total Project Cost	$7,772,080

*Adjusted to 1992 construction costs in Milwaukee using Means Local Cost Indexes.

Private Sector Case Study #2-2
FISERVE CORPORATE HEADQUARTERS BUILDING

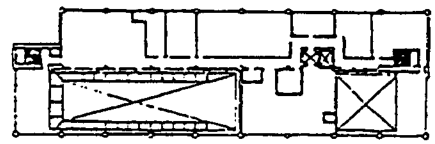
Client	Fiserv, Inc., Brookfield, Wisconsin
Architect	Kahler Slater, Milwaukee, Wisconsin
General Contractor	Jansen Construction, Brookfield
Project Description	
Program	The program called for a three-story bulding containing executive offices, conference rooms, various storage rooms and support space, a cafeteria (no kitchen), and a large computer room with special air conditioning requirements. The project also called for extensive landscaping and a 300 stall surface parking lot on the chosen 20 acre site.
Year Constructed	1992
Gross Square Footage	112,786 GSF
Project Costs	
Building Cost	$6,768,105
Construction Cost	$7,615,201
Total Project Cost	$8,197,062

MATCHING: FUNCTIONAL PLAN

Waukesha State Office Building
Case Study #2-1

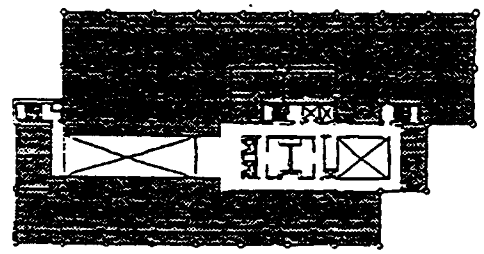
<u>Fourth Floor</u>

Office:	0 GSF
Support:	13,299 GSF
Total:	13,299 GSF



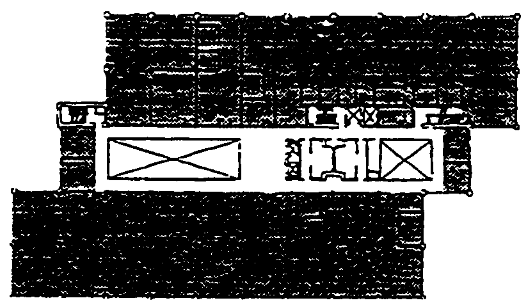
<u>Third Floor</u>

Office:	19,366 GSF
Support:	3,811 GSF
Total:	23,177 GSF



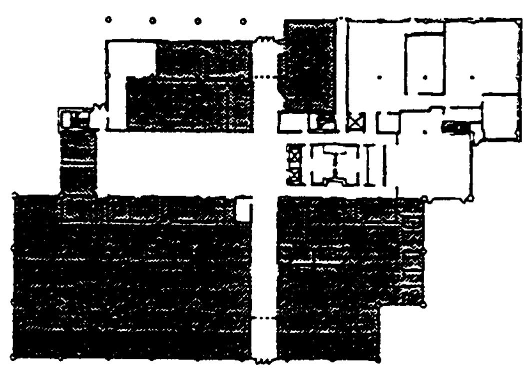
<u>Second Floor</u>

Office:	24,702 GSF
Support:	5,195 GSF
Total:	29,897 GSF



<u>Ground Floor</u>

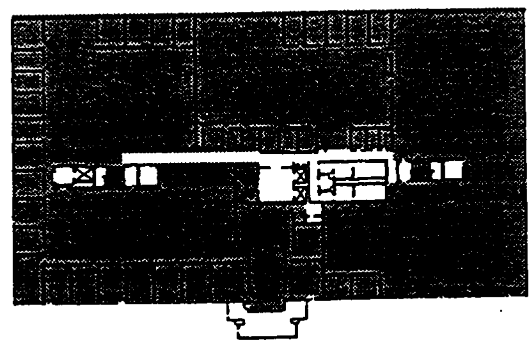
Office:	20,624 GSF
Support:	16,914 GSF
Total:	37,538 GSF



Grand Total 103,911 GSF

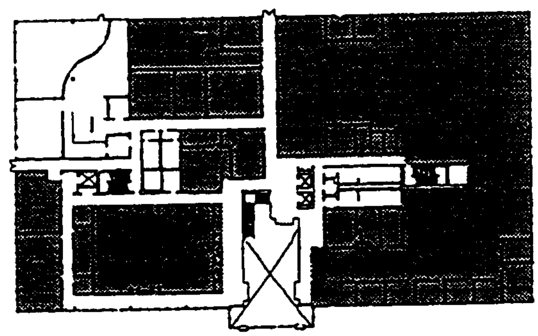
MATCHING: FUNCTIONAL PLAN

Fiserve Corporate Headquarters Building
Case Study #2-2



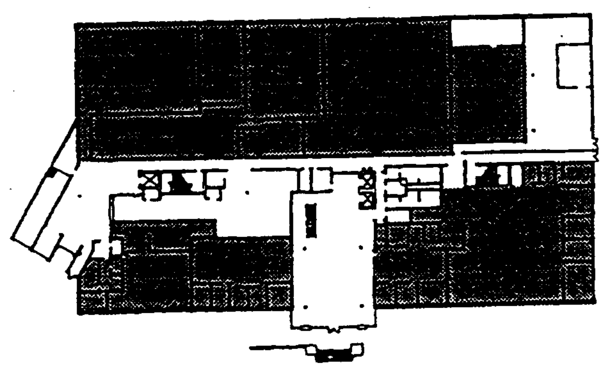
Third Floor

Office:	34,222 GSF
Support:	2,950 GSF
Total:	**37,172 GSF**



Second Floor

Office:	24,778 GSF
Support:	11,160 GSF
Total:	**35,938 GSF**



Ground Floor

Office:	25,151 GSF
Support:	14,525 GSF
Total:	**39,676 GSF**
Grand Total	**112,786 GSF**

MATCHING: ORGANIZATIONAL CONTEXT

The organizational context matched along three specific areas: organizational struction, experience and function. The following table summarizes the matching criteria for organizational context:

Organizational Context Match Criteria	Waukesha Case Study #2-1	FIserve Case Study #2-2	Remarks
Structure	Bureaucratic, multi-tiered public state agency.	Private corporation with departmentalized structure.	***Not Comparable:*** *Very different organizational structures: one vertically oriented, the other horizontally oriented.*
Experience	DOT operating in a building constructed in 1955 with additions in 1964 and 1970. The primary development experience for this project can be accounted for by the DFD.	FIserve founded in 1984, fast growing (assets reaching $1 billion in 1993), but only moderate experience in development.	***Not Comparable:*** *Very different development experiences.*
Function	Managing public transportation infrastructure	Managing private financial portfolios of banks and other lending institutions.	***Moderately Comparable:*** *Both functions are service oriented however, different types of service functions.*

MATCHING: PROJECT SCOPE

The project scope was matched according to several criteria: building program, construction materials and building systems. The following table summarizes the matching criteria:

Project Scope Match Criteria	Waukesha Case Study #2-1	Fiserve Case Study #2-2	Remarks
3.1 Program Scope			*Comparable*
Office	64,692 62%	84,151 75%	
Support	39,219 38%	28,635 25%	
Total	103,911	112,786	
3.2 Locational Factors/Site Conditions	Urban site in small city chosen for convenient public access near natural areas and riverfront.	Suburban site outside of a large city. Ample parking available on site.	*Not Comparable*
3.3 Size/ Form/ Configuration	Rectilinear and stepped four story building	Rectilinear and compact three story building.	*Moderately Comparable*
3.4 Construction Materials & Bldg Sys.			
Foundation	12" concrete foundation walls	12" concrete foundation walls	*Comparable*
Structural System	Concrete post-tensioned flat slab system	Structural steel structure w/ 8" precast concrete floor slab	*Comparable*
Exterior Wall System	Pre-cast concrete panels w/ 6" steel stud back-up/ double glazed tinted insulated glass/ R19 insulation.	Brick veneer on steel studs/ banded window wall w/ 1" insulated glass/ 3.5" batt insulation	*Comparable*
Interior Wall Constr	5/8" GWB w/ 3 5/8" metal studs	5/8" GWB w/ 3 5/8" metal studs	*Comparable*
Finishes	Carpeting, paint, acoustical ceiling tile	Carpeting, paint, acoustical ceiling tile	*Comparable*
Roof System	Single ply rubber membrane w/ tapered rigid foam insulation w/ gravel ballast.	Single ply rubber membrane w/ tapered rigid foam insulation w/ gravel ballast.	*Comparable*
Mechanical System	Incremental water source heat pump units interconnected by water pipe loop/ gas fired boiler back-up heat source/ energy management system	•Roof-top air handling units and forced air system	*Not Comparable*
Electrical System	Under carpet flat-cable power and telephone distribution system; high efficiency linear parabolic fluorescent light fixtures.	Standard electrical power system; fluorescent lighting.	*Comparable*
Plumbing System	Standard plumbing system; gas fueled domestic hot water system.	Standard plumbing system.	*Comparable*
3.5 Occupancy Patterns/ Char.	Designed for an occupancy of 517 staff and 317 vistors.	Current occupancy: 400 staff	*Comparable*

COMPARISONS: FACILITY DEVELOPMENT PROCESS

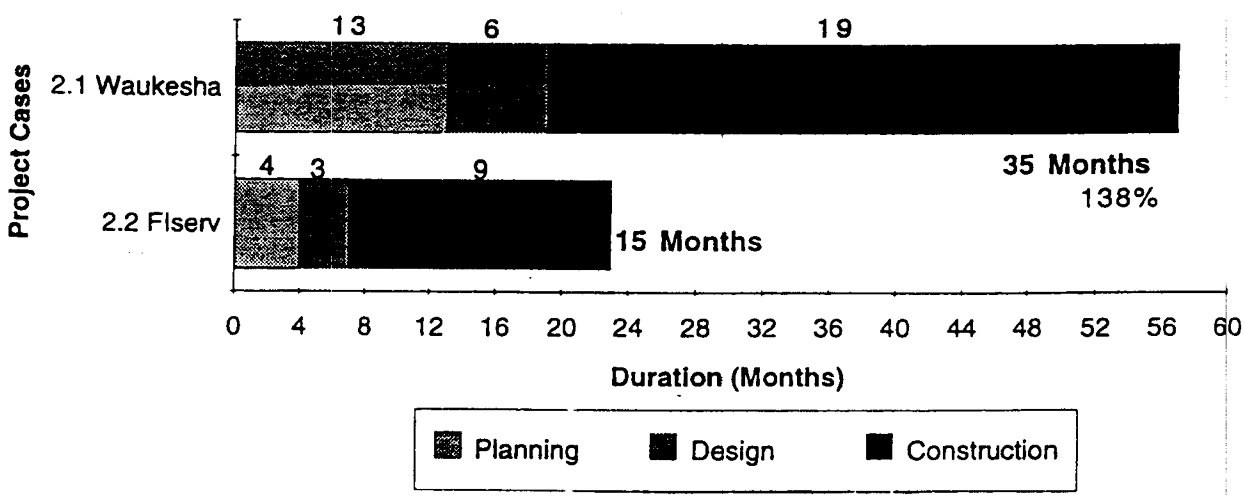
The following is a summary comparison of the major activities which took place during the Facility Development Process:

Facility Development Process	Waukesha Case Study #2-1 Date	Event	Fiserve Case Study #2-2 Date	Event
2.1 Feasibility Planning	79-81 Biennium	Recommended the construction of a new District Office Facility at a cost of $10.7 million as part of the State's Milwaukee/Waukesha Office Buildings to consolidate in one facility the District offices of the DOT, Health and Human Services, Industry, Labor and Human Relations, and Revenue.	3/91	Project was originally conceived as a joint partnership between Gilbain and Fiserv in which Fiserv entertained lease-back proposals. Soon after, Fiserv made the decision to own to building. Fiserv contracted with Gilbain would function as a guarentor and manager of all property transactions.
			5/91	Several land options were explored in the Brookfield area. Site is selected.
2.2 Definition of Scope	4/23/80	Approved the release of $232,000 of BTF-Planning to prepare an Environmental Impact Statement, appraisals, a Concept and Budget Report, and preliminary plans for the construction of a State Office Building at a cost of $7.95 million.		
	1/28/81	The Commission and the DOA recommended that the Department secure options on the Wilbur Lumber Yard site (3.5 acres) and the Barstow School site (1.6 acres).		
	3/25/81	The Building Commission approved the request to purchase one 3.6 acre parcel of land (Wilbur Lumber Yard) for the proposed State Office Building in Waukesha at a price not to exceed $460,000 in advanced land Acquisition Funds.		
2.3 Staff/ Consultant Selection	5/80	Architectural consultants are chosen and begin preparing an Environmental Impact Statement of several sites under consideration.	7/3/91	Jansen Construction retained by Gilbain for design/build services. Kahler Slater contracted with Jansen to do design work. Program meetings with staff
2.4 Design Development & Review	5/27/81	The Building Commission approved a request for the release of $120,000 to plan, bid and demolish the existing structure on the project site.	7/91	Design development started.
	6/81	The Concept & Budget Report called for the demolition of nine existing structures on the acquired site and the completion construction by 8/82 coinciding with the expiration of leases on 18,811 SF of space for various agencies scheduled to move in. To meet this schedule the architects suggested that the project be bid in five phases.	8/91	Design development completed.
2.5 Construction Documents & Estimates	6/81	Start of construction documents.	8/91	Start of construction documents.
	11/81	Construction documents subtantially completed. Completion of design work overlapped with construction phase.	9/27/91	Completion of construction documents.

2.6	**Bids & Contract Negotiations**	7/28/81	Bid Opening: Phase I: Base Bid No.1: Demolition	9/31/91	Award of contract
		10/20/81	Bid Opening: Phase II Base Bid No. 2: Site Work		
		11/24/81	Bid Opening: Phase III Base Bid No. 3: General, HVAC, Electrical & Plumbing		
2.7	**Construction & Project Management**	8/3/81	Award of Contract: Phase I	10/7/91	Building permit secured
		10/23/81	Award of Contract: Phase II		
		12/7/81	Award of Contract: Phase III		
		1/28/82	Request authorization to increase the movable equipment budget by $141,400 for a revised total movable equipment budget of $540,240.		
		3/83	Substantial Completion: Contractor continued to complete interior space planning work while tenants began occupying portions of the space.	7/92	Substantial completion
2.8	**Occupancy & Facility Management**	3/83	Occupancy	7/4/92	Occupancy
		11/29/83	Art Work		
		1/4/85	Energy Conservation Report: As built analysis of energy consumption		
		4/14/86	Construction of Entry Canopy		
		1/21/88	Project Close-out dates varied by contract. The GC closed out 2/84, while the EC closed out as late as 2/88.		

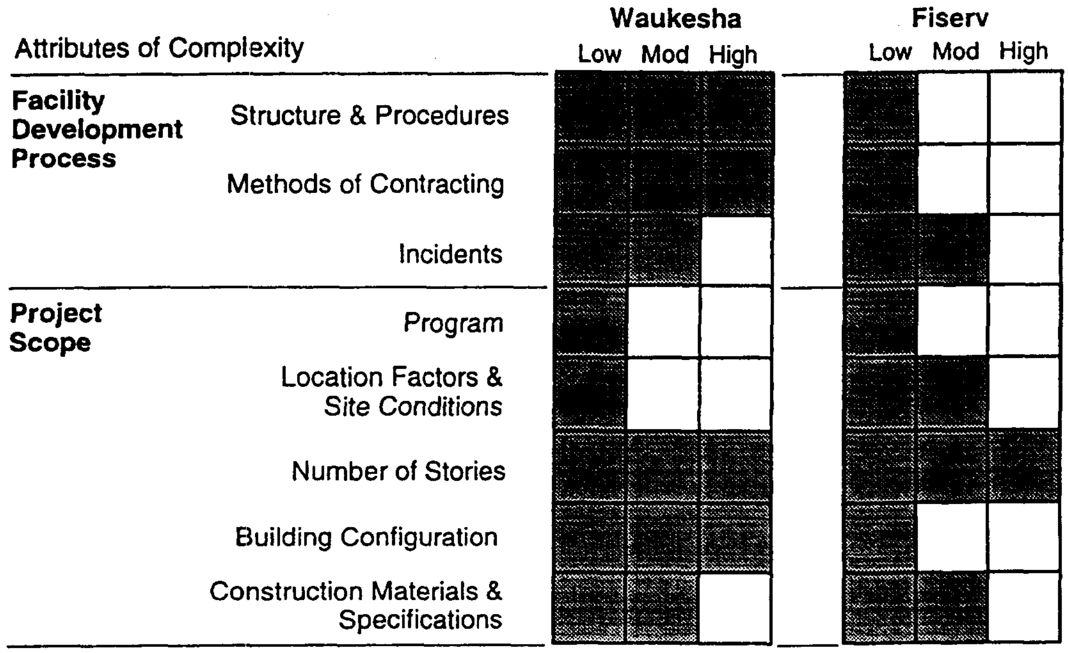
FACILITY DEVELOPMENT PROCESS COMPARISONS

The following is a comparison of the duration of planning, design and construction activities that took place during the Facility Development Process:



COMPARISON: FACILITY DEVELOPMENT COMPLEXITY PROFILE

Profile Comparison: Waukesha/Fiserv

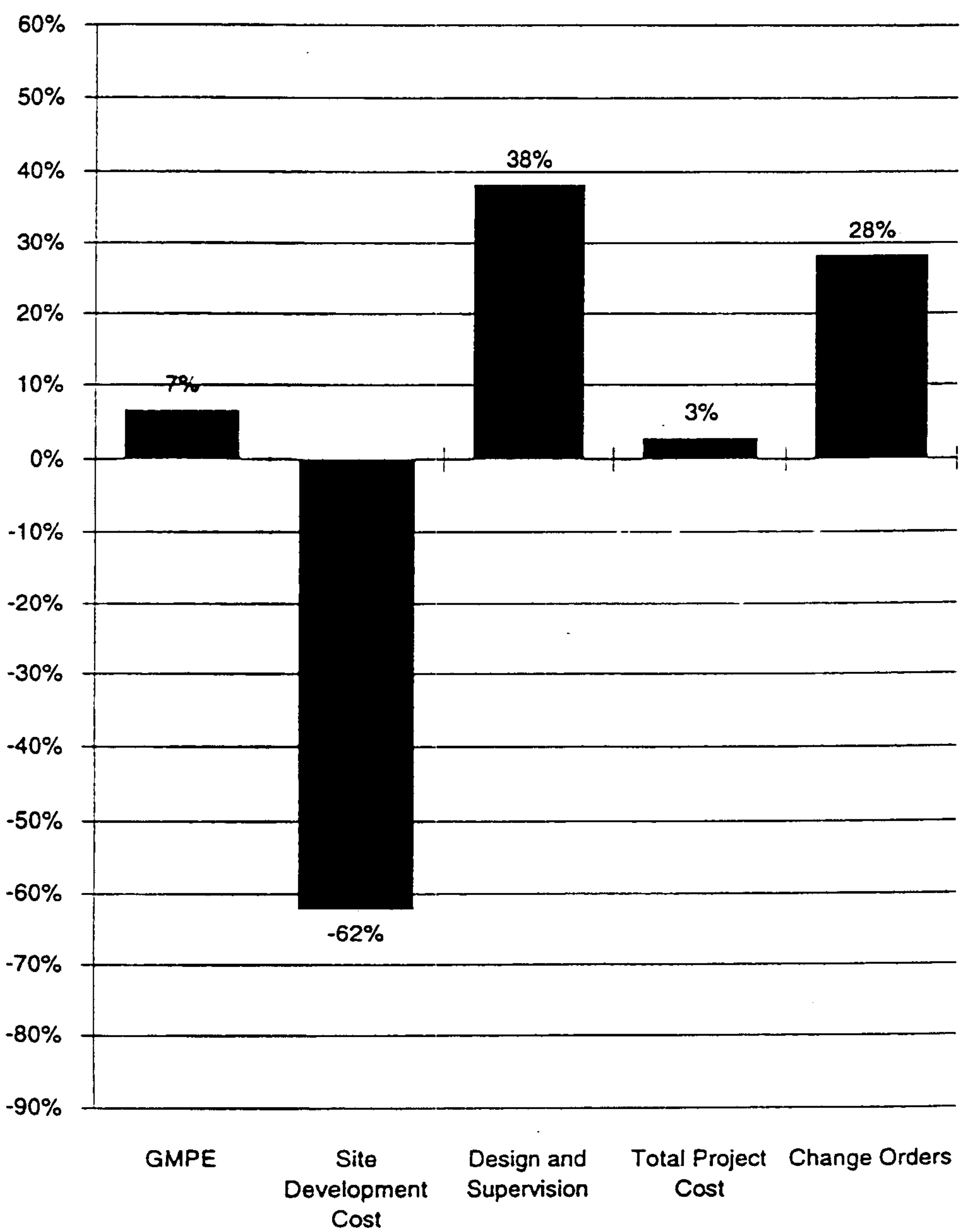


Attributes of Complexity	Waukesha	Fiserv
Structure & Procedures	The Waukesha project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD and several agencies (mainly DOT).	Fiserv followed procedures implicitly and were negotiated according to the circumstances and context of the relationship with a developer. There were few levels of decision-making. Major budgetary, project scope, and design decisions were made by a single owner representative.
Methods of Contracting	The method of contracting followed for the Waukesha project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process (although the bidding process was less conventional being conducted in three phases).	The method of contracting followed for the Fiserv project was design/build: A contractor/developer was hired through an RFP who was responsible for delivering the total project on a turn-key basis.
Incidents	During the Waukesha project there were few significant incidents that occurred as evidenced by documentation in the project records: state mandated statutory requirement to consider life-cycle costs on building systems required a redesign of roof from flat to pitched late in design process delaying construction, as well as late furniture delivery.	During the Fiserv project there were few significant incidents that occurred as evidenced by documentation in the project records: substantial change orders were incurred due to redesign related to computer facility installation.
Program	The Waukesha project program consisted primarily of standardized requirements: office and related functional spaces.	The Fiserv project program consisted primarily of standardized requirements: office and related functional spaces.
Location Factors & Site Conditions	The Waukesha project experienced no major location factor or site condition problems.	The Fiserv project was developed on a 20 acre site which was significantly larger than that required to optimally accommodate occupancy.
Number of Stories	4 floors	3 floors
Building Configuration	The Waukesha building can be described as having highly variable floor plates.	The Fiserv building can be described as prizmatic (all floor plates identical).
Construction Materials & Specifications	The Waukesha building consists of medium quality, commercial-grade construction materials and specifications.	The Fiserv building consists of medium quality, commercial-grade construction materials and specifications.

COMPARISON: FACILITY DEVELOPMENT COST PROFILE

The following summary chart identifies the percentage by which the public facility cost MORE or LESS than the private facility across the following five cost categories:

Case 2: Waukesha/Fiserv

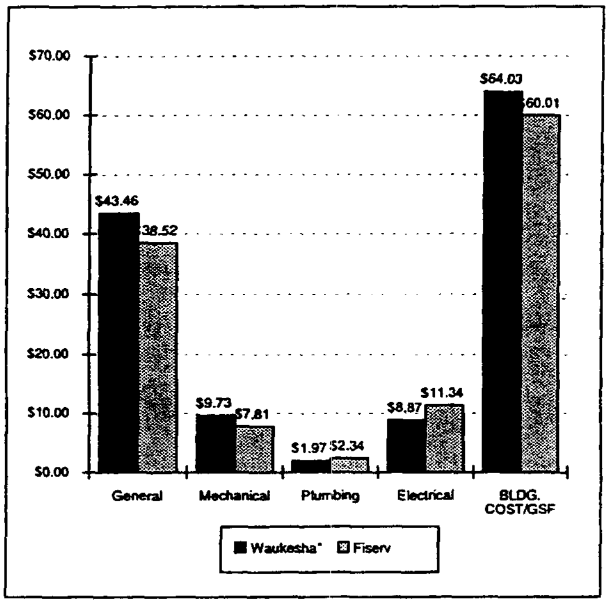


COMPARISON: BUILDING COST

	Waukesha*	Fiserv
Gross Square Feet	103,911	112,786
Year Constructed	1983	1992

BUILDING COST	Waukesha*	Fiserv
General	$4,516,109	$4,344,000
Mechanical	$1,010,628	$881,130
Plumbing	$204,965	$263,917
Electrical	$921,696	$1,279,058
Bldg. Cost Subtotal	$6,653,397	$6,768,105

BUILDING COST/GSF	Waukesha*	Fiserv	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
General	$43.46	$38.52	$4.95	13% MORE than the Private Facility
Mechanical	$9.73	$7.81	$1.91	24% MORE than the Private Facility
Plumbing	$1.97	$2.34	($0.37)	(16%) LESS than the Private Facility
Electrical	$8.87	$11.34	($2.47)	(22%) LESS than the Private Facility
Bldg. Cost/GSF Subtotal	$64.03	$60.01	$4.02	**7% MORE than the Private Facility**



BUILDING COST DISTRIBUTION	Waukesha*	Fiserv
General	68%	64%
Mechanical	15%	13%
Plumbing	3%	4%
Electrical	14%	19%
	100%	100%

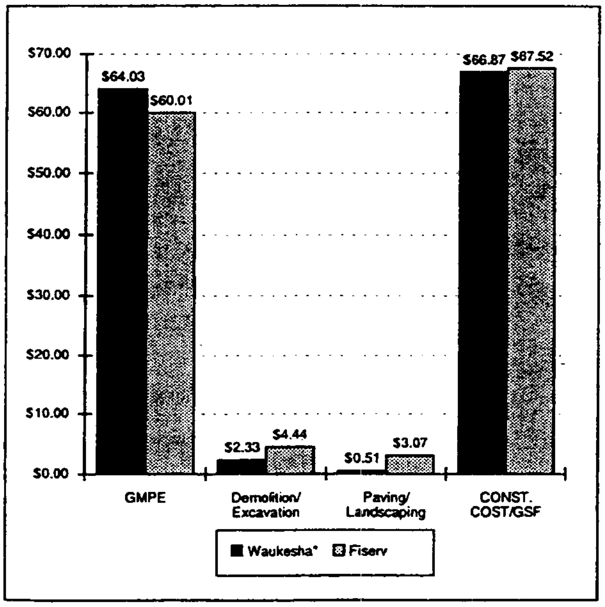
* *Adjusted to 1992 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: CONSTRUCTION COST

	Waukesha*	Fiserv
Gross Square Feet	103,911	112,786
Year Constructed	1983	1992

CONSTRUCTION COST	Waukesha*	Fiserv
GMPE	$6,653,397	$6,768,105
Demolition/Excavation	$242,287	$501,196
Paving/Landscaping	$52,748	$345,900
Const. Cost Subtotal	$6,948,433	$7,615,201

CONSTRUCTION COST/GSF	Waukesha*	Fiserv	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$64.03	$60.01	$4.02	7% MORE than the Private Facility
Demolition/Excavation	$2.33	$4.44	($2.11)	(48%) LESS than the Private Facility
Paving/Landscaping	$0.51	$3.07	($2.56)	(83%) LESS than the Private Facility
Const. Cost/GSF Subtotal	$66.87	$67.52	($0.65)	**(1%) LESS than the Private Facility**



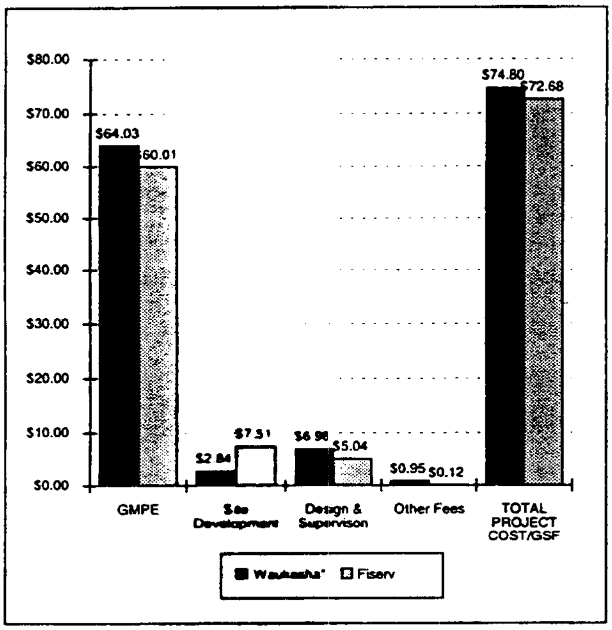
* *Adjusted to 1992 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: TOTAL PROJECT COST

	Waukesha*	Fiserv
Gross Square Feet	103,911	112,786
Year Constructed	1983	1992

TOTAL PROJECT COST	Waukesha*	Fiserv
GMPE	$6,653,397	$6,768,105
Site Development	$295,035	$847,096
Design & Supervison	$724,794	$568,861
Other Fees	$98,854	$13,000
Total Proj. Cost	$7,772,080	$8,197,062

TOTAL PROJECT COST/GSF	Waukesha*	Fiserv	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$64.03	$60.01	$4.02	7% MORE than the Private Facility
Site Development	$2.84	$7.51	($4.67)	(62%) LESS than the Private Facility
Design & Supervison	$6.98	$5.04	$1.93	38% MORE than the Private Facility
Other Fees	$0.95	$0.12	$0.84	725% MORE than the Private Facility
Total Proj. Cost/GSF Subtotal	$74.80	$72.68	$2.12	**3% MORE than the Private Facility**



DESIGN AND SUPERVISION FEE AS A PERCENTAGE OF CONSTRUCTION COST	Waukesha*	Fiserv
DFD(DSFM)	1.8%	
A/E	8.6%	7.5%
Total	10.4%	7.5%

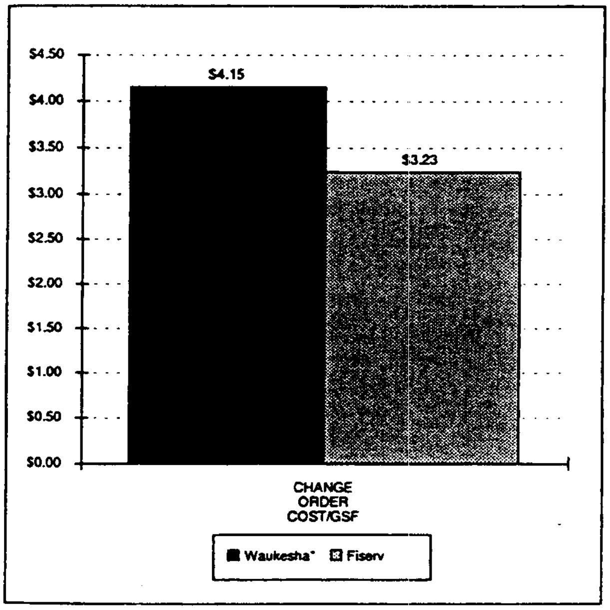
* *Adjusted to 1992 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: CHANGE ORDER COST

	Waukesha*	Fiserv
Gross Square Feet	103,911	112,786
Year Constructed	1983	1992

CHANGE ORDER COST	Waukesha*	Fiserv
All Change Orders (a)	$547,498	$364,786

CHANGE ORDER COST/GSF	Waukesha*	Fiserv	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
All Change Orders (a)	$4.15	$3.23	$0.92	28% MORE than the Private Facility



% OF TOTAL PROJECT COST	Waukesha*	Fiserv
All Change Orders (a)	7.0%	4.5%

* *Adjusted to 1992 construction costs in Milwaukee using Means Local Cost Indexes*

(a) *For all categories (breakdown unavailable for Fiserv)*

FINDINGS

The following table summarizes (a) project duration (for design and construction phases) and cost findings, and (b) categories of complexity that were identified as potential reasons for differences in project duration and cost. Filled cells (grey boxes) identify the potential factors that explain the findings on the left. [On the following page, an explanation for each factor identified in the table below is proposed.]

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences in the Case

Project Duration and Costs	Structure & Procedures	Methods of Construct	Incidents	Program	Location & Site	No. of Stories	Bldg Config	Constr. Materials
	+	+			-		+	
PROJECT DURATION Project duration (design and construction) lasted 108% LONGER for Waukesha (25 months) than for Fiserv (12 months).	■	■					■	
GENERAL COSTS General construction cost 13% MORE per gross sq. ft. for Waukesha ($43.46) than for Fiserv ($38.52).	■	■					■	
MECHANICAL COSTS Mechanical construction cost 24% MORE per gross sq. ft. for Waukesha ($9.73) than for Fiserv ($7.81).	■	■					■	
PLUMBING COSTS Plumbing construction cost 16% LESS per gross sq. ft. for Waukesha ($1.97) than for Fiserv ($2.34).								
ELECTRICAL COSTS Electrical construction cost 22% LESS per gross sq. ft. for Waukesha ($8.87) than for Fiserv ($11.34).					■			
SITE DEVELOPMENT COSTS Site development cost 62% LESS per gross sq. ft. for Waukesha ($2.84) than for Fiserv ($7.51).					■			
DESIGN & SUPERVISION Design and supervision services cost 38% MORE per gross sq. ft. for Waukesha ($6.98) than for Fiserv ($5.04) AND constitute a GREATER percentage of construction cost for Waukesha (10.4%) than for Fiserv (7.5%).	■	■						
CHANGE ORDERS Change orders cost 28% MORE per gross sq. ft. for Waukesha ($4.15) than for Fiserv ($3.23) AND constitute a GREATER percentage of total project cost for Waukesha (7%) than for Fiserv (4.5%).			■					

DISCUSSION

The following discussion elaborates on the factors identified in the previous table as contributing to differences in project duration and cost in this case study:

Structure & Procedures

*The Waukesha project organizational structure and facility development procedures involved a **more complex** set of decision-making steps and layers than Fiserv.*

The Waukesha project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD and several agencies (mainly DOT). While, Fiserv followed procedures implicitly and were negotiated according to the circumstances and context of the relationship with a developer. There were few levels of decision-making. Major budgetary, project scope, and design decisions were made by a single owner representative. These differences in structure and process are identified as possible reasons for greater project duration, general, mechanical costs as well as design and supervision service costs.

Methods of Contracting

*The method of contracting adopted for the Waukesha project created a **more complex** inter-organizational relationships than the Fiserve project.*

The method of contracting followed for the Waukesha project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process (although the bidding process was less conventional being conducted in three phases). While, the method of contracting followed for the Fiserv project was design/build: A contractor/developer was hired through an RFP who was responsible for delivering the total project on a turn-key basis. These differences in methods of contracting are identified as possible reasons for greater project duration, general, mechanical costs as well as design and supervision service costs.

Location Factors & Site Conditions

*The Waukesha project encountered significantly **less** location factors and site conditions than the Fiserv project.*

The Waukesha project experienced no major location factor or site condition problems. In constrast, the Fiserv project was developed on a large 20 acre site and had extensive site improvements. These differences in location factors and site conditions are identified as possible reasons for less site development and electrical costs for Waukesha.

Building Configuration

*The Waukesha project's building configuration was **more complex** than Fiserv.*

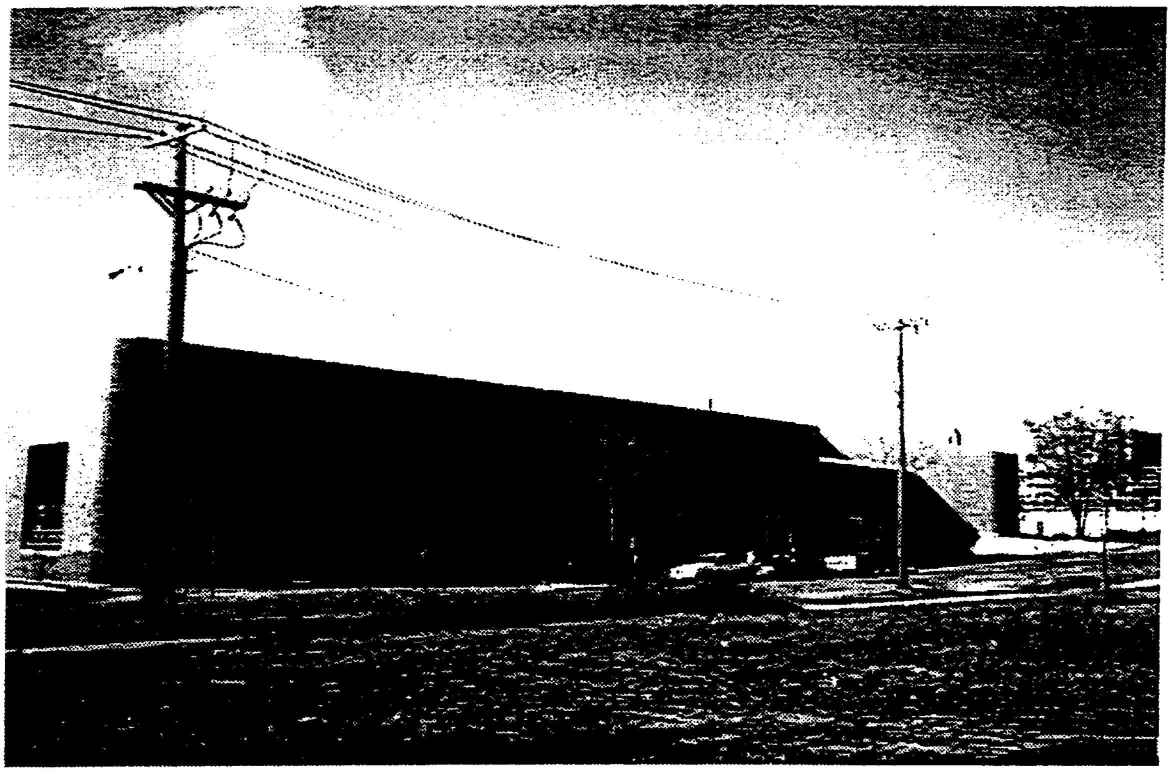
The Waukesha building can be described as having highly variable floor plates. While, the Fiserv building can be described as prizmatic (all floor plates identical). These differences in building configuration are identified as possible reasons for greater project duration, general and mechanical costs.

CASE 3: COMPARATIVE ANALYSIS

Public Sector Case Study #3-1:
Stores/Extension Services Facility

Private Sector Case Study #3-2
Electromotive Systems Facility

Public Sector Case Study #3-1
STORES/EXTENSION SERVICES FACILITY



Client	University of Wisconsin System Administration and the State of Wisconsin, Department of Administration and the Division of Facilities Development
Architect	Krueger Shutter & Associates, Inc., Madison, WI
General Contractor	Corporate Construction Ltd.
Project Description	
Program	The stated purpose of the project was to combine the existing Stores mechandising operation with Unversity Extension Services (presently housed at five locations) into a new, safe, and efficient facility. The program called for space to house unheated warehouse space, heated warehouse space, offices, and printing, mailing and labeling workareas to be shared by both operations in a single facility.
Year Constructed	1985
Gross Square Footage	59,632 GSF
Project Costs*	
Building Cost	$2,628,042
Construction Cost	$2,887,047
Total Project Cost	$3,132,883

* Adjusted to 1993 construction costs in Milwaukee using Means Local Cost Indexes.

Private Sector Case Study #3-2
ELECTROMOTIVE SYSTEMS FACILITY

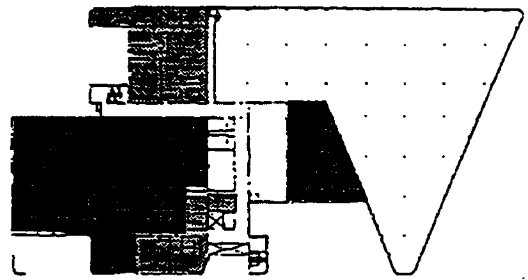
Client	Electromotive Systems, Inc., Menomonee Falls, Wisconsin
Architect	Eppstein, Keller, Uhen Architects, Milwaukee, Wisconsin
General Contractor	Berghammer, Milwaukee, Wisconsin
Project Description	
Program	The program called for a new central facility that would combine service, manufacturing, and office administration functions. In addition, the facility would need to allow for the option of expanding the warehouse facility area within three to five years.
Year Constructed	1993
Gross Square Footage	47,545 GSF
Project Costs	
Building Cost	$1,605,413
Construction Cost	$1,739,023
Project Cost	$1,889,023

MATCHING: FUNCTIONAL PLAN

Stores/Extension Services Facility
Case Study #3-1

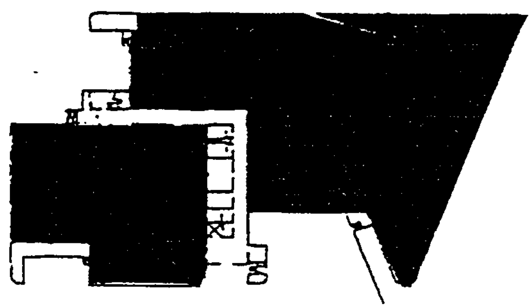
Second Floor

Office:	4,656 GSF
Manufacturing/ Warehouse:	10,880 GSF
Support:	5,776 GSF
Total:	**21,312 GSF**



Ground Floor

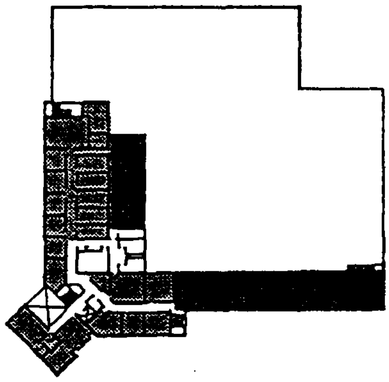
Office:	0 GSF
Manufacturing/ Warehouse:	34,528 GSF
Support:	3,792 GSF
Total:	**38,320 GSF**



Grand Total	**59,632 GSF**

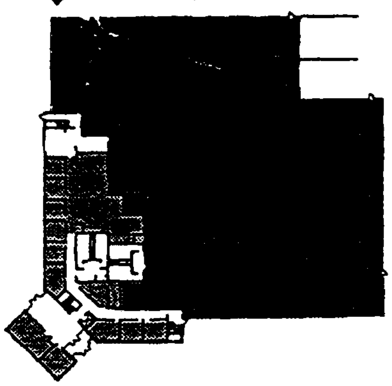
MATCHING: FUNCTIONAL PLAN

Electromotive Systems Facility
Case Study #3-2



Second Floor

Office:	4,366 GSF
Manufacturing/ Warehouse:	4,894 GSF
Support:	2,306 GSF
Total:	**11,566 GSF**



Ground Floor

Office:	3,251 GSF
Manufacturing/ Warehouse:	29,065 GSF
Support:	3,663 GSF
Total:	**35,979 GSF**

Grand Total 47,545 GSF

MATCHING: ORGANIZATIONAL CONTEXT

The organizational context matched along three specific areas: organizational struction, experience and function. The following table summarizes the matching criteria for organizational context:

Organizational Context Match Criteria	Stores/Extension Services Case Study #3-1	Electromotive Systems Case Study #3-2	*Remarks*
Structure	Two semi-independently operated departments within a large state university system. Size: 100 employees.	Private corporation. Size: 80 employees.	***Comparable:*** *Similar sized and managed organizational structures.*
Experience	The development experience of the both Stores and Extension Services has been minimal. Each had acquired lease space to fulfill their space requirements prior the new facility. The primary development experience can be accounted for from the UW-System Administration and the DFD.	Electromotive Systems' development experience was limited: involving the acquisition and operation of three facilities prior to the development of the new facility.	***Moderately Comparable:*** *The development experience of both end-client organizations was similar, however, Stores/Extension Services had the benefit of extensive UW-System and DFD experience.*
Function	Stores performs a major merchandising function for the University, while Extension Services provides duplication services for the University	Electromotive Systems manufactures adjustable frequency motor controls, automation products and electrification components and systems for overhead materials handling industry.	***Moderately Comparable:*** *Functions are somewhat related: Stores/Extension Services acts as a storage and distribution center, while Electromotive Systems acts primarily as a manufacturing and distribution facility.*

MATCHING: PROJECT SCOPE

The project scope was matched according to several criteria: building program, construction materials and building systems. The following table summarizes the matching criteria:

Project Scope Match Criteria	Stores/Extension Services Case Study #3-1	Electromotive Systems Case Study #3-2	Remarks
3.1 Program Scope			
Office	4,656 8%	7,617 16%	*Comparable*
Manufacturing	45,408 76%	33,959 71%	
Support	9,568 16%	5,969 13%	
Total	59,632	47,545	
3.2 Locational Factors/Site Conditions	The building was sited on a difficult flat trapezoidal site forcing a illregular warehouse floor area.	Located in an industrial park with ample room for future anticipated expansion.	*Not Comparable*
3.3 Size/ Form/ Configuration	Two-story storage warehouse space with two-story office wing.	Two-story manufacturing warehouse space with two-story office wing.	*Comparable*
	Due to site configuration, the warehousing area was slightly more complex than would be desired for that type of function.	Simple rectalinear building form.	*Moderately Comparable*
3.4 Constr Mat'ls & Bldg Systems			
Foundation	12" concrete foundation walls	12" concrete foundation walls	*Comparable*
Structural System	Steel joist and beam structural framing system w/ metal decking	Steel joist and beam structural framing system w/ metal decking	*Comparable*
Exterior Wall System	4" brick on 8" concrete block, w/ polystyrene insulation (R20) and 1" insulated glass in aluminum frames.	8" concrete block walls painted w/ galvanized steel preformed metal siding; polystyrene insulation (R12); 1" insulated glass in aluminum frames.	*Moderately Comparable*
Interior Wall Constr	8" concrete block partitions painted.	8" concrete block partitions painted.	*Comparable*
	5/8" GWB w/ 3 5/8" metal studs in office areas.	5/8" GWB w/ 3 5/8" metal studs in office areas.	
Finishes	Carpeting and resilient tile, paint, and acoustical ceiling tile in office areas.	Carpeting and resilient tile, paint, and acoustical ceiling tile in office areas.	*Comparable*
	Sealed concrete floor in warehouse areas.	Sealed concrete floor in warehouse areas.	
Roof System	EPDM roof system w/ 3/4" Perlite and 3" polystyrene bead board (R18).	EPDM roof system w/ 3/4" Perlite and 1# density polystyrene bead board (R18).	*Comparable*
Mechanical System	Gas fired modular hot water boiler to AHU's (hot water and C-X coils) for office areas; gas fired unit heaters in receiving and dock areas; gas fired radiant heaters in stores area.	Variable-air-volume supply and return system; perimeter electric baseboard heating; electric wall heaters at entrances; electric-electronic DDC HVAC system controls.	*Not Comparable*
	(University central station steam and chilled water systems were not available for extension to this site)		
Electrical System	Interior lighting: high pressure sodium in all open double height ceiling areas; fluorescents in offices and low ceiling conditions.	Interior lighting: high pressure sodium in all open double height ceiling areas; fluorescents in offices and low ceiling conditions.	*Comparable*
	Other standard electrical systems.	Other standard electrical systems.	
Plumbing System	Standard	Standard	*Comparable*
3.5 Occupancy Patterns/ Characteristics	Current occupancy: 100 staff	Current occupancy: 80 staff	*Comparable*

COMPARISON: FACILITY DEVELOPMENT PROCESS

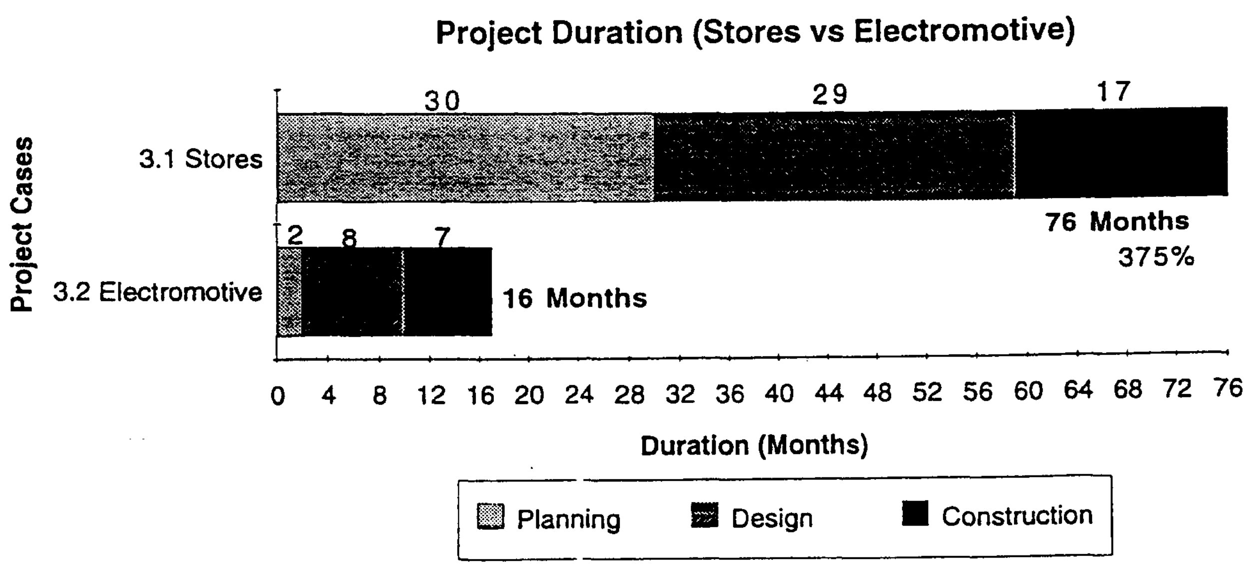
The following is a summary comparison of the major activities which took place during the Facility Development Process:

Facility Development Process	Stores/Extension Services Case Study #3-1 Date	Event	Electromotive Systems Case Study #3-2 Date	Event
2.1 Feasibility Planning	11/01/74	The UW Stores/Extension Services Building is included in authorized 1975-77 capital building program at $2.0 million for purchase of a facility	11/91	Electromotive made the decision to build a new centralized facility over leasing additional space
	6/26/75	Request for advanced planning funds approved for the Stores/Extension Services Building		
	8/23/77	The Building Commission approved a request by the UW System to release funding to study the feasibility of using the existing General Services Building.		
2.2 Definition of Scope	5/22/79	A request for funding was forwarded to the Building Commission for the preparation of a Concept & Budget report.	1/92	Eppstein conducted extensive interviewing, programming and design of the Electromotive Systems staff.
	12/5/80	The Regular Board adopted the resolution to secure appraisals and an option for the purchase of a parcel of improved land on North Murray Street.		
	11/3/81	The Building Commission approved the release of additional funding for A/E services.		
	2/82	Concept & Budget Report completed and submitted for approval. UW-Systems Administration subsequently withdrew the request for approval.		
	11/23/82	A revised Concept & Budget report resubmitted and approved. Explanations for the increase in project cost (changes in program scope from the intent of original funding) were accepted.		
2.3 Staff/ Consultant Selection	N/A	N/A	12/91	Eppstein Keller Uhen Architects were retained by Electromotive Systems, Inc. to prepare schematic design scope documents and a proposal package in order to receive proposals from qualified construction managers.
2.4 Design Development & Review	11/82	Request the release of additional funds for completion of design and authorization to complete bidding and construction		
2.5 Construction Documents & Estimates	4/83	Completion of construction documents.		

2.6 Bids & Contract Negotiations	12/21/83	Bid Opening: bids in excess of the available funds. DSFM and UW-Madisonpersonnel worked with A/E and Contractor toward the identification of acceptable negotiated revisions.	2/28/92	Request for Proposals were sent prospective contractors
	2/21/84	The Building Commission Request for an additional $162,000 was approved for a total project cost of $2,484,000.	6/25/92	Berghammer submits a proposal to construct the Electromotives 47,000GSF building for $1,598,375.
	4/5/84	Contract Awarded	7/7/92	Notice of Award to Berghammer to be construction manager charged with managing all sub-contracts in a design/build process.
			7/14/92	Award of Contract
2.7 Construction & Project Management	4/84	Start of Construction	8/25/92	BuildingPermit
	9/85	Substantial Completion	3/15/93	Substantial Completion
2.8 Occupancy & Facility Management			3/18/93	Occupancy permit issued
	9/85	Occupancy	9/8/93	Project Close-out
	6/10/88	Project Close-out		

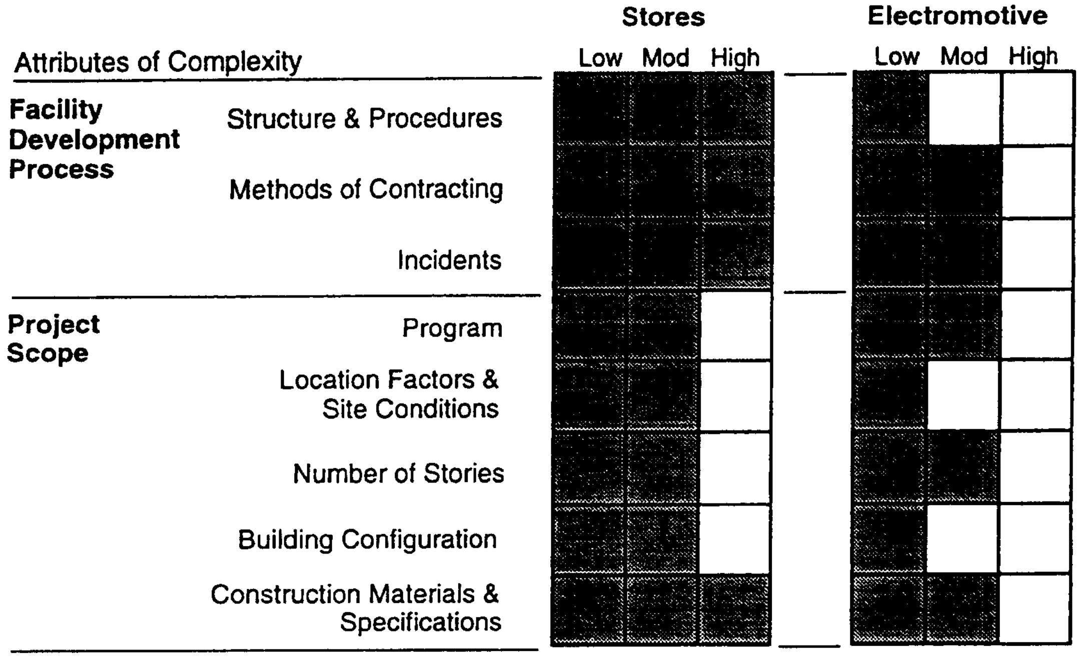
COMPARISON: FACILITY DEVELOPMENT PROCESS

The following is a comparison of the duration of planning, design and construction activities that took place during the Facility Development Process:



COMPARISON: FACILITY DEVELOPMENT COMPLEXITY PROFILE

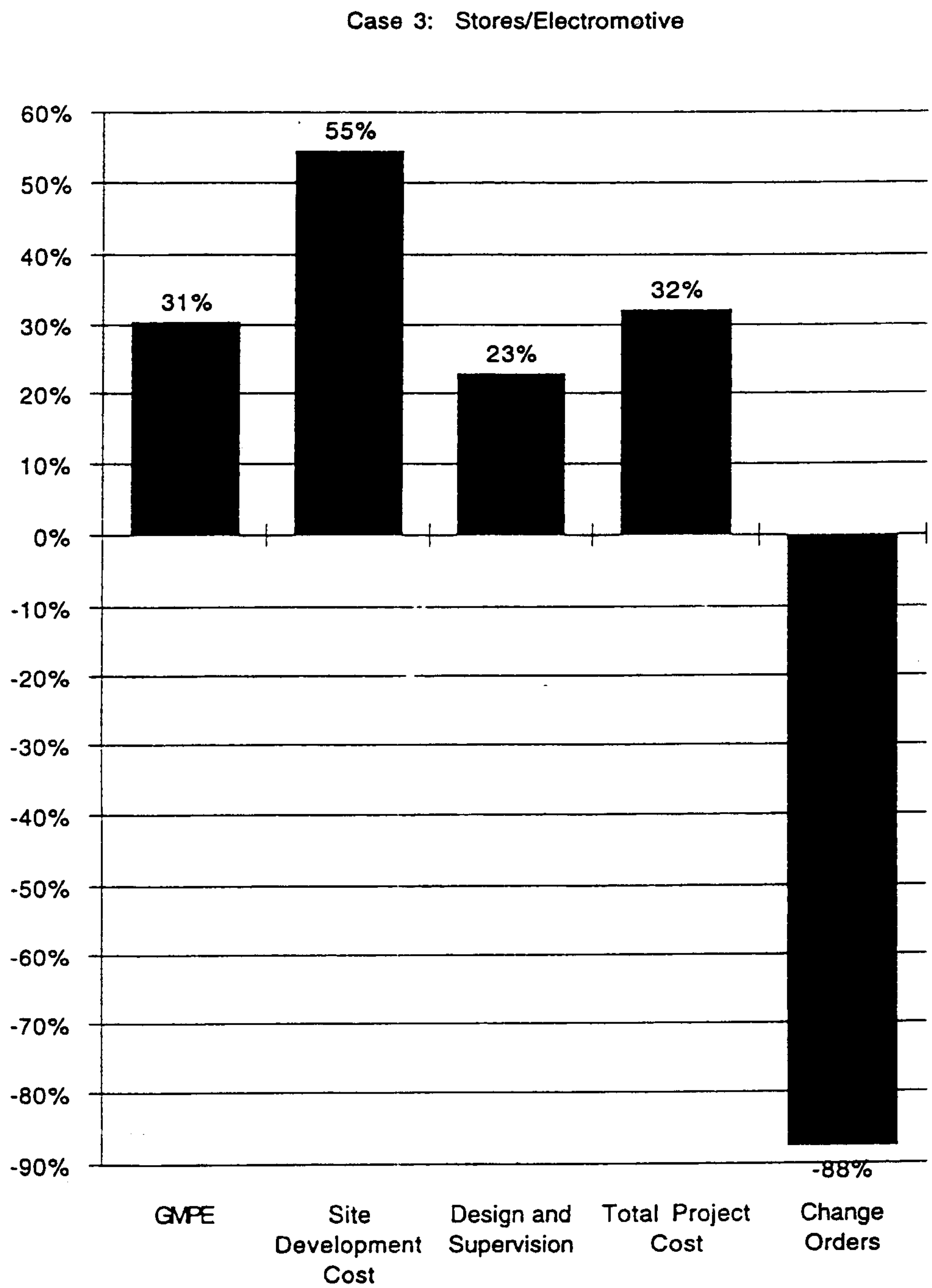
Profile Comparison: Stores/Electromotive



Attributes of Complexity	Stores	Electromotive
Structure & Procedures	The Stores project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD and the Stores and University Extension agencies.	Electromotive followed procedures implicitly and were negotiated according to the circumstances and context of the relationship with a developer. There were few levels of decision-making. Major budgetary, project scope, and design decisions were made by a single owner representative.
Methods of Contracting	The method of contracting followed for the Stores project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process (although the bidding process was less conventional being conducted in three phases).	The method of contracting followed for the Electromotive project was partially design/build: An A/E was hired as a design consultant, and a contractor/developer was selected early in the planning and design process who was responsible for delivering the total project on a turn-key basis.
Incidents	During the Stores project there were several significant incidents that occurred as evidenced by documentation in the project records: redesign in concept and budget phases due to changes in siting of the facility from original location, bids were in excess of available funds and negotiated with contractors.	During the Electromotive project there were a few significant incidents that occurred as evidenced by documentation in the project records: substantial change orders were incurred due to a redesign during construction of a mezzanine flooring system and the introduction of A/C into the warehouse/manufacturing space.
Program	The Stores project program consisted of a balance of specialized and standardized requirements: warehousing and office space.	The Electromotive project program consisted of a balance of specialized and standardized requirements: warehousing and light manufacturing and office space.
Location Factors & Site Conditions	The Stores project was located on a restricted 1.22 acre urban infill site.	The Electromotive project experienced no major location factor or site condition problems.
Number of Stories	2 floors	2 floors
Building Configuration	The Stores building can be described as having somewhat variable floor plates.	The Electromotive building can be described as prizmatic (all floor plates identical)
Construction Materials & Specifications	The Stores building consists of high quality, institutional-grade construction materials and specifications.	The Electromotive building consists of medium quality, commercial-grade construction materials and specifications.

COMPARISON: FACILITY DEVELOPMENT COST PROFILE

The following summary chart identifies the percentage by which the public facility cost MORE or LESS than the private facility across the following five cost categories:

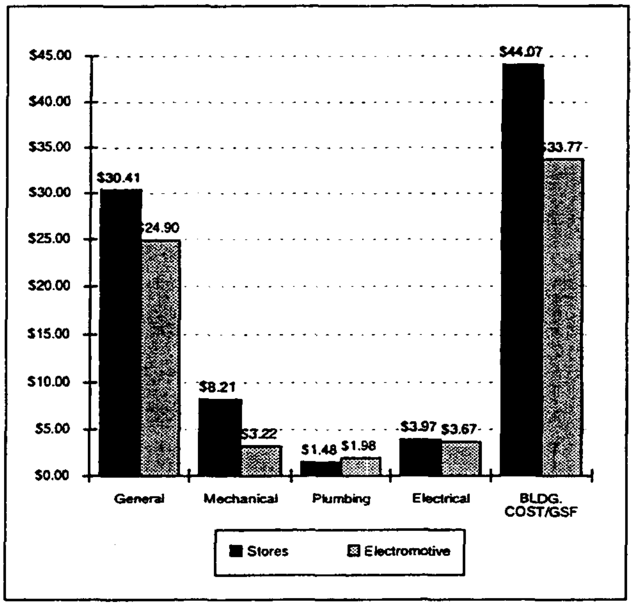


COMPARISON: BUILDING COST

	Stores*	Electromotive
Gross Square Feet	59,632	47,545
Year Constructed	1985	1993

BUILDING COST	Stores*	Electromotive
General	$1,813,315	$1,183,704
Mechanical	$489,357	$153,230
Plumbing	$88,501	$94,038
Electrical	$236,869	$174,441
Bldg. Cost Subtotal	**$2,628,042**	**$1,605,413**

BUILDING COST/GSF	Stores*	Electromotive	Difference In $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
General	$30.41	$24.90	$5.51	22% MORE than the Private Facility
Mechanical	$8.21	$3.22	$4.98	155% MORE than the Private Facility
Plumbing	$1.48	$1.98	($0.49)	(25%) LESS than the Private Facility
Electrical	$3.97	$3.67	$0.30	8% MORE than the Private Facility
Bldg. Cost/GSF Subtotal	**$44.07**	**$33.77**	**$10.30**	**31% MORE than the Private Facility**



BUILDING COST DISTRIBUTION	Stores*	Electromotive
General	69%	74%
Mechanical	19%	10%
Plumbing	3%	6%
Electrical	9%	11%
	100%	100%

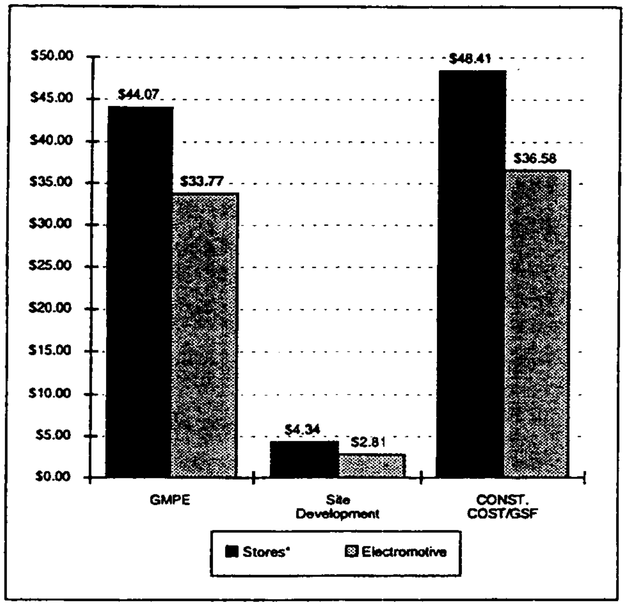
* *Adjusted to 1993 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: CONSTRUCTION COST

	Stores*	Electromotive
Gross Square Feet	59,632	47,545
Year Constructed	1985	1993

CONSTRUCTION COST	Stores*	Electromotive
GMPE	$2,628,042	$1,605,413
Site Development	$259,005	$133,610
Const. Cost Subtotal	**$2,887,047**	**$1,739,023**

CONSTRUCTION COST/GSF	Stores*	Electromotive	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$44.07	$33.77	$10.30	31% MORE than the Private Facility
Site Development	$4.34	$2.81	$1.53	55% MORE than the Private Facility
Const. Cost/GSF Subtotal	**$48.41**	**$36.58**	**$11.84**	**32% MORE than the Private Facility**



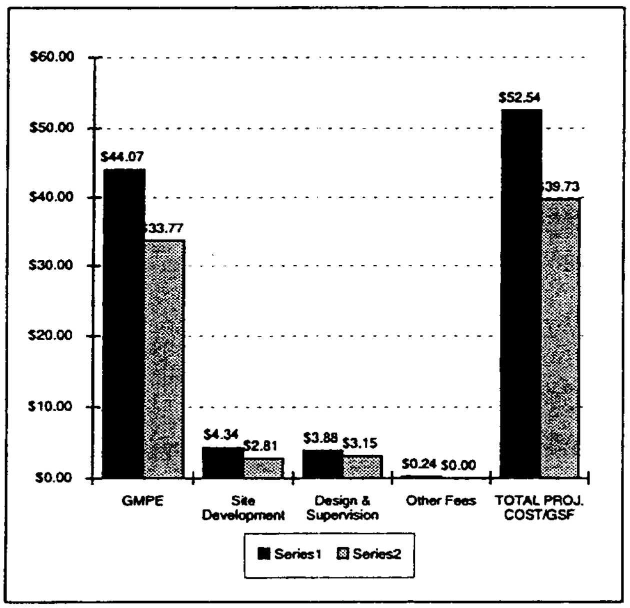
* *Adjusted to 1993 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: TOTAL PROJECT COST

	Stores*	Electromotive
Gross Square Feet	59,632	47,545
Year Constructed	1985	1993

TOTAL PROJECT COST	Stores*	Electromotive
GMPE	$2,628,042	$1,605,413
Site Development	$259,005	$133,610
Design & Supervision	$231,290	$150,000
Other Fees	$14,545	$0
Total Proj. Cost	$3,132,883	$1,889,023

TOTAL PROJECT COST/GSF	Stores*	Electromotive	Difference In $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$44.07	$33.77	$10.30	31% MORE than the Private Facility
Site Development	$4.34	$2.81	$1.53	55% MORE than the Private Facility
Design & Supervision	$3.88	$3.15	$0.72	23% MORE than the Private Facility
Other Fees	$0.24	$0.00	$0.24	MORE than the Private Facility
Total Proj. Cost/GSF Subtotal	$52.54	$39.73	$12.81	**32% MORE than the Private Facility**



DESIGN AND SUPERVISION FEE AS A PERCENTAGE OF CONSTRUCTION COST	Stores*	Electromotive
DFD (DSFM)	2.0%	
A/E	6.0%	8.6%
Total	8.0%	8.6%

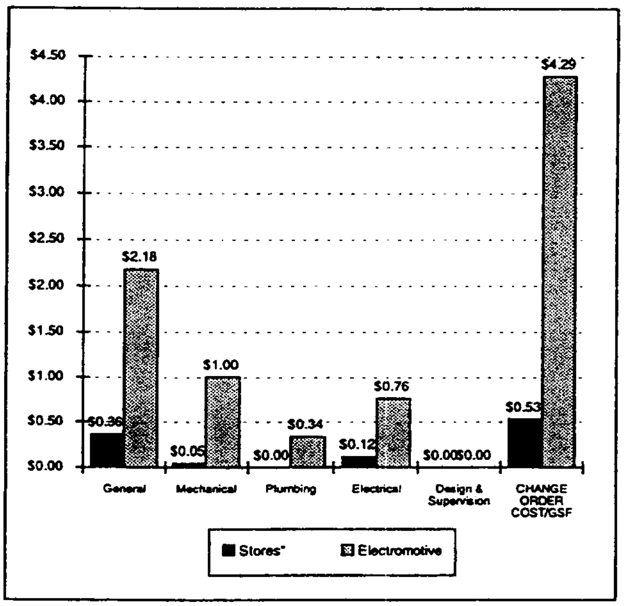
* *Adjusted to 1993 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: CHANGE ORDER COST

	Stores*	Electromotive
Gross Square Feet	59,632	47,545
Year Constructed	1985	1993

CHANGE ORDER COST	Stores*	Electromotive
General	$28,248	$103,738
Mechanical	$3,682	$47,737
Plumbing	$0	$15,992
Electrical	$9,294	$36,367
Design & Supervision	$0	$0
C.O. Cost Subtotal	**$41,223**	**$203,834**

CHANGE ORDER COST/GSF	Stores*	Electromotive	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
General	$0.36	$2.18	($1.82)	(83%) LESS than the Private Facility
Mechanical	$0.05	$1.00	($0.96)	(95%) LESS than the Private Facility
Plumbing	$0.00	$0.34	($0.34)	LESS than the Private Facility
Electrical	$0.12	$0.76	($0.65)	(84%) LESS than the Private Facility
Design & Supervision	$0.00	$0.00	$0.00	SAME as the Private Faci;ity
C.O. Cost Subtotal	**$0.53**	**$4.29**	**($3.76)**	**(88%) LESS than the Private Facility**



% OF TOTAL PROJECT COST	Stores*	Electromotive
General	0.9%	5.5%
Mechanical	0.1%	2.5%
Plumbing	0.0%	0.8%
Electrical	0.3%	1.9%
Design & Supervision	0.0%	0.0%
Total	**1.3%**	**10.8%**

* *Adjusted to 1993 construction costs in Milwaukee using Means Local Cost Indexes*

FINDINGS

The following table summarizes (a) project duration (for design and construction phases) and cost findings, and (b) categories of complexity that were identified as potential reasons for differences in project duration and cost. Filled cells (grey boxes) identify the potential factors that explain the findings on the left. [On the following page, an explanation for each factor identified in the table below is proposed.]

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences in the Case

Project Duration and Costs	Structure & Procedures +	Methods of Construct. +	Incidents +	Program	Location & Site +	No. of Stories	Bldg. Config +	Constr. Materials +
PROJECT DURATION Project duration (design and construction only) lasted 207% LONGER for Stores (46 months) than for Electromotive (15 months).	■	■	■		■		■	■
GENERAL COSTS General construction cost 22% MORE per gross sq. ft. for Stores ($30.41) than for Electromotive ($24.90).	■	■	■		■		■	■
MECHANICAL COSTS Mechanical construction cost 155% MORE per gross sq. ft. for Stores ($8.21) than for Electromotive ($3.22).	■							■
PLUMBING COSTS Plumbing construction cost 25% LESS per gross sq. ft. for Stores ($1.48) than for Electromotive ($1.98).							■	
ELECTRICAL COSTS Electrical construction cost 8% MORE per gross sq. ft. for Stores ($3.97) than for Electromotive ($3.67).								
SITE DEVELOPMENT COSTS Site development cost 55% MORE per gross sq. ft. for Stores ($4.34) than for Electromotive ($2.81).					■			
DESIGN & SUPERVISION Design and supervision services cost 23% MORE per gross sq. ft. for Stores ($3.88) than for Electromotive ($3.15) YET constitute a SMALLER percentage of construction cost for Stores (8%) than for Electromotive (8.6%).	■	■		■				
CHANGE ORDERS Change orders cost 88% LESS per gross sq. ft. for Stores ($0.53) than for Electromotive ($4.29) AND constitute a SMALLER percentage of total project cost for Stores (1.3%) than for Electromotive (10.8%).			■					

DISCUSSION

The following discussion elaborates on the factors identified in the previous table as contributing to differences in project duration and cost in this case study:

Structure & Procedures

The Stores organizational structure and facility development procedures involved a ***more complex*** *set of decision-making steps and layers than Electromotive.* The Stores project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD and the Stores and University Extension agencies. In constrast, Electromotive followed procedures implicitly and were negotiated according to the circumstances and context of the relationship with a developer. There were few levels of decision-making. Major budgetary, project scope, and design decisions were made by a single owner representative. These differences in structure and process are identified as possible reasons for greater project duration, general, mechanical costs, as well as design supervision service costs.

Methods of Contracting

The method of contracting adopted for the Stores project created ***more complex*** *inter-organizational relationships than the Electromotive project.* The method of contracting followed for the Stores project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process. While. the method of contracting followed for the Electromotive project was partially design/build: An A/E was hired as a design consultant, and a contractor/developer was selected early in the planning and design process who was responsible for delivering the total project on a turn-key basis. This difference in the method of contracting are identified as possible reasons for greater project duration, general costs, as well as design supervision service costs.

Incidents

The Stores project had ***more*** *significant incidents than Electromotive that complicated the process.* During the Stores project there were several significant incidents that occurred: redesign in concept and budget phases due to changes in siting of the facility from original location, bids were in excess of available funds and negotiated with contractors. In contrast, during the Electromotive project there was only one significant incident that occurred: substantial change orders were incurred due to a redesign during construction of a mezzanine flooring system that involved the introduction of A/C into the warehouse/ manufacturing space. These differences in the number of incidents are identified as possible reasons for greater project duration, general costs,as well as, change order costs.

Location Factors & Site Conditions

The Stores encountered ***more complex*** *location factors and site conditions than Electromotive.* The Stores project was located on a restricted 1.22 acre urban infill site. While, the Electromotive project experienced no major location factor or site condition problems. These differences in location factors and site conditions are identified as possible reasons for greater project duration, general and site development costs.

Building Configuration

The Stores project's building configuration was ***more complex*** *than Electromotive's.* The Stores building can be described as having somewhat variable floor plates. In constract, the Electromotive building can be described as prizmatic (all floor plates identical). These differences in building configuration are identified as possible reasons for greater project duration, general and plumbing costs.

Construction Materials & Specifications

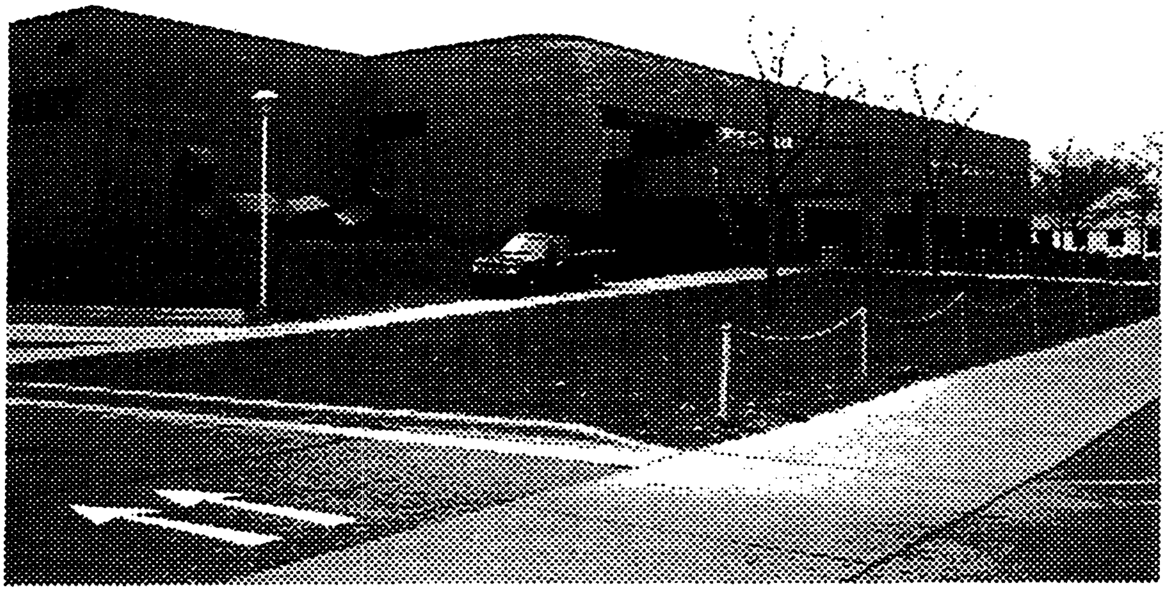
The Stores building consists of ***higher quality*** *construction materials and specifications than Electromotive.* The Stores building consists of high quality, institutional-grade construction materials and specifications. While, the Electromotive building consists of medium quality, commercial-grade construction materials and specifications. These differences in construction materials and specifications are identified as possible reasons for greater project duration, general and mechanical costs.

CASE 4: COMPARATIVE ANALYSIS

Public Sector Case Study #4-1:
Allied Health Building

Private Sector Case Study #4-2
Clark Hall College of Nursing Building

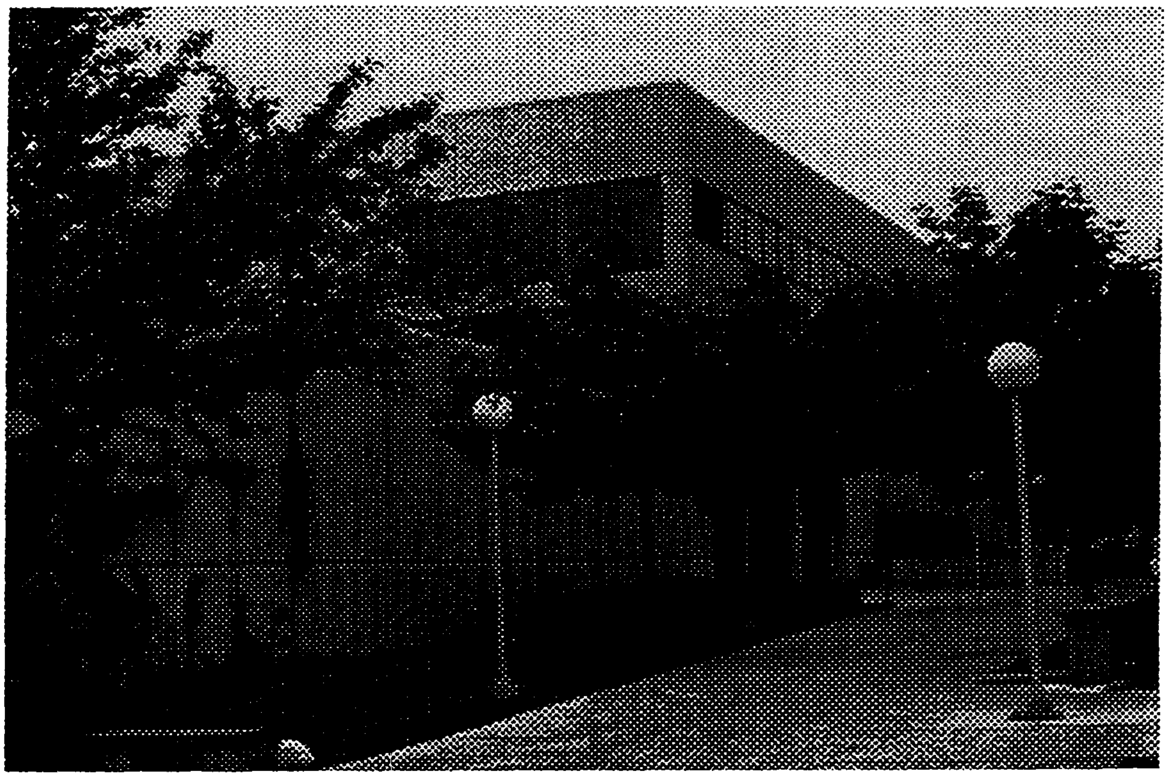
Public Sector Case Study #4-1
ALLIED HEALTH BUILDLING



Client	Client Agency: University of Wisconsin-Eau Claire The Unversity of Wisconsin-System Administration, and the State of Wisconsin, Department of Administration, Division of Facility Development, Madison, Wisconsin
Architect	The Hallbeck Group, Architects-Engineers, Inc., Eau Claire, WI
General Contractor	Market & Johnson Inc., Eau Claire, WI
Project Description	
Program	The program for this project called for providing for the construction of 47,360 ASF of instructional, research, and clinical-type facilities for the nine allied health programs at UW-Eau Claire. Overall, the building would provide classrooms, seminar rooms, offices, lounges, meeting rooms, conference rooms, research laboratory space, therapy rooms, music studios, and various support spaces.
Year Constructed	1982
Gross Square Footage	48,525 GSF
Project Costs*	
Building Cost	$2,949,849
Construction Cost	$3,088,299
Total Project Cost	$3,404,735

*Adjusted to 1982 construction costs in Milwaukee using Means location factors.

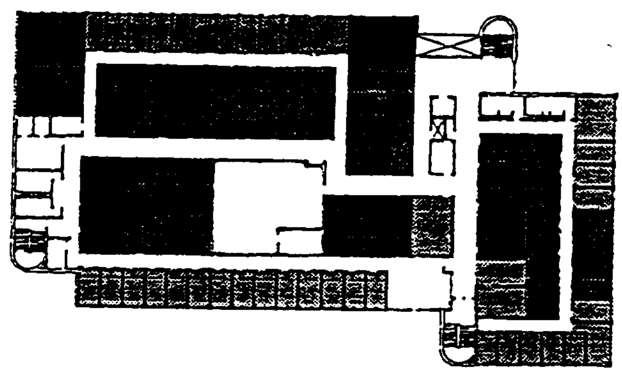
Private Sector Case Study #4-2
CLARK HALL COLLEGE OF NURSING



Client	College of Nursing, Marquette University, Milwaukee, WI.
Architect	Plunkett-Keymar-Reginato
General Contractor	Siesel, Inc.
Project Description	
Program	The program called for 43,000 square feet of research and work areas, classroom space (two 100-seat classrooms, and two 48-seat classrooms), a learning resource center, cursing lab with simulated patient areas, instructional media center lab, a demostration area, a 200 seat lecture hall, and faculty offices.
Year Constructed	1982
Gross Square Footage	44,860 GSF
Project Costs	
Building Cost	$2,583,743
Construction Cost	$2,768,418
Total Project Cost	$2,980,457

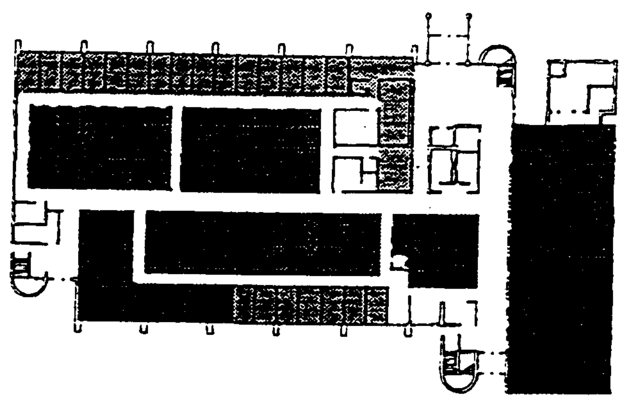
MATCHING: FUNCTIONAL PLAN

Allied Health Building
Case Study #4-1



Second Floor

Office:	5,360 GSF
Instructional:	9,572 GSF
Support:	9,843 GSF
Total:	24,775 GSF



Ground Floor

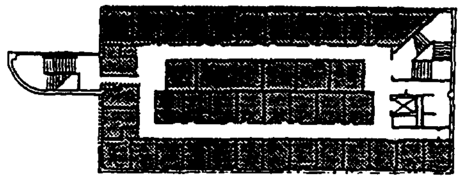
Office:	3,445 GSF
Instructional:	11,179 GSF
Support:	9,126 GSF
Total:	23,750 GSF
Grand Total	**48,525 GSF**

MATCHING: FUNCTIONAL PLAN

Clark Hall College of Nursing
Case Study #4-2

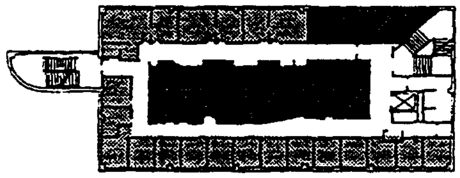
Third Floor

Office:	6,701 GSF
Instructional:	0 GSF
Support:	2,755 GSF
Total:	**9,456 GSF**



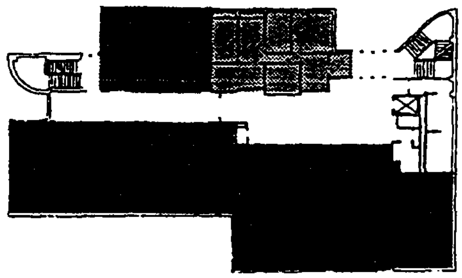
Second Floor

Office:	3,553 GSF
Instructional:	3,118 GSF
Support:	2,785 GSF
Total:	**9,456 GSF**



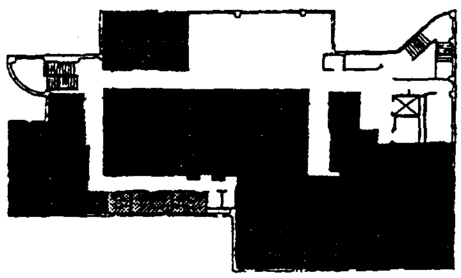
Ground Floor

Office:	1,290 GSF
Instructional:	8,299 GSF
Support:	3,385 GSF
Total:	**12,974 GSF**



Basement

Office:	333 GSF
Instructional:	8,558 GSF
Support:	4,083 GSF
Total:	**12,974 GSF**



Grand Total 44,860 GSF

MATCHING: ORGANIZATIONAL CONTEXT

The organizational context matched along three specific areas: organizational struction, experience and function. The following table summarizes the matching criteria for organizational context:

Organizational Context Match Criteria	**Allied Health Case Study #4-1**	**Clark Hall Case Study #4-2**	***Remarks***
Structure	Public university Size: 9,900	Private university Size: 15,000	***Moderately Comparable:*** *Similar organizational structures, but UW-Eau Claire part of a larger system of universities around the state.*
Experience	UW-Eau Claire has experienced moderate development over the past 15 years. The primary development experience for this project can be accounted for by the UW-System Administration and the DFD.	The Marquette campus consists of 52 buildings, with a half-dozen being constructed in the last 15 years. The Department of Physical Environment has overseen a variety of design/build and conventional construction projects.	***Comparable:*** *The development experience of both campus' are comparable.*
Function	UW-Eau Claire functions as a public university providing a wide range of undergraduate and graduate degrees in liberal arts, and the sciences.	Marquette University functions as a private university providing a wide range of undergraduate and graduate degrees in liberal arts, and the sciences.	***Comparable:*** *Both universities provide a similar function.*

MATCHING: PROJECT SCOPE

The project scope was matched according to several criteria: building program, construction materials and building systems. The following table summarizes the matching criteria:

Project Scope Match Criteria	Allied Health Case Study #4-1	Clark Hall Case Study #4-2	Remarks
3.1 Program Scope			
Office			*Comparable*
Instruction	8,805 18%	11,887 26%	
Support	20,751 43%	19,975 45%	
Total	18,969 39% 48,525	13,008 29% 44,860	
3.2 Locational Factors/Site Conditions	The building was sited on the north bank of a river in a small town. Ample area was available for parking and siting the building.	The building was limited to a narrow and deep urban infill lot between existing campus buildings. Site had unstable soil conditions.	*Not Comparable*
3.3 Size/ Form/ Configuration	A two-story simple retalinear building with two parallel interior corridors,	A narrow double loaded corridor three-story retalinear building with a basement	*Moderately Comparable*
3.4 Constr Mat'ls & Bldg Systems			
Foundation	12" concrete foundation walls	Caisson foundations	*Not Comparable*
Structural System	Reinforced concrete frame structure; one-way concrete floor slabs, beams and joists.	Reinforced concrete frame structure; one-way concrete floor slabs, beams and joists.	*Comparable*
Exterior Wall System	4" brick with 8" block back-up with 2" rigid insulation and 1" insulated operable glass window units in aluminum frames.	6" pre-cast concrete panels w/ 2" polyurethane insulation cast into core of panels; 1" insulated glass.	*Not Comparable*
Interior Wall Constr	4" concrete block partitions.	5/8" GWB w/ 3 5/8" metal studs	*Not Comparable*
Finishes	Resilient floor tile throughout, paint, suspended acoustical ceiling tile.	Carpeting and resilient floor tile, paint and vinyl wall covering, suspended acoustical ceiling tile.	*Comparable*
Roof System	Rubber membrane roof w/ rigid insulation.	Three-ply organic felts and asphalt on concrete deck; 2" styrofoam insulation over roof membrane and 1" top size gravel over insulation.	*Not Comparable*
Mechanical System	High pressure steam from campus central heating plant; Central AHU; convector to generate hot water for reheat coils, radiation and unit heaters; VAV system AC.	Low pressure steam extended from existing steamline central air handling system; chilled water extended from adjacent central chiller plant to central AHU; VAV system AC.; hot water perimeter radiation from a converter and auxilliary heat.	*Comparable*
Electrical System	Standard	Standard	*Comparable*
Plumbing System	Standard Sprinkler system throughout building.	Standard	*Comparable*
3.5 Occupancy Patterns/ Characteristics	Current occupancy: 1,200 full- and part-time students and staff (visitors not included).	Current occupancy: 850 full- and part-time students and staff (continuing education students not included).	*Comparable*

FACILITY DEVELOPMENT PROCESS COMPARISONS

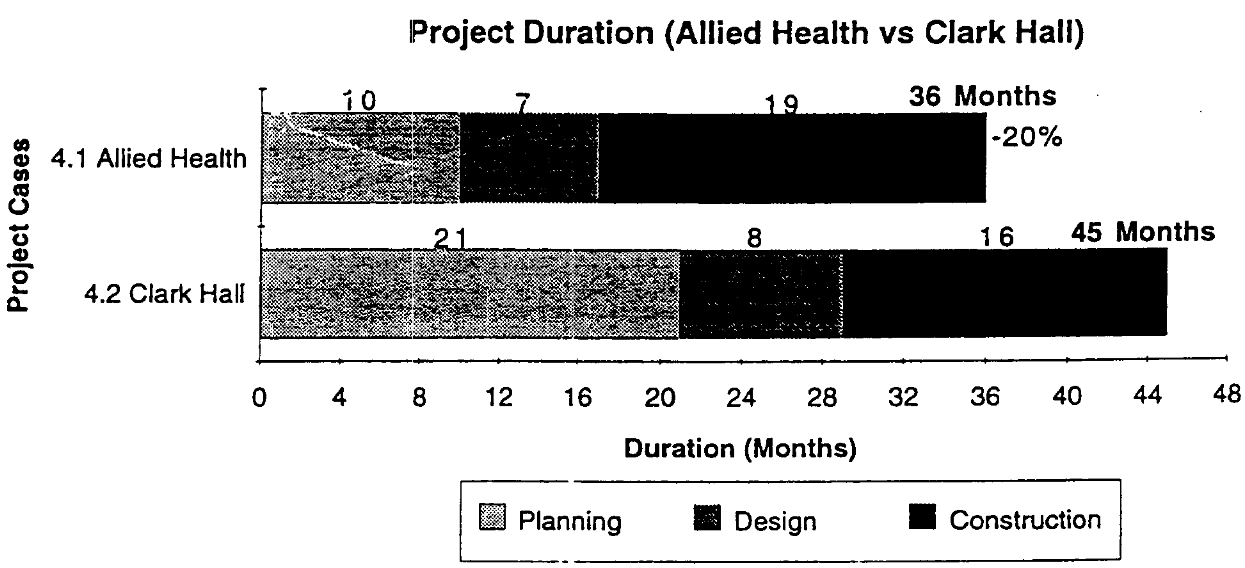
The following is a summary comparison of the major activities which took place during the Facility Development Process:

Facility Development Process	Allied Health Case Study #4-1 Date	Event	Clark Hall Case Study #4-2 Date	Event
2.1 Feasibility Planning	3/20/79	Request to Building Commission	7/1/75	School of Nursing indicates in memo school's space needs.
	8/79	Approval of projects deferred until a resolution of a $6 million cut in the UW Building Program.	9/22/78	A Physical Facilities Requirements Report completed detailing needed administrative, clerical and staff office space, continuing education nursing areas, and nursing skills lab areas.
	9/25/79	Request for the release of funds for the preparation of preliminary plans and Concept & Budget approved by the Building Commission	10/24/78	Feasibility Study: Architects III: Schunett-Erdmann Associates prepared a preliminary draft of an alternatives study for the College of Nursing.
			6/79	The planning committee was appointed to study alternative solutions.
			2/13/80	The planning committee completes a feasibility report.
			3/5/80	The 10-member building committee was formed to consider two site options recommended by the planning committee.
			4/24/80	Site location selected and approved.
2.2 Definition of Scope	7/80	Concept & Budget Report submitted & approved	7/31/80	Stage I: concept design initiated.
	7/80	Request the release of additional funds to complete design, and authorization to complete bidding and construction.	9/10/80	Stage I concept design approved by the building committee and the president.
2.3 Staff/ Consultant Selection				
2.4 Design Development & Review			9/22/80	Stage II: preliminary drawings initiated.
			11/6/80	Stage II preliminary drawings approved by the building committee and the president.
2.5 Construction Documents & Estimates	11/80	Completion of construction documents	12/17/80	Board of Trustees authorized the obtaining of bids
			1/23/81	Stage III: final construction documents initiated.
			1/30/81	Stage III construction documents approved by the building committee and the president.

2.6 Bids & Contract Negotiations	12/80	Bid opening	2/24/81	Bid opening
	1/6/81	Award of contract		Award of contract
2.7 Construction & Project Management	2/81	Start of construction	3/24/81	Start of construction
			4/1/81	Ground breaking
	8/82	Substantial completion	6/15/82	Substantial completion
2.8 Occupancy & Facility Management	9/82	Occupancy	7/82	Occupancy

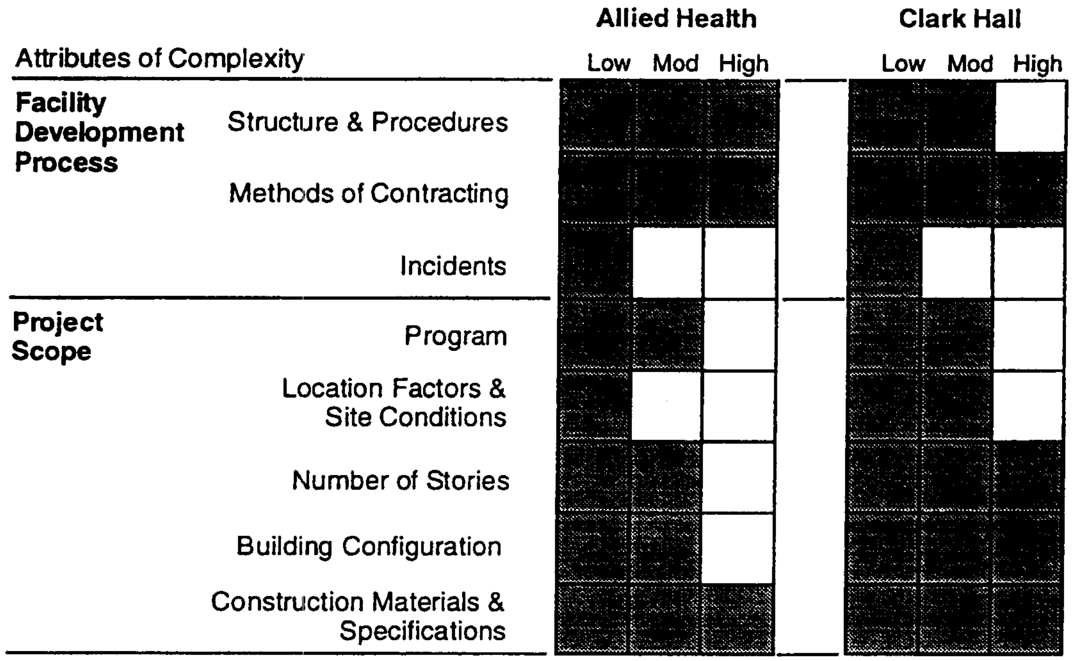
FACILITY DEVELOPMENT PROCESS COMPARISONS

The following is a comparison of the duration of planning, design and construction activities that took place during the Facility Development Process:



PROJECT PROFILE ANALYSIS

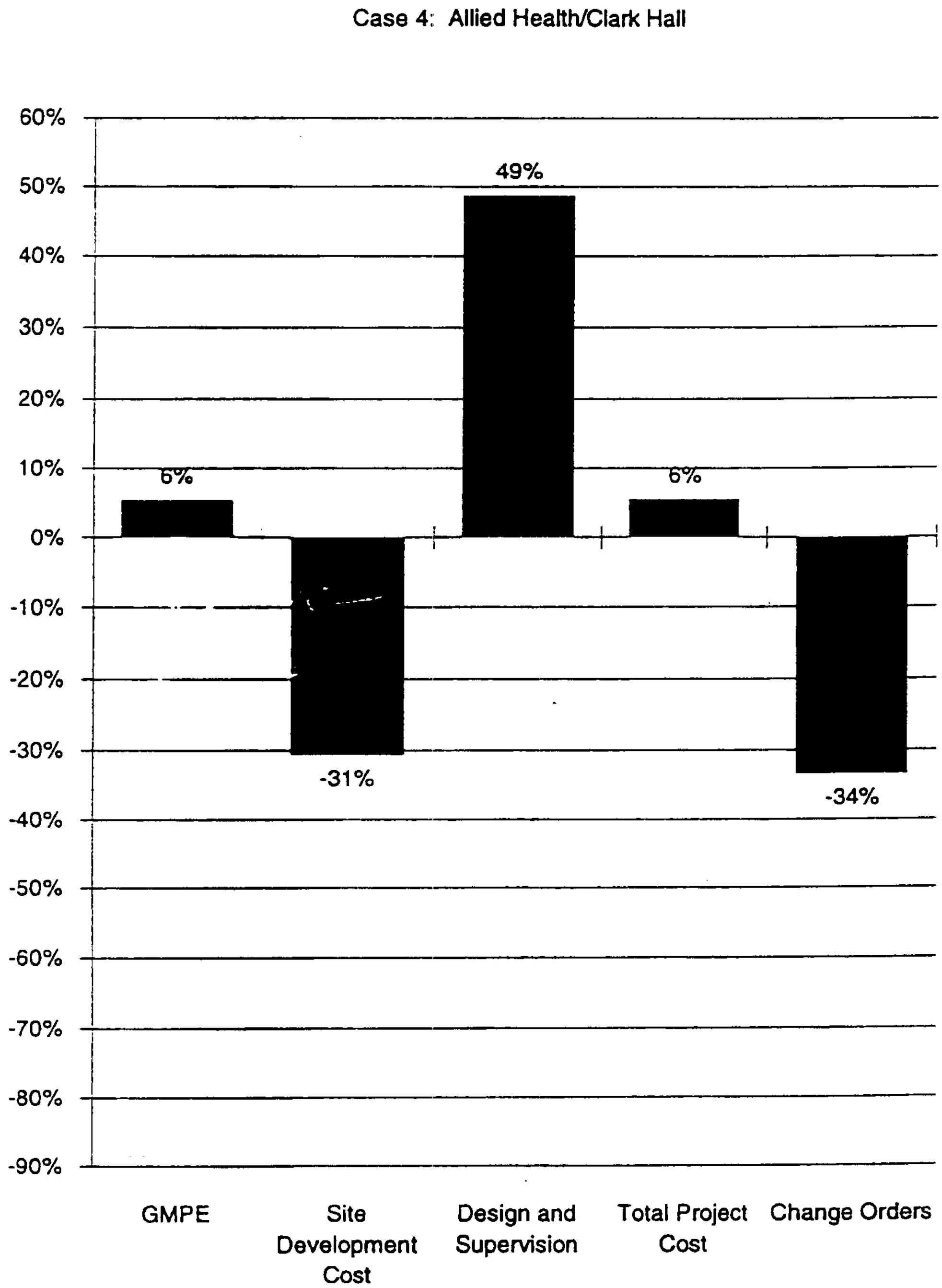
Profile Comparison: Allied Health/Clark Hall



Attributes of Complexity	Allied Health	Remarks
Structure & Procedures	The Allied Health project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD UW-System Administration, and the UW-Eau Claire campus.	The Clark Hall project explicitly followed the established university Business Office Planning Procedure. There were several levels of decision-making within the private university. Major budgetary, project scope, and design decisions were made by a building committee.
Methods of Contracting	The method of contracting followed for the Allied Health project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process.	The method of contracting followed for the Clark Hall project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process.
Incidents	During the Allied Health project there were no significant incidents that occurred as evidenced by documentation in the project records.	During Clark Hall project there were no significant incidents that occurred as evidenced by documentation in the project records.
Program	The Allied Health project program consisted of a balance of specialized and standardized requirements: classrooms, faculty offices and dry lab functions.	The Clark Hall project program consisted of a balance of specialized and standardized requirements: classrooms, faculty offices and dry lab functions.
Location Factors & Site Conditions	The Allied Health project experienced no major location factor or site condition problems.	The Clark Hall project was located on a highly restricted urban campus infill site.
Number of Stories	2 floors	3 floors + 1 basement
Building Configuration	The Allied Health building can be described as having somewhat variable floor plates.	The Clark Hall building can be described as having highly variable floor plates.
Construction Materials & Specifications	The Allied Health building consists of high quality, institutional-grade construction materials and specifications.	The Clark Hall building consists of high quality, institutional-grade construction materials and specifications.

COMPARISON: FACILITY DEVELOPMENT COST PROFILE

The following summary chart identifies the percentage by which the public facility cost MORE or LESS than the private facility across the following five cost categories:

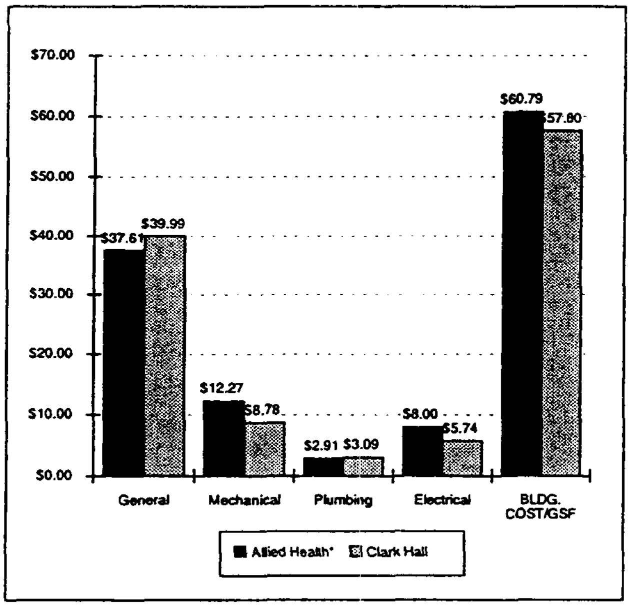


COMPARISON: BUILDING COST

	Allied Health*	Clark Hall
Gross Square Feet	48,525	44,860
Year Constructed	1982	1982

BUILDING COST	Allied Health*	Clark Hall
General	$1,825,105	$1,793,803
Mechanical	$595,422	$393,972
Plumbing	$141,351	$138,458
Electrical	$387,972	$257,510
Bldg. Cost Subtotal	**$2,949,849**	**$2,583,743**

BUILDING COST/GSF	Allied Health*	Clark Hall	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
General	$37.61	$39.99	($2.38)	(6%) LESS than the Private Facility
Mechanical	$12.27	$8.78	$3.49	40% MORE than the Private Facility
Plumbing	$2.91	$3.09	($0.17)	(6%) LESS than the Private Facility
Electrical	$8.00	$5.74	$2.26	39% MORE than the Private Facility
Bldg. Cost/GSF Subtotal	**$60.79**	**$57.60**	**$3.19**	**6% MORE than the Private Facility**



BUILDING COST DISTRIBUTION	Allied Health*	Clark Hall
General	62%	69%
Mechanical	20%	15%
Plumbing	5%	5%
Electrical	13%	10%
	100%	100%

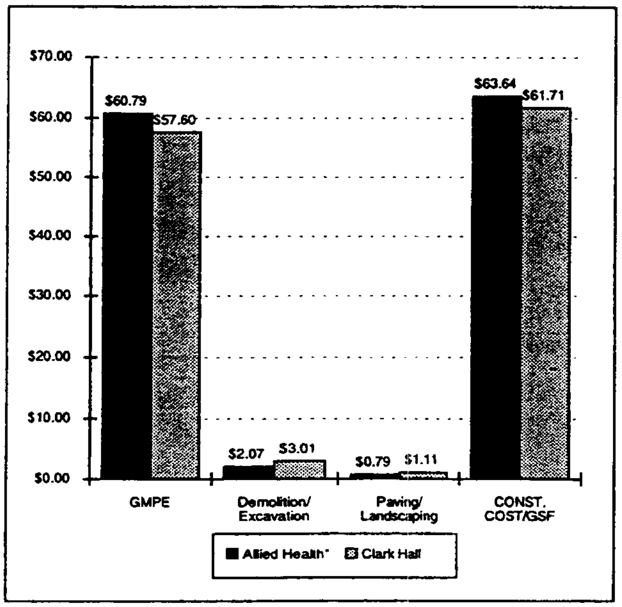
* *Adjusted to 1982 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: CONSTRUCTION COST

	Allied Health*	Clark Hall
Gross Square Feet	48,525	44,860
Year Constructed	1982	1982

CONSTRUCTION COST	Allied Health*	Clark Hall
GMPE	$2,949,849	$2,583,743
Demolition/Excavation	$100,271	$135,000
Paving/Landscaping	$38,179	$49,675
Const. Cost Subtotal	**$3,088,299**	**$2,768,418**

CONSTRUCTION COST/GSF	Allied Health*	Clark Hall	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$60.79	$57.60	$3.19	6% MORE than the Private Facility
Demolition/Excavation	$2.07	$3.01	($0.94)	(31%) LESS than the Private Facility
Paving/Landscaping	$0.79	$1.11	($0.32)	(29%) LESS than the Private Facility
Const. Cost/GSF Subtotal	**$63.64**	**$61.71**	**$1.93**	**3% MORE than the Private Facility**



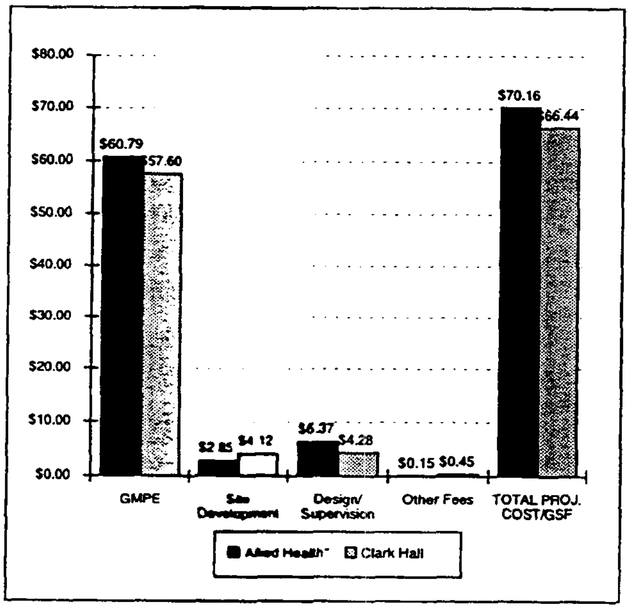
* *Adjusted to 1982 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: TOTAL PROJECT COST

	Allied Health*	Clark Hall
Gross Square Feet	48,525	44,860
Year Constructed	1982	1982

TOTAL PROJECT COST	Allied Health*	Clark Hall
GMPE	$2,949,849	$2,583,743
Site Development	$138,450	$184,675
Design/Supervision	$309,082	$192,039
Other Fees	$7,354	$20,000
Total Proj. Cost	$3,404,735	$2,980,457

TOTAL PROJECT COST/GSF	Allied Health*	Clark Hall	Difference In $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$60.79	$57.60	$3.19	6% MORE than the Private Facility
Site Development	$2.85	$4.12	($1.26)	(31%) LESS than the Private Facility
Design/Supervision	$6.37	$4.28	$2.09	49% MORE than the Private Facility
Other Fees	$0.15	$0.45	($0.29)	(66%) LESS than the Private Facility
Total Proj. Cost/GSF Subtotal	$70.16	$66.44	$3.73	**6% MORE than the Private Facility**



DESIGN AND SUPERVISION FEE AS A PERCENTAGE OF CONSTRUCTION COST	Allied Health*	Clark Hall
DFD	2.3%	
A/E	7.7%	6.9%
Total	**10.0%**	**6.9%**

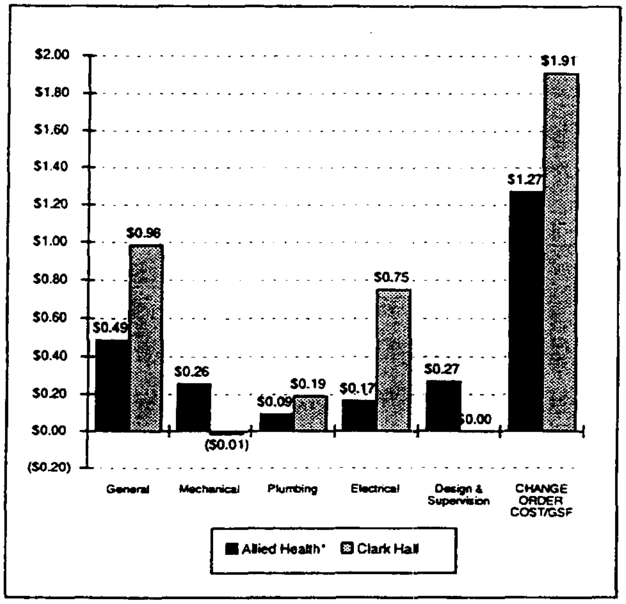
* *Adjusted to 1982 construction costs in Milwaukee using Means Local Cost Indexes*

COMPARISON: CHANGE ORDER COST

	Allied Health*	Clark Hall
Gross Square Feet	48,525	44,860
Year Constructed	1982	1982

CHANGE ORDER COST	Allied Health*	Clark Hall
General	$24,258	$44,132
Mechanical	$12,797	($628)
Plumbing	$4,700	$8,558
Electrical	$8,274	$33,610
Design & Supervision	$13,434	$0
C.O. Cost Subtotal	**$63,462**	**$85,672**

CHANGE ORDER COST/GSF	Allied Health*	Clark Hall	Difference In $/GSF	***By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?***
General	$0.49	$0.98	($0.50)	(51%) LESS than the Private Facility
Mechanical	$0.26	($0.01)	$0.27	MORE than the Private Facility
Plumbing	$0.09	$0.19	($0.10)	(51%) LESS than the Private Facility
Electrical	$0.17	$0.75	($0.58)	(78%) LESS than the Private Facility
Design & Supervision	$0.27	$0.00	$0.27	MORE than the Private Facility
C.O. Cost Subtotal	**$1.27**	**$1.91**	**($0.64)**	**(34%) LESS than the Private Facility**



% OF TOTAL PROJECT COST	Allied Health*	Clark Hall
General	0.7%	1.5%
Mechanical	0.4%	0.0%
Plumbing	0.1%	0.3%
Electrical	0.2%	1.1%
Design & Supervision	0.4%	0.0%
Total	1.9%	2.9%

* *Adjusted to 1982 construction costs in Milwaukee using Means Local Cost Indexes*

FINDINGS

The following table summarizes (a) project duration (for design and construction phases) and cost findings, and (b) categories of complexity that were identified as potential reasons for differences in project duration and cost. Filled cells (grey boxes) identify the potential factors that explain the findings on the left. [On the following page, an explanation for each factor identified in the table below is proposed.]

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences in the Case

Project Duration and Costs	Structure & Procedure (+)	Methods of Construct.	Incidents	Program	Location & Site (-)	No. of Stories (-)	Bldg. Config. (-)	Constr. Materials
PROJECT DURATION Project duration (design and construction only) lasted 8% LONGER for Allied Health (26 months) than for Clark Hall (24 months).								
GENERAL COSTS General construction cost 6% LESS per gross sq. ft. for Allied Health ($37.61) than for Clark Hall ($39.99).					■	■	■	
MECHANICAL COSTS Mechanical construction cost 40% MORE per gross sq. ft. for Allied Health ($12.27) than for Clark Hall ($8.78).							■	
PLUMBING COSTS Plumbing construction cost 6% LESS per gross sq. ft. for Allied Health ($2.91) than for Clark Hall ($3.09).								
ELECTRICAL COSTS Electrical construction cost 39% MORE per gross sq. ft. for Allied Health ($8.00) than for Clark Hall ($5.74).	■							
SITE DEVELOPMENT COSTS Site development cost 31% LESS per gross sq. ft. for Allied Health ($2.85) than for Clark Hall ($4.12).					■			
DESIGN & SUPERVISION Design and supervision services cost 49% MORE per gross sq. ft. for Allied Health ($6.37) than for Clark Hall ($4.28) AND constitute a GREATER percentage of construction cost for Allied Health(10%) than for Clark Hall (6.9%).	■							
CHANGE ORDERS Change orders cost 34% LESS per gross sq. ft. for Allied Health ($1.27) than for Clark Hall ($1.91) AND constitute a SMALLER percentage of total project cost for Allied Health (1.9%) than for Clark Hall (2.9%).					■	■	■	

DISCUSSION

The following discussion elaborates on the factors identified in the previous table as contributing to differences in project duration and cost in this case study:

Structure & Procedures

*The Allied Health project organizational structure and facility development procedures involved a **moderately more complex** set of decision-making steps and layers than Clark Hall.*

The Allied Health project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD UW-System Administration, and the UW-Eau Claire campus. In contrast, the Clark Hall project explicitly followed the established university Business Office Planning Procedure. There were several levels of decision-making within the private university. Major budgetary, project scope, and design decisions were made by a building committee. Differences in structure and procedures are identified as possible reasons for differences in cost in design supervision services.

Location Factors & Site Conditions

*The Allied Health project encountered **less** location factors and site conditions than Clark Hall.*

The Allied Health project experienced no major location factor or site condition problems. While, the Clark Hall project was located on a highly restricted urban campus infill site. These differences in location factors and site conditions are identified as possible reasons for differences in general and site development costs.

Number of Stories

*The Allied Health building consists of **less** stories than Clark Hall.*

The Allied Health building consists of two floors, while Clark Hall consists of three floors including an additional basement level. This difference in the number of stories of the building projects are identified as possible reasons for differences in general costs.

Building Configuration

*The Allied Health project's building configuration **less complex** than Clark Hall's.*

The Allied Health building can be described as having somewhat variable floor plates. The Clark Hall building can be described as having highly variable floor plates. These differences in building configuration are identified as possible reasons for differences in general, mechanical, and electrical costs.

CASE 5: COMPARATIVE ANALYSIS

Public Sector Case Study #5-1:
McPhee Physical Education Center Addition

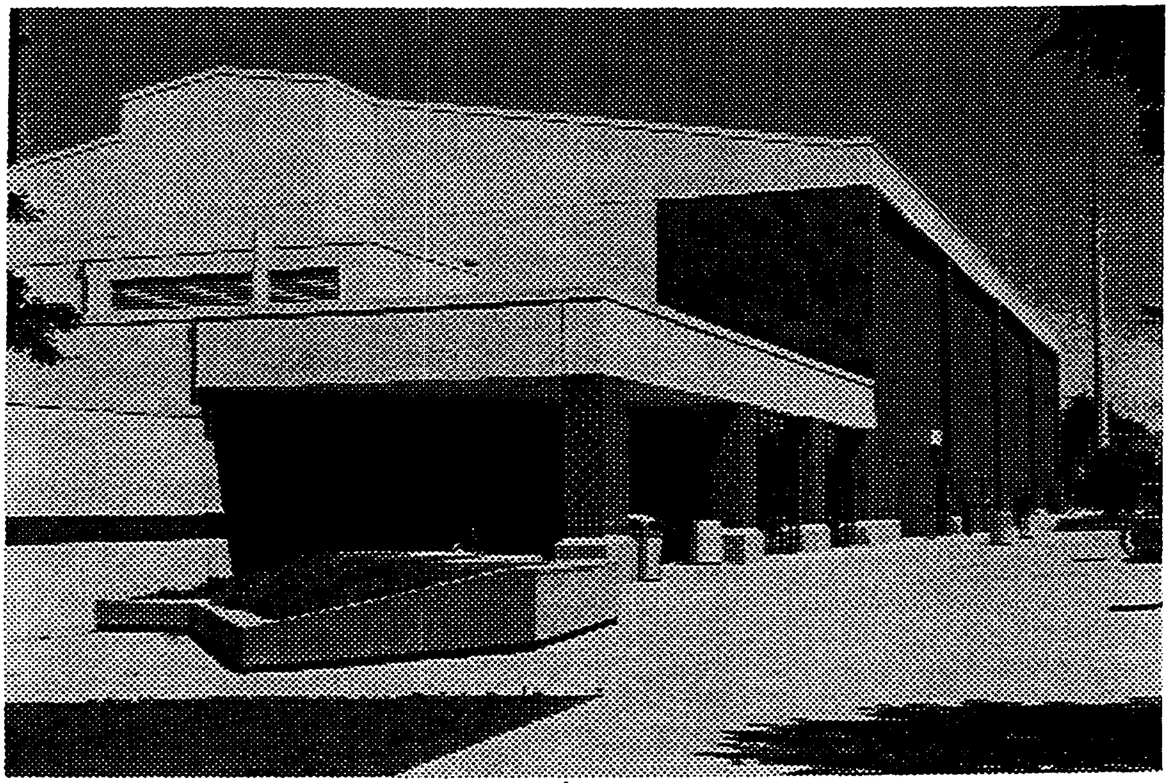
Private Sector Case Study #5-2
Beloit College Sports Center Addition

Public Sector Case Study #5-1
McPHEE PHYSICAL EDUCATION CENTER ADDITION

Client	Agency Client: University of Wisconsin-Eau Claire The Unversity of Wisconsin-System Administration and the State of Wisconsin, Department of Administration, Division of Facility Development, Madison, Wisconsin
Architect	Seymour Davis Seymour, A.E., Inc. Eau Claire, WI
General Contractor	Boldt Construction
Project Description	
Program	The program called additional space for: a gymnasium, one classroom, eight handball courts, diving well, weight room, training room, locker rooms and dressing areas, storage room, a mezzanine track, and eight faculty offices. A two-story facility would be constructed on the site adjacent to the existing McPhee physical education building and connected minimally with a glass corridor link at the gymnasium ground floor level.
Year Constructed	1987
Gross Square Footage	79,500 GSF
Project Costs*	
Building Cost	$4,070,371
Construction Cost	$4,329,383
Total Project Cost	$4,783,183

*Adjusted to 1987 construction costs in Beloit using Means location factors.

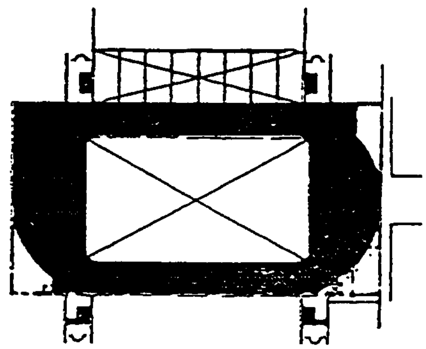
Private Sector Case Study #5-2
BELOIT COLLEGE SPORTS CENTER ADDITION



Client	Beliot College, Beliot, WI.
Architect	Potter Lawson & Pawlowsky, Inc., Madison, WI.
General Contractor	J.P. Cullen & Sons, Inc., Janesville, WI.
Project Description	
Program	The program called for new construction and renovation of the existing field house. New construction includes a gymnasium with seating capacity for 2,250, a fitness center, 3 racquetball courts, locker rooms, dance studio and faculty offices. Beloit's existing field house (an improvised WWII surplus airplane hangar constructed in 1947) was renovated for use as an indoor recreational space along with an existing six-lane swimming pool.
Year Constructed	1987
Gross Square Footage	50,700 GSF
Project Costs	
Building Cost	$3,205,561
Construction Cost	$3,764,438
Total Project Cost	$3,989,968

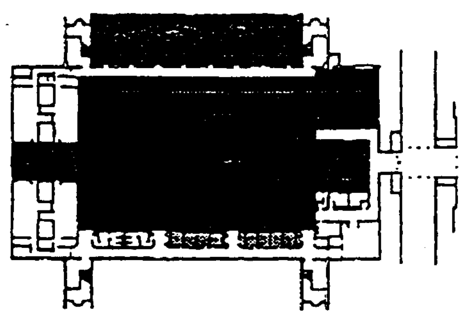
MATCHING: FUNCTIONAL PLAN

McPhee Physical Education Center Addition
Case Study #5-1



<u>Second Floor</u>

Office:	0 GSF
Instructional:	20,699 GSF
Support:	6,910 GSF
Total:	27,609 GSF



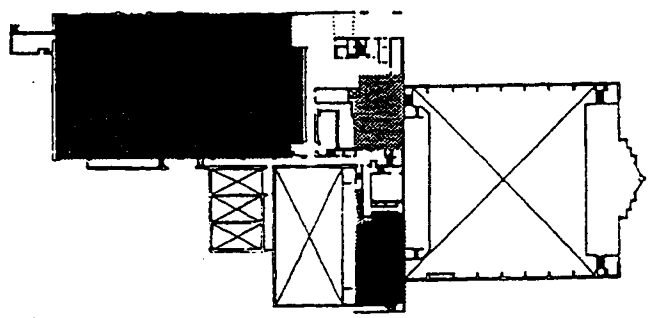
<u>Ground Floor</u>

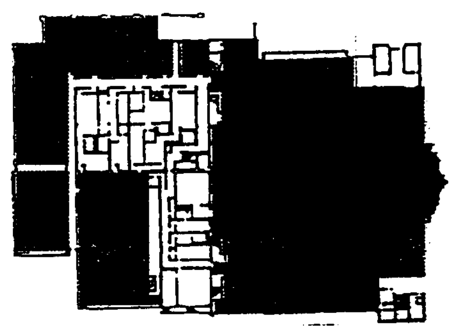
Office:	1,615 GSF
Instructional:	33, 274 GSF
Support:	17,002 GSF
Total:	51, 891 GSF

Grand Total 79,500 GSF

MATCHING: FUNCTIONAL PLAN

Beliot College Sports Center Addition
Case Study #5-2





Second Floor

	New	*Renovation*
Office:	2,700 GSF	0 GSF
Instructional:	0 GSF	26,580 GSF
Support:	15,345 GSF	0 GSF
Total:	18,045 GSF	26,580 GSF
		44,628 GSF

Ground Floor

	New	*Renovation*
Office:	0 GSF	0 GSF
Instructional:	25,400 GSF	20,100 GSF
Support:	7,255 GSF	13,834 GSF
Total:	**32,655 GSF**	**33,934 GSF**
		66,589 GSF
Grand Totals	**50,700 GSF**	**60,517 GSF**
		111,217 GSF

MATCHING: ORGANIZATIONAL CONTEXT

The organizational context matched along three specific areas: organizational struction, experience and function. The following table summarizes the matching criteria for organizational context:

Organizational Context Match Criteria	McPhee Case Study #5-1	Beliot Case Study #5-2	*Remarks*
Structure	Public university Size: 9,900	Private college Size: 1,100	***Moderately comparable:*** *UW-Eau Claire much larger institution as well as being a part of a larger system of universities around the state.*
Experience	UW-Eau Claire has experienced moderate development over the past 15 years. The primary development experience for this project can be accounted for by the UW-System Administration and the DFD.	Beliot College has experienced moderate development over the past 15 years.	***Comparable:*** *Both institutions have comparable development experience.*
Function	UW-Eau Claire functions as a public university providing a wide range of undergraduate and graduate degrees in liberal arts, and the sciences.	Beliot College functions as a private liberal arts college serving primarily undergraduates.	***Moderately comparable:*** *UW-Eau Claire is provides a more diverse curriculum than Beliot College.*

MATCHING: PROJECT SCOPE

The project scope was matched according to several criteria: building program, construction materials and building systems. The following table summarizes the matching criteria:

Project Scope Match Criteria	McPhee Case Study #5-1	Beliot Case Study #5-2	Remarks
3.1 Program Scope			
Office	1,615 2%	2,700 5%	**Moderately Comparable** with respect to % of program function, not overall scope.
Instruction	53,973 68%	25,400 50%	
Support	23,912 30%	22,600 45%	
Total	79,500	50,700	
3.2 Locational Factors/Site Conditions	The building was sited adjacent to the existing field house.	The building was tightly sited between the existing heating plant and the existing field house.	**Comparable**
3.3 Size/ Form/ Configuration	A simple two-story rectalinear structure attached to the existing field house via an underground connector.	A moderately complex two-story retalinear structure attached to both the existing field house and heating plant.	**Moderately Comparable**
3.4 Constr Mat'ls & Bldg Systems			
Foundation	16" concrete foundation walls	16" concrete foundation walls	**Comparable**
Structural System	Long span steel joist structural system on concrete columns; concrete floor slab on grade; upper level/mezzanine poured-in-place concrete one-way joist and slab.	Long span steel joist structural system on concrete columns; concrete floor slab on grade; upper level poured-in-place concrete one-way joist and slab.	**Comparable**
Exterior Wall System	10" concrete block interior wall w/ 1.5" rigid insulation w/ 4" concrete tilt-up wall exterior surface.	10" concrete block interior wall w/ rigid insulation w/ 4" brick veneer and stucco exterior finish.	**Moderately Comparable**
Interior Wall Constr	Concrete block wall partitions.	Concrete block wall partitions.	**Comparable**
Finishes	Resilient, hardwood and synthetic flooring; paint; suspended acoustical ceiling tile in offices.	Resilient, hardwood and synthetic flooring; paint; suspended acoustical ceiling tile in offices.	**Comparable**
Roof System	EPDM on 3" rigid insulation on steel roof decking.	EPDM on 3" rigid insulation on steel roof decking	**Comparable**
Mechanical System	High pressure steam from campus central heating plant; Air conditioning AHUs for faculty offices and classrooms only; heat reclaim devices; computer energy management system.	High pressure steam from campus central heating plant.	**Comparable**
Electrical System	Standard	Standard	**Comparable**
Plumbing System	Standard	Standard	**Comparable**
3.5 Occupancy Patterns/ Characteristics	Current occupancy: 215 full- and part-time students and staff.	Current occupancy: 250 full-time students.	**Comparable**

COMPARISON: FACILITY DEVELOPMENT PROCESS

The following is a summary comparison of the major activities which took place during the Facility Development Process:

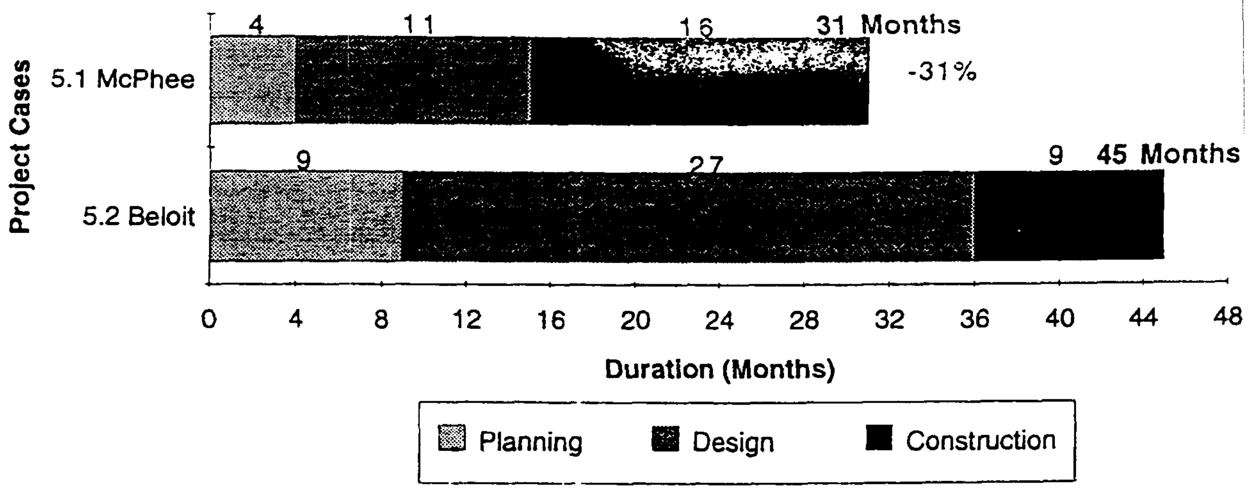
Facility Development Process	McPhee Case Study #5-1 Date	Event	Beloit Case Study #5-2 Date	Event
2.1 Feasibility Planning	3/78	Request submitted to the Building Commission for the remodeling and addition to the existing McPhee P.E. building for $3.75 million.	1980	*Campus planning study:* The Sports Center construction project was identified among Beloit College's facility needs.
	5/80	Request submitted to the Building Commission for the remodeling and addition to the existing McPhee Physical Education Building for a total project costs estimated at $4.39 million.	4/83	A building committee was formed to that included 12 members from several faculty, staff and students. Their first task was the selection of an architect.
	6/80	Request release of funds for Concept & Budget	1/84	Potter Lawson & Pawlowsky hired to conduct a site analysis and needs analysis.
	2/81	Concept & Budget Report submitted	2/84	Beloit College goes public with a fundraising campaign.
	2/81	Governor Veto: This project -- one of a package of five physical education facilities -- is caught up in a political process.		
	3/83	Reconsidered and rejected for 83-85 State Building Program (Total project costs estimated @ $4.94 million).		
	3/85	Reconsidered for 85-87 State Building Program and approved @ a total project cost of $5.44 million.		
2.2 Definition of Scope	7/24/85	Concept & Budget Report approved.	4/84	A series of public meetings and design presentations were made to target groups within the College.
2.3 Staff/ Consultant Selection		(see above)	1/84	Potter Lawson & Pawlowsky hired (see above).
2.4 Design Development & Review	7/85	Request the release of additional funds for A/E services.		
2.5 Construction Documents & Estimates	2/86	Completion of construction documents.	8/14/85	Completion of construction documents
2.6 Bids & Contract Negotiations	3/25/86	Bid opening	2/20/86	Bid opening
	5/86	Award of contract	3/3/86	Award of contract
2.7 Construction & Project Management	6/86	Start of construction	4/12/86	Start of construction
	9/87	Substantial completion		

			1/87	Construction of the new facility was subtantially complete and renovation of the existing field house began.
2.8 Occupancy & Facility Management	9/87 2/91	Occupancy Project close-out	1/87	Occupancy: Completed new construction occupied while renovation of the existing field house begins
			2/6/87	Dedication cerimonies
			12/24/87	Subtantial completion of total project

COMPARISON: FACILITY DEVELOPMENT PROCESS

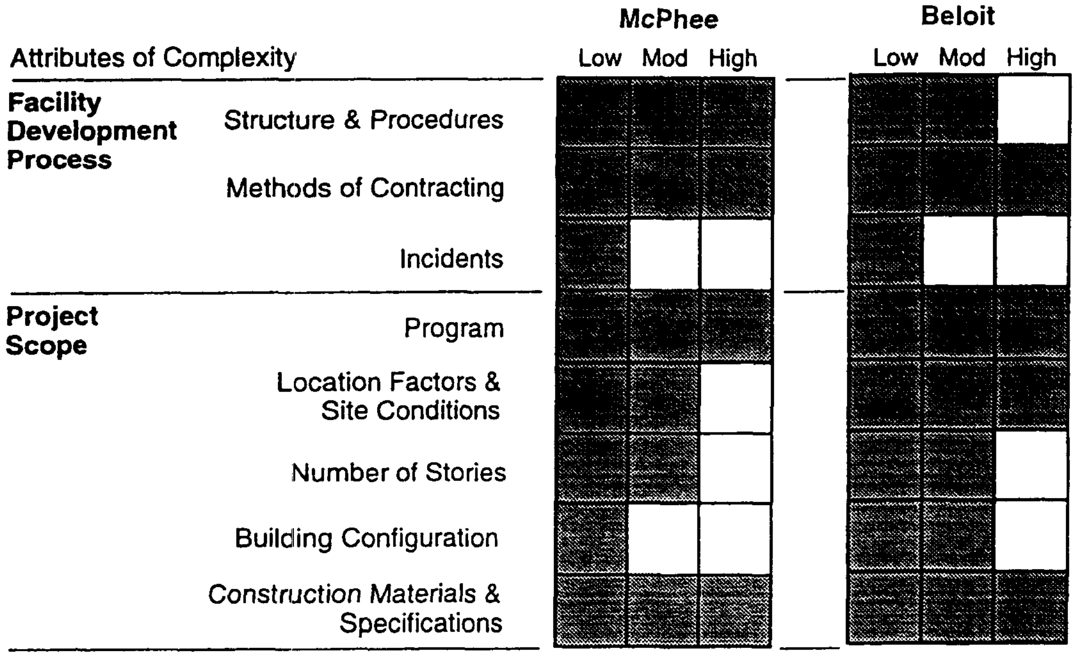
The following is a comparison of the duration of planning, design and construction activities that took place during the Facility Development Process:

Project Duration (McPhee vs Beloit)



COMPARISON: FACILITY DEVELOPMENT COMPLEXITY PROFILE

Profile Comparison: McPhee/Beloit

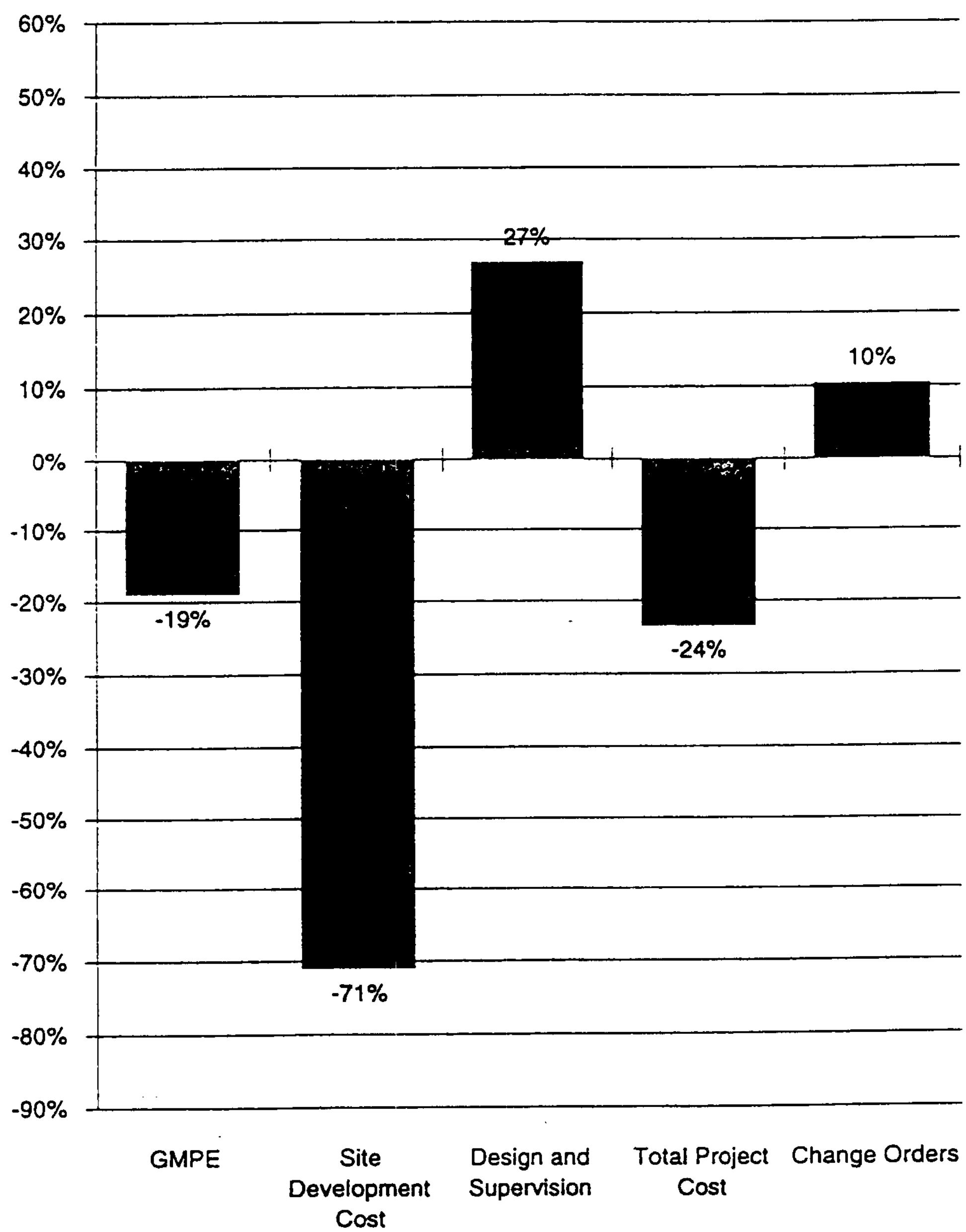


Attributes of Complexity	**McPhee**	**Beloit**
Structure & Procedures	The McPhee project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD UW-System Administration, and the UW-Eau Claire campus.	The Beloit project explicitly followed the established university procedures. There were several levels of decision-making within the private university. Major budgetary, project scope, and design decisions were made by a building committee.
Methods of Contracting	The methodsof contracting followed for the McPhee project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process.	The method of contracting followed for the Beloit project was conventional: An A/E was hired to act as design consultant and owner representative, and multiple prime contractors were selected based on a competitive bidding process.
Incidents	During the McPhee project there were no significant incidents that occurred as evidenced by documentation in the project records.	During the Beloit project there were no significant incidents that occurred as evidenced by documentation in the project records.
Program	The McPhee program consisted of a number of highly specialized and diverse requirements: gymnasium, lockers, racquetball, and offices.	The Beloit program consisted of a number of highly specialized and diverse requirements: gymnasium, lockers, racquetball, and offices.
Location Factors & Site Conditions	The McPhee project required demolition of existing structures on site.	The Beloit project was located on an campus infill site, required demolition of existing structures, and involved addition, renovation to other existing structures.
Number of Stories	2 floors	2 floors
Building Configuration	The McPhee building can be described as prizmatic (all floor plates identical)	The Beloit building can be described as having somewhat variable floor plates.
Construction Materials & Specifications	The McPhee building consists of high quality, institutional-grade construction materials and specifications.	The Beloit building consists of high quality, institutional-grade construction materials and specifications.

COMPARISON: FACILITY DEVELOPMENT COST PROFILE

The following summary chart identifies the percentage by which the public facility cost MORE or LESS than the private facility across the following five cost categories:

Case 5: McPhee/Beloit

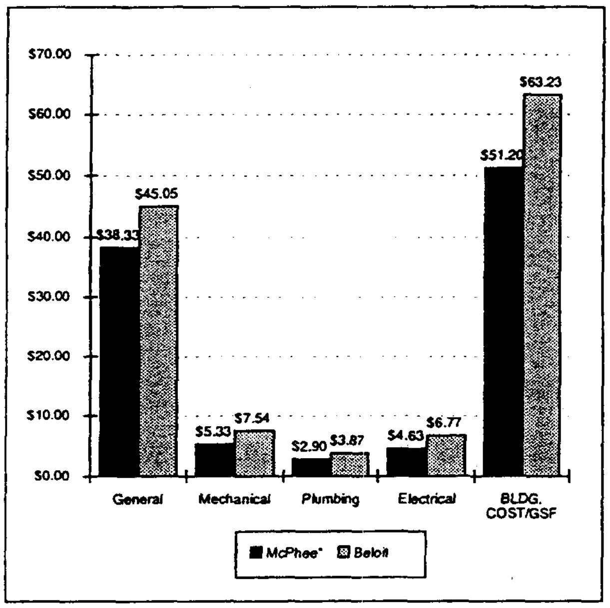


COMPARISON: BUILDING COST

	McPhee*	Beloit
Gross Square Feet	79,500	50,700
Year Constructed	1987	1987

BUILDING COST	McPhee*	Beloit
General	$3,047,463	$2,284,004
Mechanical	$424,101	$382,119
Plumbing	$230,891	$196,291
Electrical	$367,916	$343,147
Bldg. Cost Subtotal	$4,070,371	$3,205,561

BUILDING COST/GSF	McPhee*	Beloit	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
General	$38.33	$45.05	($6.72)	(15%) LESS than the Private Facility
Mechanical	$5.33	$7.54	($2.20)	(29%) LESS than the Private Facility
Plumbing	$2.90	$3.87	($0.97)	(25%) LESS than the Private Facility
Electrical	$4.63	$6.77	($2.14)	(32%) LESS than the Private Facility
Bldg. Cost/GSF Subtotal	$51.20	$63.23	($12.03)	**(19%) LESS than the Private Facility**



BUILDING COST DISTRIBUTION	McPhee*	Beloit
General	75%	71%
Mechanical	10%	12%
Plumbing	6%	6%
Electrical	9%	11%
	100%	100%

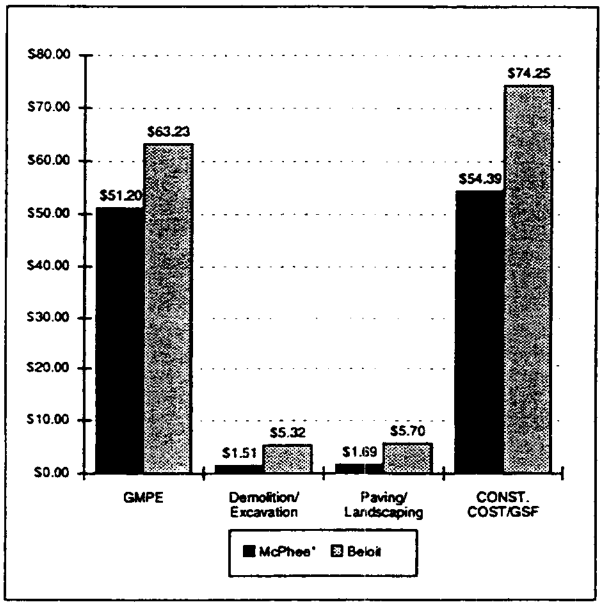
* *Adjusted to 1987 construction costs in Beloit using Means Location Factors (assuming*

COMPARISON: CONSTRUCTION COST

	McPhee*	Beloit
Gross Square Feet	79,500	50,700
Year Constructed	1987	1987

CONSTRUCTION COST	McPhee*	Beloit
GMPE	$4,070,371	$3,205,561
Demolition/Excavation	$120,028	$269,917
Paving/Landscaping	$133,984	$288,960
Const. Cost Subtotal	$4,324,383	$3,764,438

CONSTRUCTION COST/GSF	McPhee*	Beloit	Difference in $/GSF	***By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?***
GMPE	$51.20	$63.23	($12.03)	(19%) LESS than the Private Facility
Demolition/Excavation	$1.51	$5.32	($3.81)	(72%) LESS than the Private Facility
Paving/Landscaping	$1.69	$5.70	($4.01)	(70%) LESS than the Private Facility
Const. Cost/GSF Subtotal	$54.39	$74.25	($19.85)	**(27%) LESS than the Private Facility**



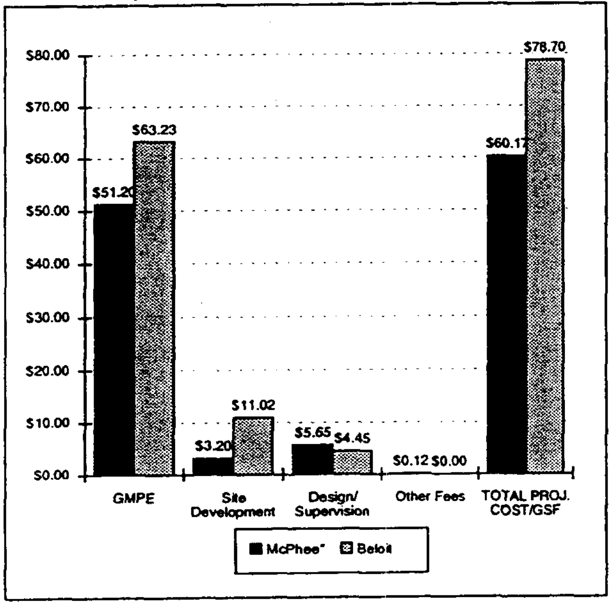
* *Adjusted to 1987 construction costs in Beloit using Means Location Factors (assuming*

COMPARISON: TOTAL PROJECT COST

	McPhee*	Beloit
Gross Square Feet	79,500	50,700
Year Constructed	1987	1987

TOTAL PROJECT COST	McPhee*	Beloit
GMPE	$4,070,371	$3,205,561
Site Development	$254,012	$558,877
Design/Supervision	$448,883	$225,530
Other Fees	$9,917	
Total Proj. Cost	$4,773,266	$3,989,968

TOTAL PROJECT COST/GSF	McPhee*	Beloit	Difference in $/GSF	*By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?*
GMPE	$51.20	$63.23	($12.03)	(19%) LESS than the Private Facility
Site Development	$3.20	$11.02	($7.83)	(71%) LESS than the Private Facility
Design/Supervision	$5.65	$4.45	$1.20	27% MORE than the Private Facility
Other Fees	$0.12		$0.12	MORE than the Private Facility
Total Proj. Cost/GSF Subtotal	$60.17	$78.70	($18.53)	**(24%) LESS than the Private Facility**



DESIGN AND SUPERVISION FEE AS A PERCENTAGE OF CONSTRUCTION COST	McPhee*	Beloit
DFD	3.9%	
A/E	6.4%	6.0%
Total	10.4%	6.0%

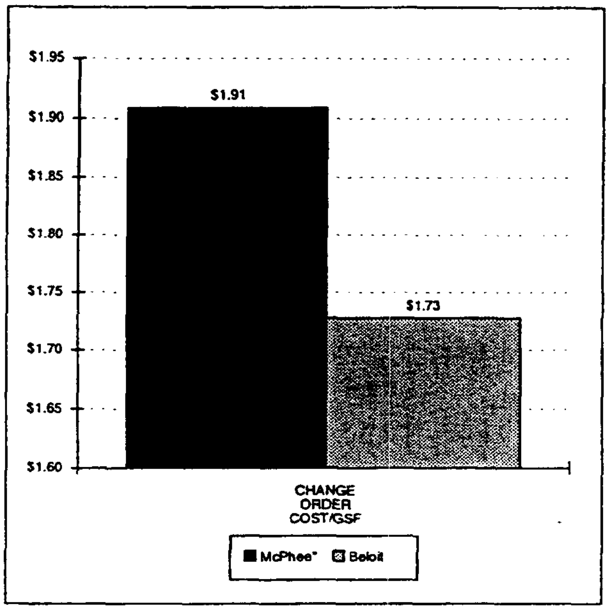
* *Adjusted to 1987 construction costs in Beloit using Means Location Factors (assuming*

COMPARISON: CHANGE ORDER COST

	McPhee*	Beloit
Gross Square Feet	79,500	50,700
Year Constructed	1987	1987

CHANGE ORDER COST	McPhee*	Beloit
All Change Orders (a)	$151,734	$87,602

CHANGE ORDER COST/GSF	McPhee*	Beloit	Difference in $/GSF	By what percentage are the $/GSF of the Public facility MORE or LESS than the Private facility?
All Change Orders (a)	$1.91	$1.73	$0.18	10% MORE than the Private Facility



PERCENTAGE OF TOTAL PROJECT COST		
All Change Orders (a)	3.2%	2.2%

* *Adjusted to 1987 construction costs in Beloit using Means Location Factors (assuming*

(a) *For all categories (breakdown unavailable for Beloit)*

FINDINGS

The following table summarizes (a) project duration (for design and construction phases) and cost findings, and (b) categories of complexity that were identified as potential reasons for differences in project duration and cost. Filled cells (grey boxes) identify the potential factors that explain the findings on the left. [On the following page, an explanation for each factor identified in the table below is proposed.]

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences in the Case

Project Duration and Costs	Structure & Procedures +	Methods of Construct.	Incidents	Program	Location & Site -	No. of Stories	Bldg. Config. -	Constr. Materials
PROJECT DURATION Project duration (design and construction only) lasted 25% SHORTER for McPhee (27 months) than Beloit (36 months); yet construction took 75% LONGER, McPhee (16 months), Beloit (9 months).	■				■		■	
GENERAL COSTS General construction cost 15% LESS per gross sq. ft. for McPhee ($38.33) than for Beloit ($45.05).					■		■	
MECHANICAL COSTS Mechanical construction cost 29% LESS per gross sq. ft. for McPhee ($5.33) than for Beloit ($7.54).							■	
PLUMBING COSTS Plumbing construction cost 25% LESS per gross sq. ft. for McPhee ($2.90) than for Beloit ($3.87).							■	
ELECTRICAL COSTS Electrical construction cost 32% LESS per gross sq. ft. for McPhee ($4.63) than for Beloit ($6.77).							■	
SITE DEVELOPMENT COSTS Site development cost 71% LESS per gross sq. ft. for McPhee ($3.20) than for Beloit ($11.02).					■			
DESIGN & SUPERVISION Design and supervision services cost 30% MORE per gross sq. ft. for McPhee ($5.77) than for Beloit ($4.45) AND constitute a GREATER percentage of construction cost for McPhee (10.4%) than for Beloit (6%).	■							
CHANGE ORDERS Change orders cost 10% MORE per gross sq. ft. for McPhee ($1.91) than for Beloit ($1.73) AND constitute a GREATER percentage of total project cost for McPhee (3.2%) than for Beloit(2.2%).	■							

DISCUSSION

The following discussion elaborates on the factors identified in the previous table as contributing to differences in project duration and cost in this case study:

Structure & Procedures

The McPhee project organizational structure and facility development procedures involved a ***moderately more complex*** *set of decision-making steps and layers than Beloit.*

The McPhee project followed the State facility development process in which procedures were explicitly followed. Major budgetary, project scope, and design decisions were made at several differentiated management levels: the building commission, DOA, DFD UW-System Administration, and the UW-Eau Claire campus. The Beloit project explicitly followed a slightly less complex university procedures. There were fewer levels of decision-making within the private university. Major budgetary, project scope, and design decisions were made by a building committee. Differences in structure and procedures are identified as possible reasons for differences in project duration of construction and design supervision service costs.

Location Factors & Site Conditions

The McPhee project encountered ***less*** *location factors and site conditions than Beloit.*

The McPhee project required demolition of existing structures on site. While, the Beloit project was located on an campus infill site, required demolition of existing structures, and involved addition, renovation to other existing structures. These differences in location factors and site conditions are identified as possible reasons for differences in project duration, general and site development costs.

Building Configuration

The McPhee project's building configuration was ***more complex*** *than Beloit's.*

The McPhee building can be described as prizmatic (all floor plates identical), by constrast, the Beloit building can be described as having somewhat variable floor plates. These differences in building configuration are identified as possible reasons for differences in project duration, general, mechanical, plumbing, and electrical costs.

COMPARATIVE ANALYSIS ACROSS CASE

OVERVIEW

This section presents a comparative analysis across the five case study pairs. Findings from this section are not conclusive due to the problems of comparing the variety of different building types represented in this study. This analysis was conducted in an effort to begin to move beyond the data to identify across case patterns, generate hypotheses and formulate conjectures for further research.

The findings are presented across each time and cost category: project duration, general, mechanical/plumbing, electrical, site development, design supervision and change orders. Each page offers a summary of a particular time or cost category across all five cases. Factors of Complexity are identified as potential contributors of time and cost differentials. Pluses { + } and Minuses { - } under each highlighted factor of complexity indicate whether that particular factor is contributing to a more complex or less complex public case with respect to the private case. Cases are identified as well that further elaborate on these factors of complexity -- refer to the individual paired case reports in the previous section.

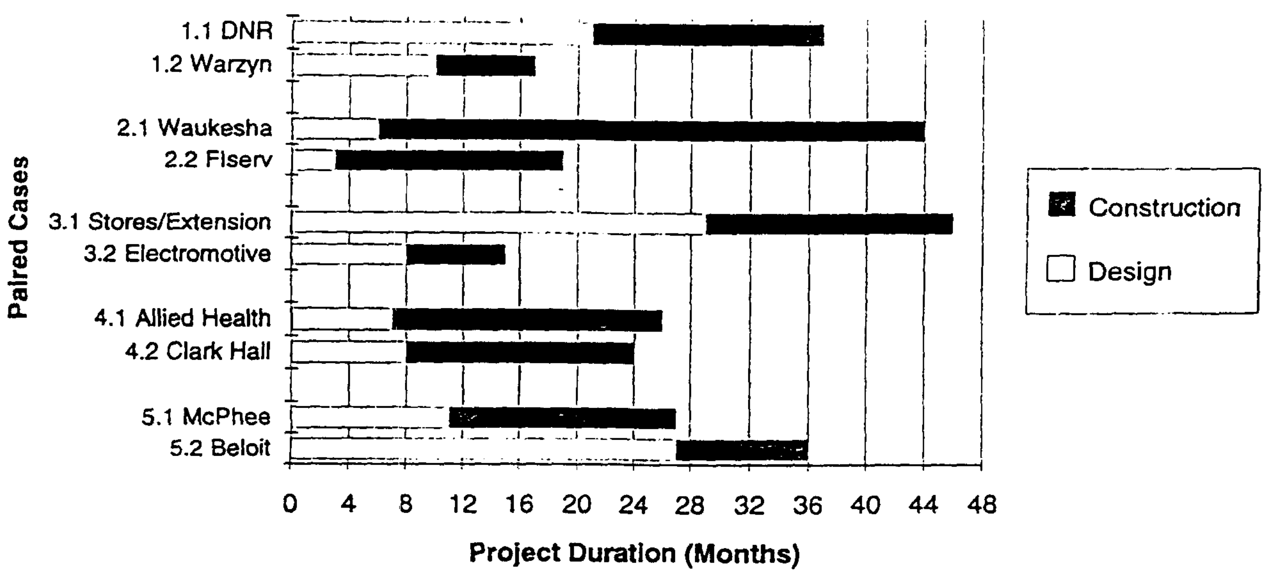
FINDINGS: PROJECT DURATION

The following table summarizes the project duration findings with respect to the eight factors of complexity.

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences

PROJECT DURATION (Across All Case Comparisons)	Structure & Procedures (+ -)	Methods of Construct (+)	Incidents (+)	Program	Location & Site (+ -)	No. of Stories	Bldg. Config. (+ -)	Constr. Materials (+)
In **4 out of 5** cases the public sector project took LONGER than the private sector. (**5 out of 5** construction longer).	3	3	2		1		2	1
In **1 out of 5** cases the public sector project duration was SHORTER than the private sector.	1				1		1	

Project Duration Across Paired Cases (Design & Construction)



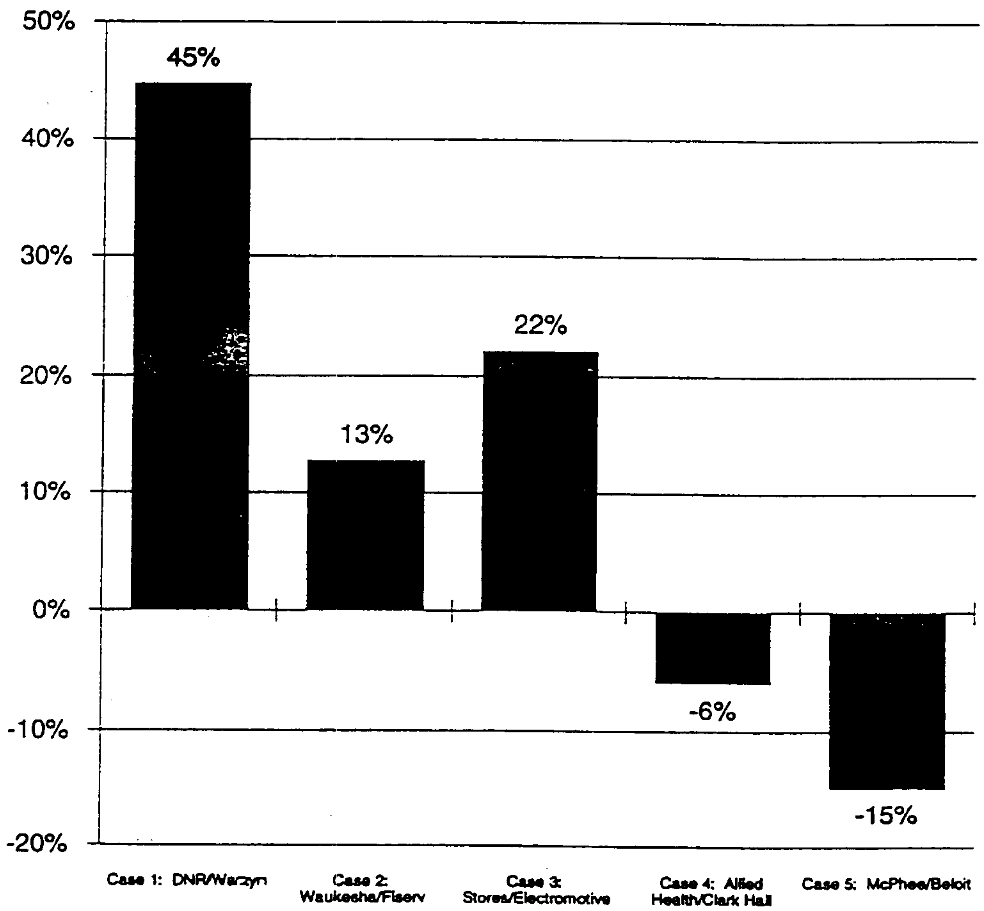
In summary, the public sector development process took LONGER than private sector due to the greater complexity of Structure & Procedures (Cases #1,2,3), Methods of Contracting (Cases #1,2,3), Incidents (Cases #1,3), and Building Configuration (Cases #2,3). In the single case were the public sector process took less time (Case #5), the construction process still took longer.

FINDINGS: GENERAL COSTS

The following table summarizes the project cost findings with respect to the eight factors of complexity.

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences

GENERAL COSTS (Across All Case Comparisons)	Structure & Procedures	Methods of Construct.	Incidents	Program	Location & Site	No of Stories	Bldg Config	Constr Materials
	+	+	+		+ -	-	+ -	+
In **3 out of 5** cases, general construction cost MORE per gross square foot for public sector projects than private sector projects.	3	3	2		2		2	1
In **2 out of 5** cases, general construction cost LESS per gross square foot for public sector projects than private sector projects.					2	1	2	



In summary, general construction cost MORE in three public sector building cases due to the increased complexity of Structure and Procedures (Cases #1,2,3), Methods of Contracting (Cases #1,2,3), Incidents (Cases #1,3), Location and Site Factors (Cases #1,3), and Building Configuration (Cases #2,3). General construction cost LESS in two public sector building cases due to less complex Location Factors & Site Conditions (Cases #4,5) and Building Configuration (Cases #4,5).

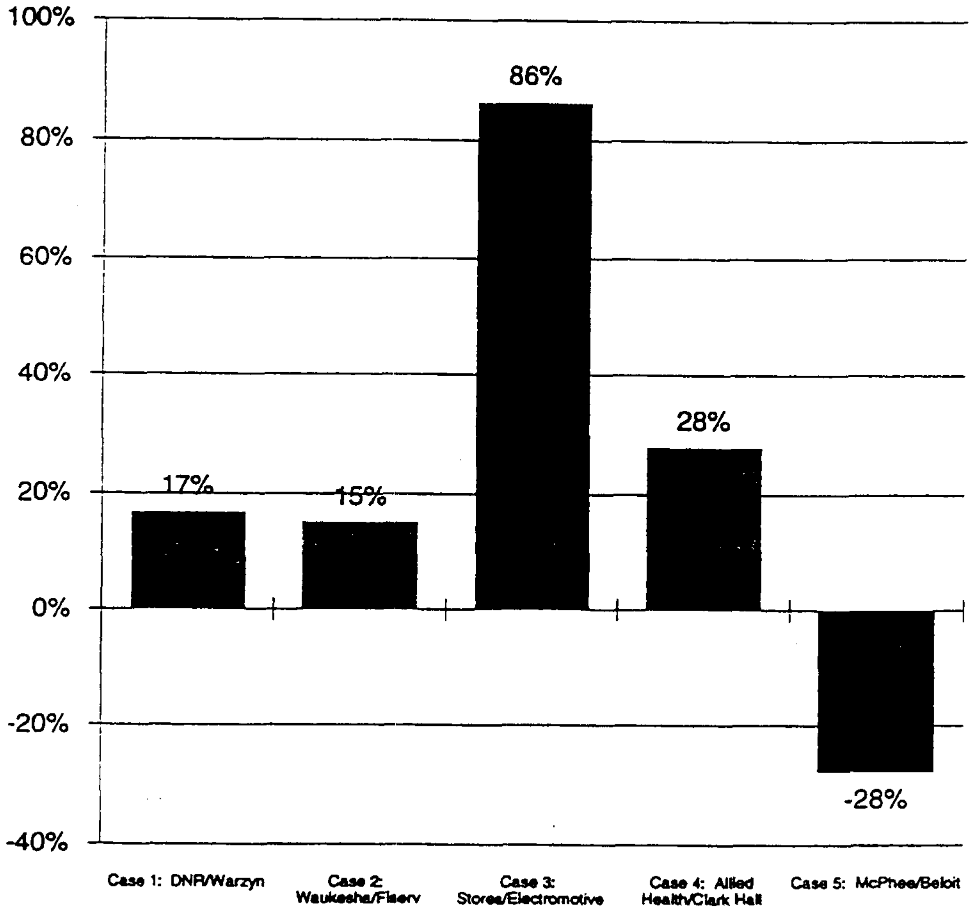
FINDINGS: MECHANICAL/PLUMBING COSTS*

The following table summarizes the project cost findings with respect to the eight factors of complexity.

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences

MECHANICAL/PLUMBING COSTS (Across All Case Comparisons)	Structure & Procedures	Methods of Construct.	Incidents	Program	Location & Site	No. of Stories	Bldg. Config	Constr. Materials
	+	+	+				+ -	+
In 4 out of 5 cases, mechanical construction cost MORE per square foot for public sector projects than private sector projects.	3	2	1				2	1
In 1 out of 5 cases, mechanical construction cost LESS per square foot for public sector projects than private sector projects.							1	

* Mechanical and plumbing costs are combined because breakdowns were unavailable for Warzyn.



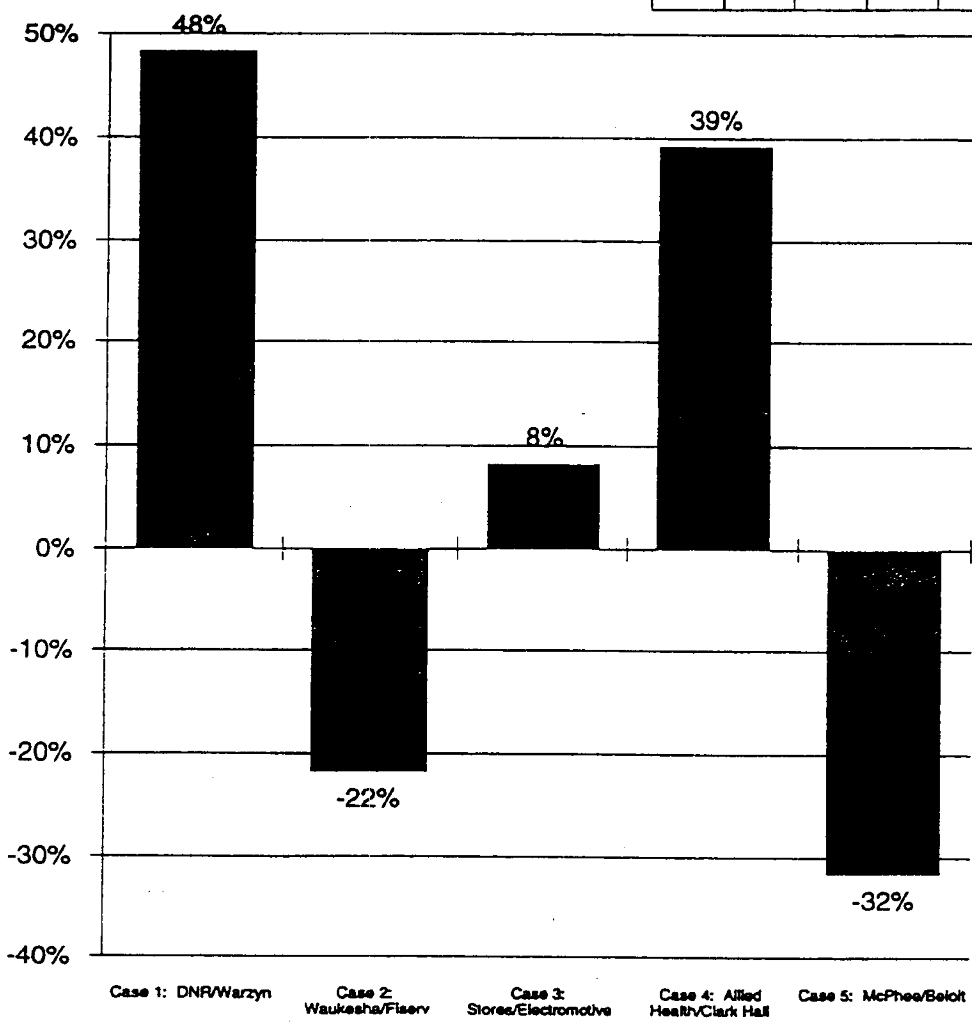
In summary, mechanical/plumbing construction cost MORE in four public sector building cases due to increased complexity of Structure and Procedures (Cases#1,2,3), Methods of Contracting (Cases#1,2), and Building Configuration (Cases#2,4). Mechanical/plumbing costs were LESS in only one public sector building (Case #5) due to a less complex Building Configuration.

FINDINGS: ELECTRICAL COSTS

The following table summarizes the project cost findings with respect to the eight factors of complexity.

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences

ELECTRICAL COSTS (Across All Case Comparisons)	Structure & Procedures	Methods of Construct	Incidents	Program	Location & Site	No. of Stories	Bldg Config	Constr. Materials
	+	+			-		+ -	
In 3 out of 5 cases, electrical construction cost MORE per square foot for public sector projects than private sector projects.	2	1					1	
In 2 out of 5 cases, electrical construction cost LESS per square foot for public sector projects than private sector projects.					1		1	

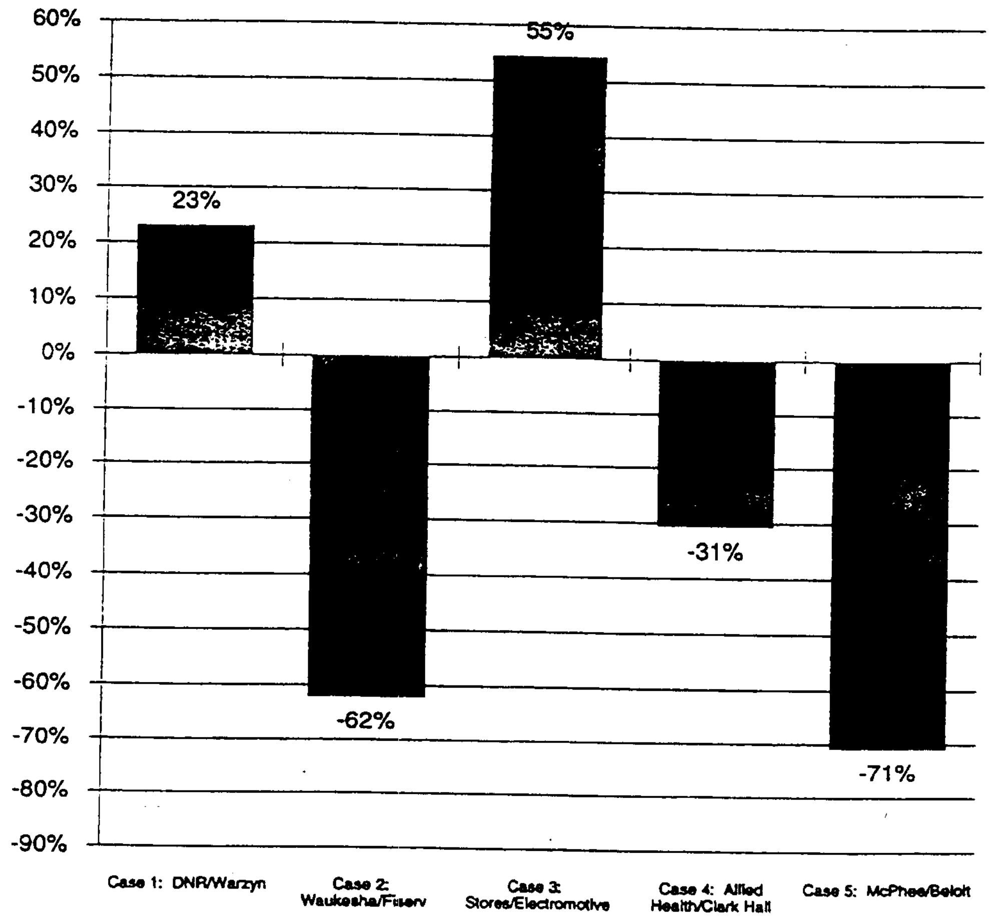


In summary, electrical construction cost MORE in three public sector building cases due to more complex Structure and Procedures (Cases#1,4), and Methods of Contracting (Case#1). Electrical construction cost LESS in two public sector building cases due to less complex Location and Site Factors (Case#2), and Building Configuration (Case#5).

FINDINGS: SITE DEVELOPMENT COSTS

The following table summarizes the project cost findings with respect to the eight factors of complexity.

SITE DEVELOPMENT COSTS (Across All Case Comparisons)	Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences							
	Structure & Procedures	Methods of Construct.	Incidents	Program	Location & Site (+ -)	No. of Stories	Bldg. Config.	Constr. Materials
In **2 out of 5** cases, site development cost MORE per square foot for public sector projects than private sector projects.					2			
In **3 out of 5** cases, site development cost LESS per square foot for public sector projects than private sector projects.					3			



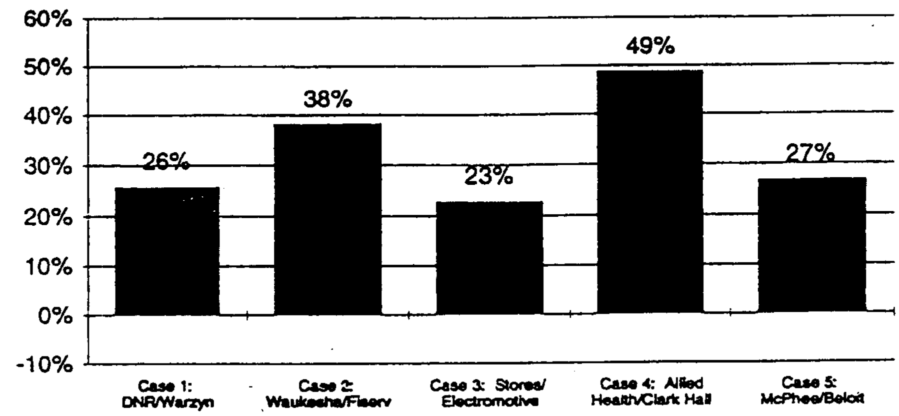
In summary, site development cost MORE in two public sector building cases due to more complex Location and Site Factors (Cases #1,3). Site development cost LESS in three public sector building cases due to less complex Location and Site Factors (Cases#2,4,5).

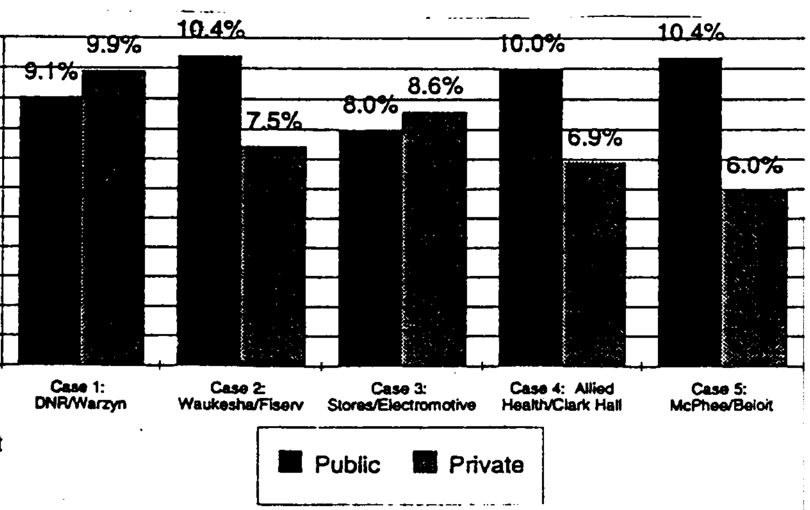
FINDINGS: DESIGN & SUPERVISION COSTS

The following table summarizes the project cost findings with respect to the eight factors of complexity.

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences in the Case

DESIGN & SUPERVISION COSTS (Across All Case Comparisons)	Structure & Procedures	Methods of Construct	Incidents	Program	Location & Site	No. of Stories	Bldg. Config.	Constr. Materials
	+	+		+				
In 5 out of 5 cases, design supervision cost MORE per square foot for public sector projects than private sector projects.	5	4		1				
In none of the cases does design supervision cost LESS per gross square foot for public sector projects than private sector projects.								





Design & Supervision Cost as a Percentage of Construction Cost

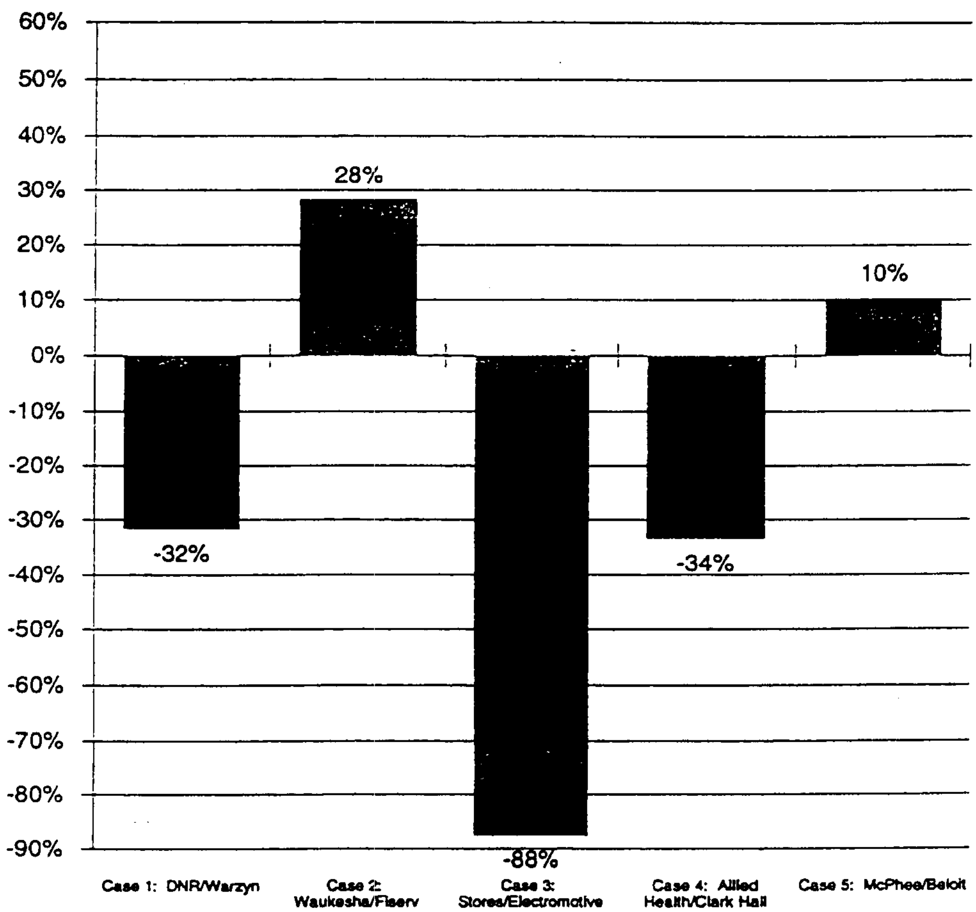
In summary, design and supervision cost MORE in all five public sector building cases due to more complex Structure and Procedures (Cases #1,2,3,4,5), and Methods of Contracting (Cases #1,2,3,4,5).

FINDINGS: CHANGE ORDERS

The following table summarizes the project cost findings with respect to the eight factors of complexity.

Factors of Complexity Identified as Potential Contributors of Duration and Cost Differences in the Case

CHANGE ORDERS (Across All Case Comparisons)	Structure & Procedures	Methods of Construct.	Incidents	Program	Location & Site	No. of Stories	Bldg Config	Constr. Materials
	+		+ -		+ -	+ -	+ -	
In **2 out of 5** cases, change orders cost MORE per gross square foot for public sector projects than private sector projects.	1		1					
In **3 out of 5** cases, change orders cost LESS per gross square foot for public sector projects than private sector projects.			2		1	1	1	



In summary, change orders cost MORE in two public sector building cases due to more complex Structure and Procedures (Case #5), and Incidents (Case #2). Change orders cost LESS in three public sector building cases due to less complex Incidents (Cases #1,3), Location and Site Factors (Case #4), Number of Stories (Case #4), and Building Configuration (Case #4).

SECTION 3

CONCLUSIONS

RESULTS WHEN THE PUBLIC FACILITY IS *MORE* COMPLEX

The following table summarizes the frequency of Public facilities costing MORE than the Private facilities when the Public facility is MORE complex.

Frequency of Factors of Complexity Contributing to LONGER Project Duration and HIGHER Project Costs Across All Cases

+	Project Duration	General	Mechanical/ Plumbing	Electrical	Site Development	Design & Supervision	Change Orders
Structure/ Procedures	3	3	3	2		5	1
Methods of Construction	3	3	2	1		4	
Incidents	2	2	1				1
Program						1	
Location Factors & Site Conditions	1	2			2		
Number of Stories							
Building Configuration	2	2	2	1			
Construction Materials & Bldg Systems	1	1	1				

The table shows that *Organizational Structure & Procedures* and *Methods of Contracting* had the HIGHEST frequencies and were determined to be the primary factors causing longer project durations and costs. *Incidents, Location & Site Factors,* and *Building Configuration* were determined to have moderate influence on project duration and costs.

RESULTS WHEN THE PUBLIC FACILITY IS *LESS* COMPLEX

The following table summarizes the frequency of Public facilities costing LESS than the Private facilities when the Public facility is LESS complex:

Frequency of Factors of Complexity Contributing to SHORTER Project Duration and LOWER Project Costs Across All Cases

-	Project Duration	General	Mechanical/Plumbing	Electrical	Site Development	Design & Super-vision	Change Orders
Structure/ Procedures	1						
Methods of Construction							
Incidents							2
Program							
Location Factors & Site Conditions	1	2		1	3		1
Number of Stories		1					1
Building Configuration	1	2	1	1			1
Construction Materials & Bldg Systems							

The table shows that *Location & Site Factors,* and *Building Configuration* had the HIGHEST frequencies and were determined to be the primary factors resulting in shorter project durations and costs.

CONCLUSIONS

There are a large number of factors that influence the cost and time required to design and construct building projects. The research instrument used in this study analyzed issues of complexity relative to time and cost outcomes and identified primary factors that caused differences in project duration and cost for the cases sampled. The study identifies those factors that are particularly responsible for outcome differences between public and private buildings. There are two main conclusions of this study based on the findings:

Conclusion #1

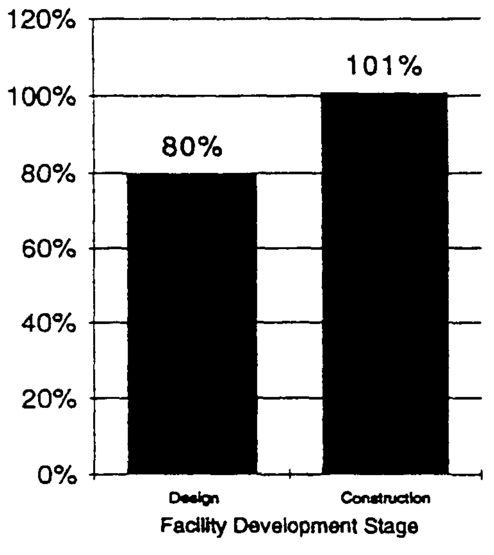
Operating within a complex process leads to a complex project that requires more time and higher costs.

While this statement may seem to be obvious, the findings in this study provide supporting evidence and put forth case examples where the questions of how much longer and how much more are answered.

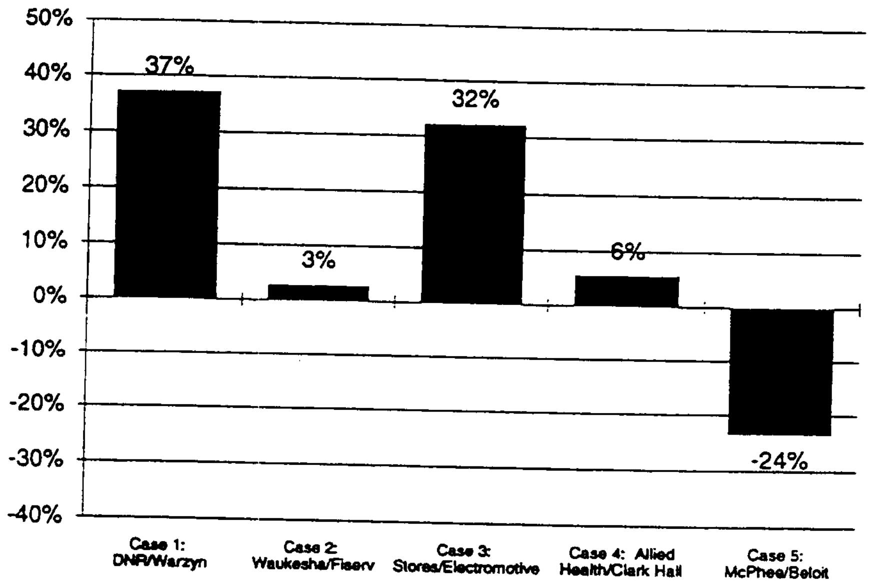
The table showing Frequency of Factors of Complexity Contributing to LONGER Project Duration and HIGHER Project Costs Across All Cases indicates that Structures and Procedures and Methods of Contracting were more complex more often in the Public sector cases and resulted in longer project durations, and higher General, Mechanical/Plumbing, and Design & Supervision costs. While differences in Design & Supervision have small effect on the Total Project Cost, differences in General and Mechanical/Plumbing costs have significant effect as together they comprise the majority of a building's Total Project Cost.

All of the Public facilities followed a more complex development process resulting in generally more complex building projects that in 4 out of 5 cases took longer to build (on average, 80% longer to design and 101% longer to construct) and in 4 out of 5 cases cost more (on average, Total Project Cost/GSF was 11% more).

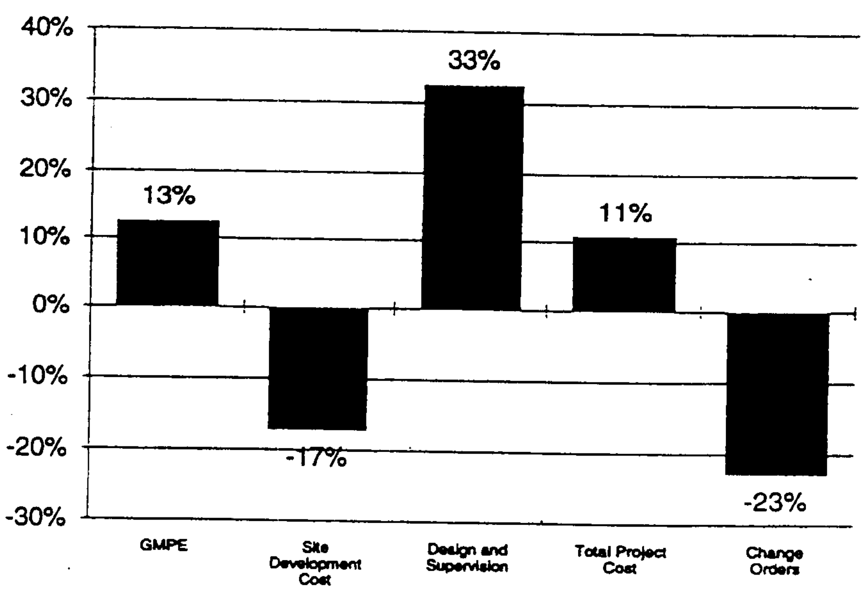
AVG. PERCENTAGE BY WHICH THE PROJECT DURATION FOR THE PUBLIC FACILITY WAS LONGER THAN THE PRIVATE FACILITY



PERCENTAGE BY WHICH TOTAL PROJECT COST FOR PUBLIC FACILITY COST MORE (+) OR LESS (-) THAN PRIVATE FACILITY BY CASE



AVG. PERCENTAGE BY WHICH THE PUBLIC FACILITY COST MORE (+) OR LESS (-) THAN THE PRIVATE FACILITY BY COST CATEGORY



Conclusion #2

"Top-line factors" significantly influence Public Sector decision-making procedures resulting in a project that is more complex that requires more time and higher costs but has greater public accountability.

A tension exists between so-called "bottom-line factors" and "top-line factors." Bottom-line factors are those factors solely associated with costs, while top-line factors are those associated with social or community benefits and issues of public accountability. Bottom-line factors are more dominant in the motives of private sector development whereas top-line factors are more significant in the public sector. At one level, the objective or motive in both public and private sector owners is the same; getting a product of value. The criteria for what is value however, is clearly different between public and private sectors–a difference that must be considered when comparing public buildings to private buildings. Is the owner's objective to build at the lowest possible cost, or to build at the best possible cost commensurate with good design, safety standards and long-term life cycles? Knowing the motive for development is critical to understanding why these factors vary between public and private sectors. This study has looked at both issues, bottom-line and top-line, one is quantitative in nature, the other is qualitative. The exact linkages between differences in these two bodies of data are difficult to pin-point, but critical in understanding why some buildings cost more than others.

In examining complexity (in terms of both development process and physical form) and various components of cost and time simutaneously, the findings reveal the trade-offs between time and cost outcomes and public accountability. For example, while Public sector buildings generally took longer and had higher Total Project Costs/GSF, Change Orders/GSF were smaller (on average, 23% less) and in 3 out of 5 cases Change Orders constituted a significantly smaller percentage of Total Project Cost than its Private Sector match.

APPENDIX A

CASE STUDY DESCRIPTIONS

Case 1-1
Department of Natural Resources, Southeast District Headquarters Building
Milwaukee, Wisconsin

Architects:	Plunkett-Keymar-Reginao
General Contractor:	Bell-Reichl, Inc.; Franklin, WI
Mechanical:	Conditioned Air Design; West Allis, WI
Electrical:	Magaw Electric; New Berlin, WI
Plumbing:	Joe Debelak Plumbing Co.; Menomonee, WI

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Department of Natural Resources, Southeast District Headquarters Building.

1.0 Organizational Context
The Madison DNR state headquarters is a public state agency under the Department of Administration of the State of Wisconsin. The DNR agency is comprised of four divisions each with a number of bureaus: The Division of Environmental Quality, the Division of Resource Management, the Division of Enforcement and the Division of Property Management. In addition, there are a number of Districts throughout the state, the largest of which is the Southeast District which covers an eight county region and contains the majority of Wisconsin's population. There is a total of 363 staff in the Southeast District, with 185 of those occupying DNR's Southeast District Headquarters building in Milwaukee.

The Department of Natural Resources has been in existence since 1967. Since that time, DNR has developed substantial property holdings (2,800 buildings with a replacement value of well over $120 million). Although it is 40% of the total number of state owned buildings, it is only about 4% of the state owned space on a gross square foot (GSF) basis. The Department manages over 71,000 acres of parks and trails, 37,000 acres of southern forests and about 440,000 acres of northern forests, including 5,200 campsites, as well as 3,000 miles of roadways and extensive parking lots with a value of approximately $300 million. The DNR's total facility development cost expenditures/year for the entire organization have averaged $ 4,277,094 over the ten year period from 1983-1993.

Until 1983, the Southeast District of the DNR leased space in several different locations within Milwaukee. It was not until 1983 that the DNR occupied its first fully owned and occupied office facility.

The DNR has had several motives for development. Historically, DNR programs have expanded and developed in response to an increasingly uncertain environment. Many natural environmental problems and events, in addition to new policies and regulations, have resulted in unanticipated program changes over the past decade which could not have been anticipated. General impacts on all programs include (a) the recycling movement, (b) changes in public expectations of the services offered by DNR due to increases in environmental awareness and activism, (c) changes in perception of the DNR from an "enforcement agency" to a "service agency", (d) the change in emphasis of DNR towards more urban environmental issues. Federally mandated programs such as the Clean Air Act of 1990 have placed additional demands on DNR program development. The continual expansion and development of DNR programs has had, and continues to have, a direct impact on the size, location, and effectiveness of the facilities in servicing DNR programs.

2.0 Facility Development Process

The following is a summary of the major activities which took place during the Facility Development Process of the DNR's SEH Building:

Event	Date	Description
Annual Review	1979-81 Biennium	The project was recommended as part of the State's Milwaukee/Waukesha Office Buildings complex at a cost of $2,752,000.
Building Commission Authorization	4/23/80	Building Commission action authorized the release of $60,000 in Building Trust Funds (planning) for the preparation of the Concept and Budget Report.
Consultant Selection	8/12/80	Plunkett-Keymar-Reginao architects retained to provide consulting services
D.D. Initiated	8/80	Design Development begun on project.
E.I.S. completed	2/81	Completion of Environmental Impact Statement
C.B.R. completed	3/81	Completion of the Concept & Budget Report
C.B.R. approval	3/15/81	Natural Resources Board Approval of the Concept & Budget Report
C.B.R. submitted	4/28/81	Concept and Budget Report submitted to DSFM for review
C.B.R. submitted	5/81	Concept & Budget Report submitted to the Building Commission for approval and release of $90,000 Building Trust Funds and authority to plan, bid and construct the project at a cost of $3,244,230
Approval of the Concept & Budget Report	6/25/81	Building Commission approval of the Concept & Budget Report and authorization to bid and construct (the DOSFM delayed the submission of the Concept & Budget Report)
Construction documents started	7/81	
CD Revisions	11/12/81	Revisions to working drawings
CD review	12/7/81	DSFM constructio n document review.
Final CD review	1/21/82	Final review of construction documents.
Notice to bidders	2/11/82	
Bid opening	3/16/82	
Award of contracts	5/25/82	
Construction begins	5/25/82	
Date of substantial completion	9/13/83	
Building occupied	9/19/83	
Dedication Ceremonies	9/21/83	

Typically, the facility development process can proceed once the State Building Commission authorizes the release of funds for the design and construction of a project that has been approved in the State Budget. There are a total of 38 steps that all State of Wisconsin agencies normally follow in the development of a building project from inception to final inspection and acceptance of the work (See Appendix B for an outline of the building program followed by all State of Wisconsin Agencies).

At the time of the planning for the SEH building, the 38-step facility development process had not been formally identified. Development of the SEH building did, however, follow a process that resembled the 38-step procedure. Since 1983, other steps have been added to the process (For example, in the early 1970's the procedure did not have steps 4, 12, 27, 16, and 31).

There were several issues which can be highlighted which significantly affected the process. The length of the Concept and Budget Report process was an issue brought up several times. One major item during construction which caused some problems with the schedule was the code approval of the roof. Finally, a delay in the completion of the project motivated the DNR to seek damages caused by the delay.

Concept & Budget Report
The Concept and Budget Report was completed by the Architects and submitted to the DSFM (DFD) in March of 1981. The Natural Resources Board approved the Report soon after on March 15. The Report was reviewed and the Architects resubmitted the Report on May for approval from the Building Commission. The Commission did not approve the Report till June 25 ,1981. The total time elapsed from the time the report was submitted to the time it was approved was four months. During this time the project was placed on hold (due to funding problems) by DSFM and the Concept and Budget Report was not submitted to the Building Commission in a timely fashion. The problem with the Concept and Budget Report in this case was that the DNR was, and is, rapidly growing and the program was out of date the day the agency finally occupied the building.

Roof Code Approval Process
A pitched metal roof system was originally conceived of as an alternative design in the Concept and Budget Report estimated to cost an additional $64,410 and providing an annual energy cost avoidance of $650. The decision to provide a pitched metal roof was made later in the design process.

On December 14, 1982, the Architect responded to the DSFM's charge that the Architect was not taking a lead in resolving various issues. One particular problem which frustrated the Architect was the delay in solving the code approval of the roof . An eariler proposal offered by the Architects to use a metal roof system was rejected by the DSFM for not meeting specifications. Further letters with DILHR were required as well before approval was granted. The Architect listed a chronology of events which took place in an effort to get the sloped metal roof system approved which extended the length of the process: the process began February 15, 1982 with the submission of the plans. Eighteen letters of correspondence between the Architects, DSFM and DILHR and 11 months later, the roof was yet to be approved. In fact, on December 14, the Architect had the shop drawings for the metal roof send back to the manufacturer for incomplete data.

Delay in Construction Completion
On June 16, 1983, the DNR seeked damages ($14,224.08) caused by the delay in the completion of the project which represented the cost of extending leases on their current office spaces for one month period. The original completion date was set at July 26, 1983. The project was not substantially complete until September 13. The DSFM (DFD) offered a proposal to prorate the damages on the basis of the amount of each contract. The general response from the contractors was the rejection of any responsibility or the claim that the original date of completion was still possible.

The SEH project was delivered although the contractor went into Chapter 11 toward the end of the project and was cause for some last minute delays. Defective connections in the mechanical system piping caused some delays as well as problems with the laboratory casework contractor. In addition, rain caused a two week delay.

3.0 Project Scope
Program Preparation
For budgetary purposes a detailed program was developed by the agency staff of the DNR SED using the standard DOA format. Decisions were made at upper administrative levels. The district director and the section chiefs were involved in developing the program. After review by DOA staff, the program was then "interpreted" by the architect into an architectural space program. The design report was completed by the architect as per DOA procedure.

The scope was defined by first producing a project evaluation of the present facilities (required by the state to justify a capital budget request). A breakdown of space requested for the new Southeast District Headquarters was then presented. The report also outlined the present facilities occupied by DNR which included six separate locations, all of which were being leased. Finally, the report presented four possible options for relieving their overcrowded conditions in the present facilities. The option for new construction was the recommended action. The program for the SED project called for the preservation of an existing bank building on the site (saving the bank was not a part of the original program). The budget for the SED project was tight, but flexible enough to accommodate changes. Insuring the success of the "community demonstration" aspect of the project (described in next section) was the primary reason for allowing fleibility in the budget.

Location Factors/Site Conditions
The DNR had several goals and objectives for constructing the SEH building in the city of Milwaukee. The DNR felt that since their work increasingly involved urban environmental issues they ought to be a symbolically, and literally, supportive of the city.

The DNR SEH building is located on an urban site at the intersection of N. Martin Luther King Drive and West North Avenue – two significant Milwaukee streets. The area has a relatively high crime rate compared to other parts of the City. As an incentive for the DNR to move to this location, the City of Milwaukee's Department of City

Development assembled the land from individual ownerships, provided all clearing and demolition (several unoccupied commercial buildings), and provided street amenities and landscaping. DNR chose the site and accepted to take part in what was viewed as a "social experiment" to restore and improve the social and economic life of the area. DNR felt that a State presence in the neighborhood might improve the chances of attracting other small businesses to revitalize the commercial area along Martin Luther King Drive.

The goals of the project were as much social as economic. There were many local neighborhood community issues which had to be addressed. For example, DNR initially considered erecting a fence around the property to guard against vandalism. DNR then realized that building what appeared to be a fortress would not serve the purpose of instilling confidence in the neighborhood. As a result, the site was opened up and landscaped to be as friendly to the neighborhood as possible.

The Milwaukee Department of City Development conveyed the site to the State for $1.00 (cleared and ready for construction). Preparation of the site did not require any special site work or environmental remediation. Parking is accommodated on surface lots with 70+ stalls. The parking lot has a gated fence surrounding it with a guard on duty (added later). A bus shelter on the corner of the lot together with a green space and landscape walks were provided as amenities to the neighborhood.

Occupancy

The primary users of the building on a daily basis are SEH staff. There is also considerable use by the general public as this facility is the largest "sales office" of licenses in the state of Wisconsin. The meeting areas in the building are also available for use by various public groups and non-profit organizations. Such use translates to increased electric, heating and security needs. These are viewed as necessary and incremental costs of the commitment to the surrounding community. It is a social policy with financial cost implications.

4.0 Project Outcomes

CASE 1.1: DNR Southeast Headquarters

Gross Square Feet	48,049
Year Constructed	1982

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Bldg. Cost
General	$1,997,808 (b)	$2,156,499	$44.88	70.4%
Mechanical	$379,495	$409,639	$8.53	13.4%
Plumbing	$152,846	$164,987	$3.43	5.4%
Electrical	$308,808	$333,337	$6.94	10.9%
Subtotal	$2,838,957	$3,064,463	$63.78	
BUILDING COST SUBTOTAL	**$2,838,957**	**$3,064,463**		
Building Cost/GSF	**$59**	**$64**		

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Adjusted Cost (a)	Cost/GSF
Demolition/Excavation	$115,739	$124,932	$2.60
Paving/Landscaping	$53,733	$58,001	$1.21
Subtotal	$169,472	$182,934	$3.81
CONSTRUCTION COST SUBTOTAL	**$3,008,429**	**$3,247,396**	
Construction Cost*/GSF	**$63**	**$68**	

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Adjusted Cost (a)	Cost/GSF	% of Const. Cost
DFD	$56,621	$61,119	$1.27	1.9%
A/E	$215,739	$232,876	$4.85	7.2%
Other Fees	$7,493	$8,088	$0.17	0.2%
Subtotal	$279,853	$302,083	$6.29	9.3%
TOTAL PROJECT COST	**$3,288,282**	**$3,549,479**		
Total Project Cost/GSF**	**$68**	**$73.87**		

CHANGE ORDERS

	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Total Proj. Cost
General	$71,989	$77,707	$1.50	2.2%
Mechanical	$1,645	$1,776	$0.03	0.1%
Plumbing	$20,057	$21,650	$0.42	0.6%
Electrical	$41,189	$44,461	$0.86	1.3%
Design & Supervision	$59,742	$64,488	$1.24	1.8%
Subtotal	$194,623	$210,082	$4.05	5.9%

* *Construction Cost = Building Cost+Site Cost*
** *Total Project Cost = Building Cost+Site Cost+Fees*
(a) Adjusted to 1986 construction costs in Madison using Means Local Cost Indexes
(b) Includes landscape office partition

4.0 Project Outcomes, continued

Building Performance
The DNR SEH provided a short-lived solution to the increasing space needs of the SED. The facility was nearly at capacity when first occupied. The expanding scope of responsibilities and services provided by the DNR has made the SEH building inadequate in a relatively short time.

In terms of reaching its goals as a catalyst for renewal of the Martin Luther King Jr. Drive commercial area and neighborhood, the DNR SEH project was less than successful and only moderately successful in attracting businesses to relocate to the area. There is a general increase of vitality on the street, but this has been gradual. Other incentives like the TIF District which may be more responsible for the increase in activity along the street. The DNR does, however, serve as a symbol for the improved economic stability of the area. Apparently, the Walgreens on the other side of Martin Luther King Drive may be the highest grossing store in Wisconsin.

There is no evidence that the energy conservation measures demonstrated the claimed payback; there was little follow-up evaluation to confirm the claim.

Overall, the SEH is considered a successful project. Effectiveness of the process for the SED project was "very similar" to expectations for most projects. In general, the process developed a good working relationship with the City and overall a good building, however, expansion potentials were not sufficiently addressed.

The building's design capacity of 130 was exceeded within a year of occupancy and has been overcrowded since. Currently, the building is occupied by 183 permanent staff, a full 41% over building design capacity.

The SED is presently studying the options for relocating Environmental Quality program staff to field stations around the district, expanding at the present site, or building a completely new building. The staff in general is pleased with the building as a quality constructed product, however, the process by which the building was defined according to present needs did not take the future growth needs of the SED into consideration.

Case 1-2
Warzyn Corporate Headquarters Building
Madison, Wisconsin

Architects: Potter, Lawson & Powlowsky
General Contractor: Findorff Construction

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Warzyn Building in Madison, Wisconsin.

1.0 Organizational Context
The Warzyn corporation, at the time of the planning and construction of their new Madison headquarters, was a four-person partnership. The four partners bought out the original owner Willard Warzyn in 1977 through the purchase corporate stock and existing facilities.

There are several groups which make up the Warzyn organization. The Operations group contains all technical staff located in various sites throughout the State. The Operations group manager reports to the vice president of operations at each location. The Client Services groups include oil and gas, chemicals, manufacturing, solid and hazaradas waste. The Mid-West Region includes offices in Detroit, Madison, Milwaukee and Chicago. All total, the corporation has nearly 20 project managers who are responsible for bringing the work in and building and maintaining client relations.

The most recent mission statement was written in 1990, shortly after the organization had gone through a re-organization. The goal was to increase staff to 1,200 people. The firm Warzyn started in 1955 and at that time they were the only geotechnical engineering and soils and foundation engineering firm in the State of Wisconsin. They started with a half a dozen employees. In 1965 the staff increased to 25. In 1977, the corporation bought out Warzyn which had about 45 staff members.

In addition to geotechnical engineering, they did materials testing and general civil and structural engineering. Warzyn was involved in a number of environmental engineering areas: Solid waste engineering in early 1970s; permits and developing landfils in Wisconsin; subsurface topographic ground water issues; and hydro-geology. Warzyn was not comfortable with the direction the firm was taking on the environmental side. In the 1980s the firm developed rapidly after 1985, and by 1989, 75% of the corporation was environmental, and only 25% was civil/geo-technical engineering. Issues about allocations of resources in various parts of the business caused a split between these two aspects of the business, and in 1990, 85 people left Warzyn (42% of firm ownership left). What remains is an environmentally focused service. Approximately a staff of 320 dropped to 225. The corporation has since grown back to about 275.

Warzyn has seven office locations in addition to the present facility in Madison. The facility currently houses 125 staff members. In June of 1993 they moved their remaining staff in the area into the building filling the building to capacity (125 occupants).

The corporation put an addition on their existing building in 1980, but outgrew the building. In 1984, they began to make plans to build a new building which would be large enough for their entire staff to occupy. At that time, they had staff in three and four different locations and organizationally the operation of the corporation was a bit inefficient.

Warzyn has had some experience constructing a similar sized facility in Chicago soon after the construction of this facility. At the time plans were being made for the building, Warzyn had offices in Madison and Milwaukee only. The Warzyn Corporation itself leases all its space and owns no buildings. The buildings are owned by a partnership organized as a separate corporate entity from Warzyn. Warzyn plans the building and has the building leased back to the corporation.

Warzyn's mission is to become an environmental firm with a national presence. Their ultimate objective is to grow to be a 1000-1500 firm in ten years, with 6-8 regional office centers supporting overall about 25-30 offices. According to Warzyn, this size is typical of large environmental services firms. To service nationally need plant sites around country need to have local knowldege and local contacts with various environmental agencies and regulators.

2.0 Facility Development Process

The following is a summary of the major activities which took place during the Facility Development Process of the Warzyn Building:

Events	Date	Description
2.1 **Capital Budget Requests Process**	N/A	N/A
2.2 **Definition of Scope**	April, 1984	Request for Proposal sent out
2.3 **Staff/Consultant Selection**	June, 1984	RFPs received Retained Findorff/ Potter-Lawson Began negotiations with the City of Madison and the University of Wisconsin with respect to an Industrial Revenue Bond.
	Dec., 1984	Agreement with lending institution on industrial development revenue bond
	February 14, 1985	Signed contract with lending institution for bond Ground breaking
2.4 **Design Development & Review**	N/A	
2.5 **Construction Documents & Estimates**	N/A	
2.6 **Bids & Contract Negotiations**	N/A	(Contract negotiated at inception of project design and planning stages - see above)
2.7 **Construction & Project Management**	April, 1985	Construction Begins
	November, 1985	Substantial Competition
2.8 **Occupancy & Facility Management**	November, 1985	Occupancy

Due to some limited experiences with a renovation and addition project at one of their branch offices, Warzyn had a good sense of the process. The facility developement process for the Warzyn Building followed the Design/Build model. A request for proposals was sent out to three different developers. One of the main driving forces in the selection decision was location and the fact that one developer could finance the building with an industrial development bond. Findorf /Potter Lawson was eventually selected. Warzyn had done work with Findorf in the past, and the partners of Warzyn had respect for the work of Potter Lawson as well.

The budget for the building (which included all fees) was negotiated up front in the contract with Findorf/Potter-Lawson. The Warzyn Building was financed through an industrial revenue bond. The maximum budget originally set at $1,850,000 and eventually when way beyond this initial figure which was arrived at by calculating the square feet they were working with and needed and had a square foot price of $ 50-60/GSF.

The program and design process consisted of three months of intensive discussions with the architect and contractor. Potter-Lawson proposed several different office types from whichWarzyn could choose. Warzyn opted to use their own in-house engineering staff to provide structural design and civil design services. The costs associated with these services were later deducted from Findorf/Potter-Lawson's total fee.

During design development there were bi-weekly meetings to review proposed building systems. Of the four partners at that time, one, a civil engineer, was quite involved in design and construction phases of the project. He acted as the client representative ("point-person") for the architect and contractor.

During construction, it was discovered that the design of the mechanical system was underestimated for the size of the actual laboratory space. The problem orignated in the design phase: at the time of the programming of the building, laboratory space requirements were not known. The mechanical engineers estimated the load with the information that was available at the time. During the later phases in the process, the size and requirements of the laboratory space became clearer, but the mechanical systems design did not change. It was not until the construction phases that the lab requirements were fully known; causing the need for a change order. An additional $200,000 was required to make the necessary modifications in the mechanical system. The owner with whom we talked was not concerned about the oversight. From his point-of-view, the work would need to be done anyway.

The building associates have a triple-net lease with the corporation: all operation and maintenance responsibilities lie with the corporation. The building associates are advised of any changes the corporation is planning to make in the building, however the building associates have incurred no costs to date. There has been a nominal amount of modification in partitioning systems, but no major reorganizations or renovations.

3.0 Project Scope

The program was included in the RFP which was initially prepared in-house. After the selection of developer the program was refined during subsequent meetings with the architect. The main goal of the project was to provide for efficient office space. One of the primary drivers was the need for an analytical laboratory: soils and materials testing were housed at another site near by. Warzyn required a sophisticated laboratory in the new facility, in addition to office space. The layout of office workspace had to allow for interaction and association between the different operating groups within the firm

In the Summer of 1984 Warzyn was actively looking for property on which to build their new facility. They had several alternatives, one of which was locating in the UW-Madison University Research Park which provided the best location for their regional business. For instance, they had working relationships with several professors at the university on the geo-technical end of their business. There were two main reasons for locating to the research park: location, and the covenance policy established in the park with respect to the development of the property was acceptable. They were the type and size of business the university was most interested in working with. Warzyn subsequently became the first tenant of the park. Warzyn bergan using the library as a resource, as well as the university computer center which helped increase the sophistication of their services.

Warzyn negotiated a 50 year ground lease with the ability to extend it to 100 years. The owners feel the ground lease arrangement may be a disadvantage for prospective developers and may explain why the university has had such slow development in the park.
The site is relatively flat and there are no major subsurface problems to contend with. The building layout is quite efficient for Warzyn's needs. However, with the restrictions and covenants which are associated with the property, and the size of the property, they were limited as to how many parking spaces they were allowed dictating the square footage of building possible. Ultimately, they could only develop up to 55,000 GSF of building on the site. Warzyn eventually developed 32,000 GSF with the understanding that they could expand the building to 55,000 GSF at a later date.

Warzyn planned for 32,000 SF which included 5,000 GSF extra space for lease, and eventually for future expansion. However, at the time of occupancy, they quickly occupied the additional space. The additional space was initially a dedicated drafting area.

Two years later Warzyn was forced to lease an additional 7,500 GSF of space and moved their executive, accounting, and human resource groups to that location. They also leased additional 2,500 GSF of lab space from the university located near by soon after. Rent is economical to other locations

4.0 Project Outcomes

CASE 1.2: Warzyn Engineering

Gross Square Feet	31,585
Year Constructed	1986

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Cost/GSF	% of Bldg. Cost
General	$979,129	$31.00	67.5%
Mechanical	$323,164 (a)	$10.23	22.3%
Plumbing			
Electrical	$147,650	$4.67	10.2%
Subtotal	$1,449,943	$45.91	

BUILDING COST SUBTOTAL	**$1,449,943**
Building Cost/GSF	**$46**

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Cost/GSF
Demolition/Excavation	$54,407	$1.72
Paving/Landscaping	$43,250	$1.37
Subtotal	$97,657	$3.09

CONSTRUCTION COST SUBTOTAL	**$1,547,600**
Construction Cost*/GSF	**$49**

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Cost/GSF	% of Const. Cost
A/E	$153,600	$4.86	9.9%
Other Fees			
Subtotal	$153,600	$4.86	9.9%

TOTAL PROJECT COST	**$1,701,200**
Total Project Cost/GSF**	**$54**

CHANGE ORDERS

	Actual Cost	Cost/GSF	% of Total Proj. Cost
General	$187,424 (b)	$5.93	11.0%
Mechanical			
Plumbing			
Electrical			
Design & Supervision			
Subtotal	$187,424	$5.93	11.0%

* *Construction Cost = Building Cost+Site Cost*
** *Total Project Cost = Building Cost+Site Cost+Fees*
(a) *Includes Plumbing*
(b) *For all categories (breakdown unavailable)*

4.0 Project Outcomes, continued.

Building Performance

Workstations with 5 1/2 foot stationary studded partitions are located around the perimeter of the building, while the full height partitions are in the center of the office space. In all space leased after this design they have gone to office partition furniture systems (Steelcase or Herman Miller) and full height partitions on the exterior for more flexibility. Are going to spend about 40,000 to modify spaces for additional staff relocating in June.

The performance of the building has been fair to good. There have been a few minor mechanical equipment problems; two years after occupancy Warzyn hired Honeywell to help them monitor their mechanical systems.

The mission of being a multiple location firm, leasing additional space was not seen as a major disadvantage. Warzyn intentionally leased space as a strategy for follow changes in the market. The decision to lease space in a particular area was to limit their growth in that area. Warzyn's ground lease runs in 1995 and the company may seek other space at that time. Changes in work strategies in the analytical laboratory are the motivator for a possible move: the laboratory has grown significantly and has occupied the entire basement level and expect this growth to continue in the near future. In general, organizational changes have allowed the company from becoming overcrowded in the present facility.

Case 2-1:
Waukesha State Office Building
Waukesha, WI
DSFM Project Number 8004-53

Architects:	Brust-Zimmerman, Milwaukee, WI
General Contractor:	A. Guenther & Sons Co., Inc., West Allis, WI
Mechanical:	Bon Heating & A/C, Milwaukee, WI
Electrical:	Uihlein Electric Co., Inc, Brookfield, WI
Plumbing:	R.A. Bachman Co., Milwaukee, WI

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Waukesha State Office Building.

1.0 Organizational Context
The main motivation to build the Waukesha State Office Building concerned the Department of Transportation's plans to administratively merge the Milwaukee and Waukesha offices providing space for over approximately 500 employees. It was estimated that a savings in operating costs -- close to $1 million -- from the reduction of thirty-three authorized positions made possible by the physical consolidation of the district offices.

One siting option was to provide an addition to the existing DOT office building located in Waukesha. The existing offices of the DOT in Waukesha was built in 1955 with additions in 1964 and 1970. The accrued depreciation to elements of the building did not warrant a further addition to accommodate this change in organization. Therefore, the option of providing a new state office building for the agency was sought.

During the planning process, the State of Wisconsin DOA made the decision to investigate the possibility of consolidating a number of state agencies in the Milwaukee-Waukesha region who were collectively leasing nearly 30,000 square feet of space at an annual cost of over $200,000 in various locations in Waukesha and Brookfield. A recommendation was sent to the Building Commission in the 1979-81 Biennium. The project was consistent with the Wisconsin Building Commission's Urban Policy statement adopted in December of 1979.

The motivation for the Waukesha State Office Building Project was to consolidate into one state-owned facility the various tenant agencies presently housed in either leased or other state-owned space in the district. It was believed that the consolidation of these agencies would provide greater convenience to citizens seeking services from one or more of the agencies and result in long term cost savings to the State over continuing to rely on leasing. These tenant agencies included the district offices of the Department of Transportation, Health and Human Services, Industry, Labor and Human Relations, and Revenue. The leases in these state agencies projected to occupy the proposed building were to expire. The rationale for consolidating these various agencies were due in part to the projection that lease costs were expected to escalate in the following years.

2.0 Facility Development Process

Event	Date	Description
Request to Building Commission	79-81 Biennium	Recommended the construction of a new District Office Facility at a cost of $10.7 million as part of the State's Milwaukee/Waukesha Office Buildingsto consolidate in one facility the District offices of the DOT, Health and Human Services, Industry, Labor and Human Relations, and Revenue.
Funds approved for planning	4/23/80	Approved the release of $232,000 of BTF-Planning to prepare an Environmental Impact Statement, appraisals, a program statement, a Concept and Budget Report, and preliminary plans for the construction of a State Office Building at a cost of $7.95 million of 1979-81 general fund supported borrowing.
		Consultants begin examining environmental impacts and as of the date had not completed the Environmental Impact Statement of several sites under consideration for acquisition (Wilbur Lumber Yard and Barstow Street School sites preferred over current DOT and Martin Street sites).
Status Report to Building Commission	1/28/81	The Commission and the DOA recommended that the Department secure options on the Wilbur Lumber Yard site (3.5 acres) and the Barstow School site (1.6 acres) and that the development of the Concept and Budget Report continue for a building of approximately 100,000 GSF for the D.O.T.'s 517 employees and 317 visitors.
Site Selection Approved	3/25/81	The Building Commission approved the request to purchase one 3.6 acre parcel of land (Wilbur Lumber Yard) for the proposed State Office Building in Waukesha at a price not to exceed $460,000 in advanced land Acquisition Funds.
Request release of funds for Concept & Budget	5/27/81	The Building Commission approved a request for the release of $120,000 to plan, bid and demolish the existing structure on the project site.
Concept & Budget Report completed and submitted to the Building Commission for approval	6/81	The Concept and Budget Report called for the demolition of nine existing structures on the acquired site by August, 1981; complete construction by August 1982 which coincides with the expiration of leases on 18,811 SF of space for various agencies scheduled to move in. To meet this schedule the architects suggested that the project be bid in five phases.
Completion of Construction Documents	11/81	Design work overlapped with construction phase.
Bid Opening: Phase I	7/28/81	Base Bid No.1: Demolition
Award of Contract: Phase I	8/3/81	
Bid Opening: Phase II	10/20/81	Base Bid No. 2: Site Work
Award of Contract: Phase II	10/23/81	
Bid Opening: Phase III	11/24/81	Base Bid No. 3: General, HVAC, Electrical & Plumbing
Award of Contract: Phase III	12/7/81	
Request for funds for moveable equipment budget	1/28/82	Request authorization to increase the movable equipment budget by $141,400 for a revised total movable equipment budget of $540,240.
Substantial Completion	3/83???	Contractor continued to complete interior space planning work while tenants began occupying portions of the space.
Occupancy	3/83	
Art Work	11/29/83	
Energy Conservation Report	1/4/85	As built analysis of energy consumption
	4/14/86	Construction of Entry Canopy
Project Close-out	1/21/88	Close-out dates varied by contract. The GC closed out 2/84, while the EC closed out as late as 2/88.

The DOT was the primary tenant and was involved earily on the process with DFD before other tenants were found for the project.

Several scope items were modified late in the planning process which added to the eventual cost of the building. At the time, the State had mandated a statutory requirement to consider life-cycle costs on building systems; and as a result, this project was caught up in this trend. The design included an energy management system, passive solar design, heat pumps, an underground water storage tank that retained excess heat from people and equipment, and photocells that dim fluorescent lighting as daylighting increases. A high density storage system was added that required a few bays in the building to be additionally reinforced. Finally, the Building Commission, concerned about roof leaks in flat roofing systems throughout the state, mandated a change in the roof design from the original flat roofing system to a pitched metal roofing system due to that added an additional $180,000 to the project budget.

The bid package of five phases was proposed as a way of saving both time and money in the construction of the project. Phase I consisted of demolition; Phase II consisted of site preparation, excavation, structure and enclosing envelope; Phase III consisted of separate lump sum bids for nine contracts: general construction, landscaping, plumbing and sewerage, HVAC, electrical, fire protection, elevator work, building management, and testing and balancing; Phase IV consisted of interior layout, furniture, equipment and miscellaneous; and Phase V consisted of site development. The entire process--from award of contract to completion of construction--was scheduled to take a total of 13 months. It placed greater demand on the consultant and the DOA to contain costs. All phases would be bid in accordance with existing statutes. The phased bid procedure would permit construction to start in the fall while the bid documents for the later phases are being completed. Foundation work would be completed before winter weather set in and above ground structural work could be placed until late December with initial construction taking place in the Spring of 1982. The architects claimed that this phased bid procedure could save both time and money. For instance, the architects claimed that 6 months could be saved in proceeding with phased bids. It is not clear that this occurred.

Construction fell behind the schedule, due to late deliveries of the furniture and metal roofing systems. Later, internal space planning continued after the building shell was provided by the contractor. The various state agencies were facing penalties for violating expiring leases. The contractor claimed that the late delivery of the metal roofing system caused him to be late, arguing that only one manufacturer and proprietary system fit the project specifications. The DOA filed a claim against the contractor and the two parties came to negotiated settlement for damages incurred.

3.0 Project Scope

The project consists of a four story, reinforced concrete, exterior precase concrete walls, standing seam metal roof, 98,000 GSF of office and support space consolidated in one facility the District offices of the DOT, Health and Human Services, Industry, Labor and Human Relations, and Revenue. Office, Labs, records, storage, data processing, cafeteria, conference rooms, receiving and shops.

Convenient public access and maximizing natural light were goals of the agency in the design of the project. The design provided a stepped back form which would admittedly cost more in initial up-front costs over a more conventional rectangular building. Use of natural daylighting was chosen over the use of solar energy devices to reduce the need for artificial lighting (passive solar design)

Site feature: greatest natural feature is its proximity to the Fox River. ALthough the riverfront had origianlly been devoted to industrial development, the City of Waukesha's long term plans call for a series of greenways and achnowlegdment of the river for occupants and visitors of the facility. Its presence is likely to increase the City's desire to improve the riverfront.

4.0 Project Outcomes

CASE 2.1: Waukesha State Office Building

Gross Square Feet	103,911
Year Constructed	1983

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Bldg. Cost
General	$3,559,021	$4,516,109	$43.46	68%
Mechanical	$796,448	$1,010,628	$9.73	15%
Plumbing	$161,527	$204,965	$1.97	3%
Electrical	$726,363	$921,696	$8.87	14%
Subtotal	$5,243,359	$6,653,397	$64.03	
BUILDING COST SUBTOTAL	**$5,243,359**	**$6,653,397**		
Building Cost/GSF	**$50**	**$64**		

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Adjusted Cost (a)	Cost/GSF
Demolition/Excavation	$190,940	$242,287	$2.33
Paving/Landscaping	$41,569	$52,748	$0.51
Subtotal	$232,509	$295,035	$2.84
CONSTRUCTION COST SUBTOTAL	**$5,475,868**	**$6,948,433**	
Construction Cost*/GSF	**$53**	**$67**	

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Adjusted Cost (a)	Cost/GSF	% of Const. Cost
DFD(DSFM)	$100,890	$128,021	$1.23	1.8%
A/E	$470,300	$596,773	$5.74	8.6%
Other Fees	$77,904	$98,854	$0.95	1.4%
Subtotal	$649,094	$823,648	$7.93	11.9%
TOTAL PROJECT COST	**$6,124,962**	**$7,772,080**		
Total Project Cost/GSF**	**$59**	**$75**		

CHANGE ORDERS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Total Proj. Cost
General	$162,373	$206,038	$1.56	2.7%
Mechanical	$115,005	$145,932	$1.11	1.9%
Plumbing	$32,127	$40,767	$0.31	0.5%
Electrical	$121,963	$154,761	$1.17	2.0%
Subtotal	$431,468	$547,498	$4.15	7.0%

* *Construction Cost = Building Cost+Site Cost*

** *Total Project Cost = Building Cost+Site Cost+Fees*

(a) *Adjusted to 1992 construction costs in Milwaukee using Means Local Cost Indexes*

Case 2-2
Flserv Corporate Headquarters Building
Brookfield, Wisconsin

Architect:	Kahler Slater
General Contractor:	Gilbane Properties, Inc Jansen Construction, Brookfield

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Flserv Corporate Headquarters Building.

1.0 Organizational Context
Flserv, founded in 1984, is a fast growing single-source provider for advanced financial data processing systems and information management products and services to banks, credit unions, thrifts, mortgage firms, savings institutions and other financial intermediares. They are also a provider of electronic banking and item processing services nationally. They have increased their client base from 170 in 1984 to over 2,500 in 1993. An example of one component of their ongoing growth is their acquision strategy: they have acquired and merged with 47 organizations since their founding. Flserv employs over 6,300 professionals and operates full-service data centers, software system development centers, item processing and support centers in 61 cities, including international offices. Flserv's total assets in 1993 reached nearly $1.2 billion.

In 1983, Flserv was a subsiduary of a Milwaukee bank and was located in West Allis housing a total of 90 employees. At that time, they broke away from the bank and formed what was eventually to know as Flserv. In the process, the company quickly experienced rapid growth and began looking for additional space. The decision was made, in early 1991, to build a new corporate headquarters building. By the time they occupied the new building a year later they had grown to nearly 400 employees.

2.0 Facility Development Process

Event	Date	Description
Project Feasibility	3/91	Project was originally conceived as a joint partnership between Gilbain and Flserv in which Flserv entertained lease-back proposals. Flserv made the decision to own to building. Flserv contracted with Gilbain would function as a guarentor and manager of all property transactions.
Site Selection	5/91	Several land options were explored in the Brookfield area
	7/3/91	Jansen Construction retained by Gilbain for design/build services
Program meetings with staff	7/3/91	Kahler Slater contracted with Jansen to do design work.
Completion of construction documents	9/27/91	
Award of contract	9/31/91	
Building permit	10/7/91	
Substantial completion	7/92	
Occupancy	7/4/92	

Change Orders
there were a total of $564,000 in change orders mostly in the computer facilities which the design was further refined during the construction phases. $250,000 was attributable to electrical changes while $75,000 was attributable to mechanical changes.

3.0 Project Scope
No formal program was developed, however, the architects arranged several meetings with various Flserve staff. In addition, each department was asked to submit responses to a questionnaire and outline their five year plan. This information served as the building design criteria. The program called for a 120,000 GSF, three-story bulding to contain executive offices, conference rooms, various storage rooms and support space, a cafeteria (no kitchen), and a large computer room with special air conditioning requirements. The project also called for extensive landscaping and a 300 stall surface parking lot on the chosen 20 acre site.

4.0 Project Outcomes

CASE 2.2: Fiserv Headquarters

Gross Square Feet	112,786
Year Constructed	1992

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Cost/GSF	% of Bldg. Cost
General	$4,344,000	$38.52	64%
Mechanical	$881,130	$7.81	13%
Plumbing	$263,917	$2.34	4%
Electrical	$1,279,058	$11.34	19%
Subtotal	$6,768,105	$60.01	

BUILDING COST SUBTOTAL	**$6,768,105**
Building Cost/GSF	**$60**

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Cost/GSF
Demolition/Excavation	$501,196	$4.44
Paving/Landscaping	$345,900	$3.07
Subtotal	$847,096	$7.51

CONSTRUCTION COST SUBTOTAL	**$7,615,201**
Construction Cost*/GSF	**$68**

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Cost/GSF	% of Const. Cost
A/E	$568,861	$5.04	7.5%
Other Fees	$13,000	$0.12	0.2%
Subtotal	$581,861	$5.16	7.6%

TOTAL PROJECT COST	**$8,197,062**
Total Project Cost/GSF**	**$73**

CHANGE ORDERS

GMPE	Actual Cost	Cost/GSF	% of Total Proj. Cost
General	$364,786 (a)	$3.23	4.5%
Mechanical			
Plumbing			
Electrical			
Design & Supervision			
Subtotal	$364,786	$3.23	4.5%

* *Construction Cost = Building Cost+Site Cost*
** *Total Project Cost = Building Cost+Site Cost+Fee*
(a) *For all categories (breakdown unavailable)*

Case 3-1
Stores/Extension Services Facility
University of Wisconsin-Madison
Madison, Wisconsin
DSFM Project Number 7906-09

Architects:	Krueger Shutter & Associates, Inc., Madison, WI
General Contractor:	Corporate Construction Ltd.

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Stores/Extension Services Facility.

1.0 Organizational Context
The Stores facility performs a major merchandising function for the University. It stocks and delivers over 5,500 catalog items which are in regular demand on the campus. The purpose is to provide timely service to UW-Madison research and teaching activities and to purchase these supplies in large quanities to obtain lower prices at savings to the University and to maintain stocks of supplies that are not stored and readily available from other sources. The project is necessary to reduce the inefficiencies of operating at two locations, locate to a more structurally sound building and modernize the operation. The new facility would house the merchandising operation in a building physically suited for handling the diversified stocks in a safe and efficient manner.

The UW Extension Duplicating Services serves the copy printing and duplicating needs of the University of Wisconsin System as well as University Extension. The department employs 52 full-time people who work in a variety of fields including graphic arts, offset printing and publication advising among many others. The volume of work increased fourfold since 1963 when the operation was first created, yet the operations continued to be housed in an 8,200 square foot basement facility during most of this period of growth. An additional 5,000 square feet of leased space was acquired during this period to accommodate the increase in volume. The increase in volume has resulted in cramped space conditions in both locations that impared the efficiency of the operation in terms of delivery, storage and shipping. In addition, four other functions associated with UW Extension, namely, 4-H bulletin distribution, Bulk Mail Operation, Agricultural Bulletin operations, and the Duplicating operations if combined were seen as eliminating further the duplication of similar functions and provide operational and administrative efficiencies within a facility suited for handling those functions.

2.0 Facility Development Process

Event	Date	Description
Request to Building Commission	11/01/74	The UW Stores/Extension Services Building is included in authorized 1975-77 capital building program at $2.0 million for purchase of a facility (Board of Regents, Resolution 894).
Request for advanced planning funds for Concept & Budget Report	6/26/75	Advanced funds ($27,000) were approved for the Stores/Extension Services Building (one of 18 total UW System projects approved on this date).
Site Selection	3/29/76	At the time, Madison Stores had 52,000 NASF with an additional estimated need of 40,000 NASF for a total need of 94,550 NASF. The additional 40,000 NASF included a need for: 20,000 for unheated warehouse space; 5,000 for heated warehouse space; 5,000 for office, and; 10,000 for printing, mailing and labeling work. The UW System considered the potential use of the Coca Cola Plant and the old Red Owl store to house the Stores/Extension Services Facility. The total amount of space available including new warehouse space that would need to be provided was 119,079 GSF.
Feasibility Study	8/23/77	The Building Commission approved a request by the UW System to release $15,000 to study the feasibility of using the existing General Services Building for some or all of the UW Madison Stores and UW-Extension Services space needs. The funds would be used to investigate ways to consolidate similar functions of the UW and DOA that operate out of the General Services Facility.
Request release of funds for Concept & Budget	5/22/79	A request for $36,000 in funding was forwarded to the Building Commission for the preparation of a Concept and Budget report that details the renovation of a nexisting building on the North Murray site.
Land Appraisal	12/5/80	the Regular Board adopted the resolution to secure appraisals and an option for the purchase of a 1.22 acre parcel of improved land on North Murray Street in the City of Madison for the site of the future Stores/Extension facility.
Request for additional building trust funds for A/E services	11/3/81	The Building Commission approved a request for the release of an additional $10,000 of Building Trust Funds for additional A/E services for the project. The funds were to be used to pay for redesign services due to the change in siting for the facility from the original Charter Street location to the North Murray site.
Concept & Budget Report completed and submitted to the Building Commission for approval	2/82	The stated purpose of the project was "to combine the existing Stores mechandising operationat 29 North Charter Street with extension services (presently housed at five locations) into a new, safe, and efficient facility." The program called for 54,000 NASF of additional space. The budget was estimated at $2,322,000 -- a full $322,000 over the authorized building program enumeration of the General Fund Supported Borrowing for this project. The schedule estimated the completion of construction in May of 1983 and occupancy in June of 1993.
Request withdrawn for approval of Concept & Budget Report	2/82	Systems Adminstration withdrew their request for the approval of the Concept and Budget Report which asked for a total increase in budget of $682,000 for a revised total project cost of $2,682,000. This increase included the authority to purchase one 1.22 acre parcel of improved land for $360,000 and the release of an additional $85,000 for the preparation of final plans and specifications among other additional costs.
Concept & Budget Report approved and purchase of land	11/23/82	A revised concept and budget report was resubmitted and approved. Explanations for the increase in project cost (changes in program scope from the intent of original funding) were accepted.
Request the release of additional funds for A/E services	11/82	Request the release of additional funds for completion of design and authorization to complete bidding and construction
Completion of construction documents	4/83	
Bid opening	12/21/83	The bids were determined to be in excess of the available funds. Subsequently, DSFM and UW-Madison DPC personnel worked with the A/E and Contractor toward the identification of acceptable negotiated revisions that would result in a reduction in project cost and construction of a viable facility. A post-bid budget of $2,484,000 was agreed on which exceeded the previously authorized budget by $162,000.
Request for additional funds	2/21/84	The Building Commission Request for an additional $162,000 was approved for a total project cost of $2,484,000.
Award of contract	4/5/84	Corporate Construction Ltd. is awarded a contract for $2,176,475.
Substantial completion of construction	???	The construction process proceeded with few major problems.
		Final payment certificate 2/11/87
Occupancy	Fall, 1985	
Project close-out	6/10/88	

The major problem in the beginning was the site selection process conducted for this project. Due to the changes in site, changes in scope and complexity of the building design caused increased costs. These budget cost overruns slowed the planning process down taking x amount of months.

The design process was complicated by the change in siting for the building. Cost overruns continued to plague the project during the bidding and negotiation phases.

Once the design was completed and construction contracts were signed, the construction process proceeded smoothly.

Change Order Issues

A total of six change orders were issued with a total of 50 individual issued construction bulletins for a total cost of approximately $31,000 or only 1.5% of the total cost of the project. The changes were items that are typical with any construction process: relocating electrical service, adding sidelights, adding masonry control joints to certain interior walls, changes required to meet DILHR code requirements, addition of concrete walks, etc. The largest cost item totalled $4,800.

4.0 Project Outcomes

CASE 3.1: Stores Extension Service Facility

Gross Square Feet	59,632
Year Constructed	1985

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Bldg. Cost
General	$1,393,271	$1,813,315	$30.41	69%
Mechanical	$376,000	$489,357	$8.21	19%
Plumbing	$68,000	$88,501	$1.48	3%
Electrical	$182,000	$236,869	$3.97	9%
Subtotal	$2,019,271	$2,628,042	$44.07	

BUILDING COST SUBTOTAL	**$2,019,271**	**$2,628,042**
Building Cost/GSF	**$34**	**$44**

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Adjusted Cost (a)	Cost/GSF
All Site work	$199,008 (b)	$259,005	$4.34
Subtotal	$199,008	$259,005	$4.34

CONSTRUCTION COST SUBTOTAL	**$2,218,279**	**$2,887,047**
Construction Cost*/GSF	**$37**	**$48**

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Adjusted Cost (a)	Cost/GSF	% of Const. Cost
DFD (DSFM)	$43,550	$56,679	$0.95	2.0%
A/E	$134,163	$174,611	$2.93	6.0%
Other Fees	$11,176	$14,545	$0.24	0.5%
Subtotal	$188,889	$245,835	$4.12	8.5%

TOTAL PROJECT COST	**$2,407,168**	**$3,132,883**
Total Project Cost/GSF**	**$40**	**$53**

CHANGE ORDERS

	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Total Proj. Cost
General	$21,704	$28,248	$0.36	0.9%
Mechanical	$2,829	$3,682	$0.05	0.1%
Plumbing				
Electrical	$7,141	$9,294	$0.12	0.3%
Design & Supervision				
Subtotal	$31,674	$41,223	$0.53	1.3%

* *Construction Cost = Building Cost+Site Cost*
** *Total Project Cost = Building Cost+Site Cost+Fees*
(a) *Adjusted to 1993 construction costs in Milwaukee using Means Local Cost Indexes*
(b) *Includes Demo, Site, Earthwk, Pave, Landscp.*

Case 3-2:
Electromotive Systems, Inc.
N49 W13650 Campbell Drive
Menomonee Falls, Wisconsin

Architect: Eppstein, Keller, Uhen Architects, Milwaukee, Wisconsin.
General Contractor: Berghammer, Milwaukee, Wisconsin

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Electromotive Systems Facility.

1.0 Organizational Context
Electromotive Systems, Inc.,created in 1981, manufactures adjustable frequency motor controls, automation products and electrification components and systems for the overhead material handling industry. The company had relocated once before to a 20,000 square foot facility when, in 1985, they expanded their business to include the manufacture of motor controls. Soon after this relocation, Electromotive required an additional 15,000 square feet of manufacturing space and were operating out of three separate facilities. In 1990, in addition to the growth Electromotive was experiencing in the Milwaukee area, the company expanded into the international market through a German subsidiary, Electromotive Systems, GmbH. At the time of the project's inception the company had a total of 80 employees scattered at three sites.

2.0 Facility Development Process

Event	Date	Description
Project Inception	11/91	Electromotive made the decision to build a new centralized facility over leasing additional space
Retained Architect	12/91	Eppstein Keller Uhen was retained by Electromotive Systems, Inc. to prepare schematic design scope documents and a proposal package in order to receive proposals from qualified construction managers. Eppstein conducted extensive interviewing, programming and design of the Electromotive Systems staff.
Request for Proposals	2/28/92	RFP was sent prospective contractors
Request for Proposals Received	6/25/92	Berghammer submits a proposal to construct the Electromotives 47,000GSF building for $1,598,375.
Meetings held with Applicants	6/30/92	Meeting between Berghammer and Electomotive to discuss proposal.
Notice of Award	7/7/92	Berghammer to be construction manager charged with managing all sub-contracts in a design/build process. The owner indicated they would like to occupy 3/1/93 at a total cost of $1,538,375. The owner desired to value engineer the cost of the project down to $1.45 million.
Award of Contract	7/14/92	
Building Permit	8/25/92	
Substantial Completion of Construction	3/15/93	
Occupancy	3/18/93	Occupancy permit was issued
Project Close-out	9/8/93	

Electromotive Systems, Inc. realized that a new central facility would unite their service and manufacturing functions and greatly increase their operating efficiency. Electromotive, consulting with EKU, determined their space needs to be approximately 47,000 GSF of office and manufacturing space. In addition, the facility would need to allow for the option of expanding the warehouse facility area within three to five years.

The contractor was involved in the beginning of the process and acted as the construction manager hiring EKU to complete the design services. Price alternatives were discussed earlier in the process there by minimizing incremental costs of the project. The team approach advocated by Berghammer is the central component of what they call their Modified Construction Management process (MCM). The MCM describes the process of assembling the entire project team in the early stages of a construction project in order to perform Value Engineering and achieve a more cost effective space solution for the client. In the MCM process, during the estimating stages, the construction manager obtains at least three competitive bids on each item with the exception of carpentry and concrete work. Projects are broken down into 20 to 25 subcontract categories instead of being packaged into three or four prime contracts --This strategy eliminates sub-contractor mark-ups on their "packaged" work. At this stage, all major sub-contractors are selected and a guaranteed maximum price is established. A construction schedule is established and regular progress meetings are held. As costs accumulate, the construction manager's books are open for inspection. In addition, on MCM contracts, Berghammer offers a two year guarantee: they promise to give their profit back should they miss the completion date (guarantee does not include plumbing, heating and electrical work which is covered by a one year guarantee).

Change Orders

There were 15 separate items in change order No.1 totalling $112,177 which included a mezzanine and air conditioning to the Shop area both owner initiated decisions. These two items accounted for the majority of this first change order list. There were over 73 items in change order No.2 totalling $75,920. These items consisted to numerous revisions to general construction drawings, upgrading electrical and mechanical system items, and various other minor changes.

During June of 1993, Berghammer was formally evaluated by the owner representative of Electromotive. Electromotive agreed that the project team "asked the right questions and took time to understand our overall space needs, worked with the project architect to develop a good project design,...was sensitive to our budget constraints during the pre-construction phase,...worked to bring all team members together in a unified effort on our behalf,...promptly informed of changes in design, cost and schedule in all phases of the project,...my project was completed to my satisfaction, and the construction site was clean and organized throughout the project,...I was satisfied with the timeliness required to complete the project and the quality of craftsmanship and attention to detail. In summary, the owner commented that the project was "very well coordinated". The only complaint by the owner was that his phone calls were not returned by the project manager within 24 hours.

4.0 Project Outcomes

CASE 3.2: Electromotive Systems, Inc.

Gross Square Feet	47,545
Year Constructed	1993

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Cost/GSF	% of Bldg. Cost
General	$1,183,704	$24.90	74%
Mechanical	$153,230	$3.22	10%
Plumbing	$94,038	$1.98	6%
Electrical	$174,441	$3.67	11%
Subtotal	$1,605,413	$33.77	

BUILDING COST SUBTOTAL	**$1,605,413**
Building Cost/GSF	**$34**

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Cost/GSF
Demolition/Excavation	$44,502	$0.94
Paving/Landscaping	$89,108	$1.87
Subtotal	$133,610	$2.81

CONSTRUCTION COST SUBTOTAL	**$1,739,023**
Construction Cost*/GSF	**$37**

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Cost/GSF	% of Const. Cost
A/E	$150,000	$3.15	8.6%
Other Fees			
Subtotal	$150,000	$3.15	8.6%

TOTAL PROJECT COST	**$1,889,023**
Total Project Cost/GSF**	**$40**

CHANGE ORDERS

	Actual Cost	Cost/GSF	% of Total Proj. Cost
General	$103,738	$2.18	5.5%
Mechanical	$47,737	$1.00	2.5%
Plumbing	$15,992	$0.34	0.3%
Electrical	$36,367	$0.76	1.9%
Design & Supervision			
Subtotal	$203,834	$4.29	10.8%

* *Construction Cost = Building Cost+Site Cost*

** *Total Project Cost = Building Cost+Site Cost+Fees*

Case 4-1:
Allied Health Building
University of Wisconsin-Eau Claire
Eau-Claire, WI
DSFM Project No. 7910-39

Architect: The Hallbeck Group, Architects-Engineers, Inc., Eau Claire, WI
General Contractor: Market & Johnson Inc., Eau Claire, WI
Mechanical Contractor: Kirckof Plumbing & Heating Co., Rochester, MN
Electrical Contractor: Sherman Electric Service, Inc., Eau Claire, WI
Plumbing Contractor: Badger State Inc., Eau Claire, WI.

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Allied Health Building.

1.0 Organizational Context
The University of Wisconsin-Eau Claire's total campus fall enrollment in 1977-78 was 9,734 FTE students and as of 1980 that number had risen to 9,930 FTE. The Allied Health Center project was one of a total of six proposed projects recommended by the Administrative Affairs and Higher Education Subcommittees in the 1979-81 Building Program.

The motivation for the project was to provide needed instructional and clinical space to train students academically and clinically in nine University programs: Environmental and Public Health; Health Care Administration; B.S.-Medical Technology; M.S.-Instruction and Administration in Medical Technology; Department of Communicative Disorders; Music Therapy Program; Department of Special Education; Department of Social Work; and the Human Development Center.

2.0 Facility Development Process

Action	Date	Description
Request to Building Commission	3/20/79	
Request for advanced planning funds for Concept & Budget Report	8/79	Approval of projects deferred until a resolution of a $6 million cut in the UW Building Program.
Request for the release of funds for the preparation of preliminary plans and Concept & Budget approved by the Building Commission	9/25/79	
Concept & Budget Report submitted & approved	7/80	
Request the release of additional funds to complete design, and authorization to complete bidding and construction	7/80	General obligation bonding: $3,460,000.
Completion of Construction Documents	11/80	
Bid Opening	12/80	
Award of Contract	1/6/81	
Substantial Completion	8/82	
Occupancy	9/82	
Final Payment to GC	2/28/83	DSFM approved final payment
Project Close-out	11/86	

The project came well within the budget (nearly 15% under) due to good competitive bidding. The construction funds not used in project were immediately reverted to the state for other use. According to the owner representative, the construction process proceeded without any major incidents.

There was intensive involvement up front between the DFD project manager, the architect and the department groups. Once agreement on the program was established the process tightened and became more efficient. No further input from users once the program was established with kept the process tight. The project manager for the DFD exercised strong leadership in the process. This control was evident in the small number and size of the change orders experienced throughout the construction process.

3.0 Project Scope

The program for this project called for providing for the construction of 47,360 ASF of instructional, research, and clinical-type facilities for the nine allied health programs at UW-Eau Claire. The first floor would house the Communicative Disorders Department, the Human Development Center and Music Therapy as well as some general instruction facilities. The second floor would house the Allied Health Department, Social Work, Special Education, Inter-Departmental facilities, and the mechanical equipment room. Overall, the building would provide classrooms, seminar rooms, offices, lounges, meeting rooms, conference rooms, research laboratory space, therapy rooms, music studios, and various support spaces.

4.0 Project Outcomes

CASE 4.1: Allied Health Building, UW–Eau Claire

Gross Square Feet	48,525
Year Constructed	1982

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Bldg. Cost
General	$1,771,946 (b)	$1,825,105	$37.61	62%
Mechanical	$578,079	$595,422	$12.27	20%
Plumbing	$137,234	$141,351	$2.91	5%
Electrical	$376,672	$387,972	$8.00	13%
Subtotal	$2,863,931	$2,949,849	$60.79	
BUILDING COST SUBTOTAL	**$2,863,931**	**$2,949,849**		
Building Cost/GSF	**$59**	**$61**		

CONSTRUCTION COSTS

SITE DEVELOPMENT	Actual Cost	Adjusted Cost (a)	Cost/GSF
Demolition/Excavation	$97,350	$100,271	$2.07
Paving/Landscaping	$37,067	$38,179	$0.79
Subtotal	$134,417	$138,450	$2.85
CONSTRUCTION COST SUBTOTAL	**$2,998,348**	**$3,088,299**	
Construction Cost*/GSF	**$62**	**$64**	

TOTAL PROJECT COST

DESIGN & SUPERVISION	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Const. Cost
DFD	$70,277	$72,385	$1.49	2.3%
A/E	$229,803	$236,697	$4.88	7.7%
Other Fees	$7,140	$7,354	$0.15	0.2%
Subtotal	$307,220	$316,436	$6.52	10.2%
TOTAL PROJECT COST	**$3,305,568**	**$3,404,735**		
Total Project Cost/GSF**	**$68**	**$70**		

CHANGE ORDERS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Total Proj. Cost
General	$23,551	$24,258	$0.49	0.7%
Mechanical	$12,424	$12,797	$0.26	0.4%
Plumbing	$4,563	$4,700	$0.09	0.1%
Electrical	$8,033	$8,274	$0.17	0.2%
Design & Supervision	$13,043	$13,434	$0.27	0.4%
Subtotal	$61,614	$63,462	$1.27	1.9%

* *Construction Cost = Building Cost+Site Cost*

** *Total Project Cost = Building Cost+Site Cost+Fees*

(a) *Adjusted to 1982 construction costs in Milwaukee using Means Local Cost Indexes*

(b) *Includes laboratory equipment (not movable)*

Case 4-2:
Clark Hall College of Nursing
Marquette University
Milwaukee, Wisconsin

Architect:	Plunkett-Keymar-Reginato
General Contractor:	Siesel, Inc.
Electrical Contractor:	Staff
Mechanical:	Azco Downey
Plumbing:	J.M. Brennan

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Clark Hall College of Nursing Building.

1.0 Organizational Context
The College of Nursing supports 700 full-time undergraduates, graduates, faculty, administration, support and grant staff and over 150 part-time students and staff. In addition, there are over 5,250 continuing education students attending the school.

The College was originally housed in the facilities at St. Joseph's Hospital. There has been a long mutually beneficial relationship between the university and the hospital. The hospital provides a much needed clinical resource, joint staff appointments, and a training environment for nurses for the College of Nursing. In turn, the hospital has the advantage of consulting the College and other services to the faculty.

The motivation for relocating to a new building was the need for a more functional building and to have students located on campus. Some of the school's functions would remain at St. Joesph's Hospital facility and the hospital would continue to serve as the major clinical facility to the Marquette campus. The move did not effect enrollment.

The Marquette campus consists of over fifty-five buildings, with a half-dozen being constructed in the last fifteen years -- the Nursing School being one of them. Typically, the University finances buildings in groups of two to four buildings under a single bond issue. Several buildings over the past twenty years have been developed using a design/build construction method, however, most of the buildings on campus have been developed using the more traditional prime contract competitive bidding method. Learning lessons from the past two design/build projects, the Physical Environment Office has begun providing more detailed and demanding specifications on design/build projects.

2.0 Facility Development Process

Event	Date	Description
	7/1/75	A two page memo was written by the School of Nursing that sketched out the school's estimated space needs.
Physical Facilities Requirements Report	9/22/78	A fifteen-page Physical Facilities Requirements Report was completed that detailed the administrative, clerical and college staff office space, continuing education nursing areas, and nursing skills lab areas required.
Feasibility Study	10/24/78	Architects III: Schunett-Erdmann Associates prepared a preliminary draft of an alternatives study for the College of Nursing. Preliminary cost and feasibility study of moving from their present location to the campus was investigated.
Planning committee formed	6/79	The planning committee was appointed to study alternative solutions.
Feasibility report completed	2/13/80	The planning committee completes a feasibility report on the project.
Building Committee	3/5/80	The 10-member building committee was formed to consider two site options recommended by the planning committee.
Site location selected and approved	4/24/80	
Stage I: concept design	7/31/80	
Stage I approval	9/10/80	Stage I concept design approved by the building committee and the president.
Stage II: preliminary drawings	9/22/80	
Stage II approval	11/6/80	Stage II preliminary drawings approved by the building committee and the president.
Board of Trustees authorized the obtaining of bids	12/17/80	
Stage III: final construction documents	1/23/81	
Stage III approval	1/30/81	Stage III construction documents approved by the building committee and the president.
Bid opening	2/24/81	
Award of contract		
Start of construction	3/24/81	
Ground Breaking	4/1/81	
Substantial completion	6/15/82	
Occupancy	7/82	
Project close-out		

Business Office Planning Procedure

The following is a summary of Marquette University's Business Office Planning Procedure for New Construction and Major Remodeling Projects:

Once the following has been accomplished: (a) The project is authorized by the University administration. (b) a building committee is appointed including a representative of the Physical Environment office, (c) the hiring of an architect or consultant is authorized, and (d) a budget is established.

The following procedure for project approval will be followed: Stage I: Concept Phase. The design is developed by the architect/consultant to the point where a clear concept can be established. Drawings include plot plan, site plan, floor plans and elevations, and occasionally study models. Stage II: Preliminary Design. The design is developed to the point where all major decisions can be made for all phases of the work. This includes plot development and landscaping (excluding planting unless otherwise specified), all mechanical systems, materials and finishes, and integrating handicapped accessibility. Drawings include all those in Stage I, in addition to building sections, and schematics of HVAC, electrical and plumbing designs. The building area is completed, time schedule established, budget revised, outline specifications and a preliminary energy analysis indicating projected total energy consumption are completed. Stage III: Final Working Drawings and Specifications. Complete working drawings, bidding documents and specifications for all work to be performed under the architect/consultant's direction.

Approvals for each stage are as follows: (a) The Building Committee approves submission and transmits to the Director of Physical Environment who submits to the Vice President of Business and Finance, (b) the Vice

President of Business and Finance approves and transmits to the Executive Vice President, who then submits his approval and/or comments to the President, finally (c) the Executive Vice President, or at his direction the Vice President of Business and Finance, obtains approval of the University Trustees, if required, using established procedures for Trustee approvals.

Process

At the time of the project, the program was developed in detail only after a budget had been established. The budget was determined from a preliminary brief written by the College and a set of loose standards developed through experience with similar projects. Not until the architect was hired did many program issues get resolved. Currently, the Physical Environment is developing a procedure that will allow for a more detailed program development prior to estalishing a budget.

During construction of the project, the biggest problem was the soils conditions. Several unit cost change orders were required to satisfactorily place caissons in a number of bell-bottom excavations (C.O. G-4 for $9,404). Large change orders consisted of grouping smaller items (due to changes in procedures during construction in the form of field directives and requests for information the ability to group change orders is much more difficult currently.) The total change orders amounted to less than 3% of the total construction costs for the project. However, several large changes orders (E-1 for $16,707, and E-3 for $11,407) called for revisions to corridor lighting, the fire alarm system, and the relocation of power panels.

3.0 Project Scope

The program called for 43,000 square feet of research and work areas, classroom space (two 100-seat classrooms, and two 48-seat classrooms), a learning resource center, cursing lab with simulated patient areas, instructional media center lab, a demostration area, a 200 seat lecture hall, and faculty offices.

4.0 Project Outcomes

CASE 4.2: Clark Hall, Marquette University

Gross Square Feet	44,860
Year Constructed	1982

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Cost/GSF	% of Bldg. Cost
General	$1,793,803 (a)	$39.99	69%
Mechanical	$393,972	$8.78	15%
Plumbing	$138,458	$3.09	5%
Electrical	$257,510	$5.74	10%
Subtotal	$2,583,743	$57.60	

BUILDING COST SUBTOTAL	**$2,583,743**
Building Cost/GSF	**$58**

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Cost/GSF
Demolition/Excavation	$135,000	$3.01
Paving/Landscaping	$49,675	$1.11
Subtotal	$184,675	$4.12

CONSTRUCTION COST SUBTOTAL	**$2,768,418**
Construction Cost*/GSF	**$62**

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Cost/GSF	% of Const. Cost
A/E	$192,039	$4.28	6.9%
Other Fees	$20,000	$0.45	0.7%
Subtotal	$212,039	$4.73	7.7%

TOTAL PROJECT COST	**$2,980,457**
Total Project Cost/GSF**	**$66**

CHANGE ORDERS

GMPE	Actual Cost	Cost/GSF	% of Total Proj. Cost
General	$44,132	$0.98	1.5%
Mechanical	-$628	-$0.01	-0.02%
Plumbing	$8,558	$0.19	0.3%
Electrical	$33,610	$0.75	1.1%
Design & Supervision			
Subtotal	$85,672	$1.91	2.9%

* *Construction Cost = Building Cost+Site Cost*
** *Total Project Cost = Building Cost+Site Cost+Fees*
(a) *Includes laboratory equipment (not movable)*

Case 5-1:
McPhee Physical Education Center Addition
University of Wisconsin-Eau Claire
DSFM Project Number 8007-11

Architect:	Seymour Davis Seymour, A.E., Inc. Eau Claire, WI
General Contractor:	Boldt Construction
Mechanical Contractor:	Hovland Sheet Metal, Inc., Eau Claire, WI
Electrical Contractor:	B & B Electric, Inc. Eau Claire, WI
Plumbing Contractor:	Certified; Altoona, WI

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the McPhee Physical Education Center Addition.

1.0 Organizational Context
The University of Wisconsin-Eau Claire's total campus fall enrollment in 1977-78 was 9,734 FTE students and as of 1980 that number had risen to 9,930 FTE. Of those students in 1977, 215 were enrolled in the physical education professional program.

In 1969, the professional program offered by the University of Wisconsin-Eau Claire Physical Education Department included minors for men and women. In 1972, the professional education major for women was initiated with an enrollment of 94.

In 1974, the passage of Title IX in the State of Wisconsin required that women be provided equal access to programs and facilities in the areas of physical education, sports, and recreation. This provision appreciably compounded the space/facility deficiency problems at a number of UW campuses around the state.
In the Fall of 1975 at UW-Eau Claire the physical education major was available to both men and women. Responses to Title IX have brought about increased program opportunities for women in athletics and intramurals. This action more than doubled the number enrolled in the program to a total of 215 in the fall of 1977. In addition, the women's intercollegiate athletic program grew from no sponsored activities in 1974 to eight, with an expected expansion to ten by 1980.

The shortage of space required that men and women alternately use needed space in the existing 1969 McPhee Physical Education Center. The existing physical education building was planned to serve a student body of 5,500 FTE, nearly half of the present 9,930 FTE. Classrooms were converted to laboratory and prep space for instructional purposes; the number of faculty increased by approximately 20%; scheduling of the gymnasium and swimming pool became difficult; and the facility was quickly becoming inadequate and unsafe due to crowded conditions.

2.0 Facility Development Process

Event	Date	Description
Request to Building Commission	3/78	Request submitted to the Building Commission for the remodeling and addition to the existing McPhee Physical Education Building for a total project cost of $3,755,000.
Request for advanced planning funds for Concept & Budget Report	5/80	Request submitted to the Building Commission for the *remodeling and* addition to the existing McPhee Physical Education Building for a total *project costs estimated* at $4,390,000
Request release of funds for Concept & Budget	6/80	
Concept & Budget Report submitted	2/81	The total project costs estimated at $4,390,000
Governor Veto	N/A	This project was part of a package of five physical education *facilities which* was caught up in the political process. A debate insued in which this *buidling type* was described as either an physical education instructional space or an intermurial space. As instructional space this building would have more priority for funding.
Reconsidered for 83-85 State Building Program	3/83	The total project costs were estimated at $4,943,500. This consideration failed.
Reconsidered for 85-87 State Building Program	3/85	*the project* was approved at a total project cost of $5,439,000 (a 42% increase in cost from the 1978 estimate).
Approval of Concept & Budget Report	7/24/85	The Building Commission approved the project's Concept and Budget Report and authorized an increase in the project budget of $1,049,000 from $4,390,000 to $5,439,000.
Request the release of additional funds for A/E services	7/85	
Completion of Construction Documents		
Bid Openning	3/25/86	
Award of Contract	5/86	
Substantial Completion of Construction	9/87	
Occupancy	9/87	
Project Close-out	2/91	

2.0 Facility Development Process, continued

The project continued to increase is cost nearly 42% from its first introduction in 1978 ($3.8 million) until its approval in 1985 ($5.4 million). Most of this increase can be attributed to the cost of inflation (6% x 7 yrs = 42%), while the remainder can be attributed to the addition of the mezzanine track above the gymnasium.

During the construction process (5/23/86), questions were raised concerning the design of the mechanical system. The charge by the director of facilities planning at UW-Eau Claire was that problems with the budget caused the architect/engineer to compromise the design of the mechanical and electrical systems. The facility management staff requested a change order be issued that would allow separation of the building's heating system and the domestic hot water heating system. This change, it was argued, had several economic, energy saving, environmental, and operational advantages that would produce a payback in a few years of operation. Seven months later a change order was finally submitted for $23,936 to extend the steam line to provide more economical operation as requested by UW-Eau Claire facility management staff.

General change orders: 15 total change orders ($31,000) with a total of 20 items representing normal finish revisions and coordination changes. The only major item was an add for $6025 for building an area well for larger generator to accommodate changes in ventilation requirements (change order G14).

There were a total of four change orders on this project totalling approximately $49,000 (48,762.50) submitted by the architects. The only major cost was in change order No.1 in which the architects formally requested an adjustment in their fees as a result of the 7/24/85 Building Commission action which increased the project budget by over $1 million. In essence, this project did not incur any major problems as reflected in the very small amount of change orders during the construction process. Both the agency and the architect agreed that the process progressed very smoothly and without incident.

During the occupancy of the building several problems have arisen. The HVAC systems as designed and built did not accommodate the additional heat generated from indirect lighting directed toward the roof structure. Additional exhaust fans were installed to eleviate this problem at a cost of $28,000. Another problem has been water damage to the brick veneer at the outer parapet wall; this project is on going.

3.0 Project Scope

This project required necessary additional space to meet the minimum standards established and accepted by the Bureau of Facilities Management and Systems Administration in the areas of physical education, athletics, and intermurals. This project called for the addition of several types of space deleted from the original building proposal for the McPhee Physical Education Center on the University of Wisconsin-Eau Claire campus. Specifically, the 1985-87 biennium program called a total of 64,200 square feet of additional space (79,000 GSF) for: a gymnasium, one classroom, eight handball courts, diving well, weight room, training room, locker rooms and dressing areas, storage room, a mezzanine track, and eight faculty offices. The program called for a two story facility to be constructed on the site adjacent to the existing McPhee physical education building and connected minimally with a glass corridor link at the gymnasium ground floor level.

The program increased from the original 46,465 square feet program to 64,200 square feet with the addition to the program of a mezzanine track in the 1985-87 biennium program. This change, along with other minor adjustments in the program, precipitatedthe increasing costs of the project estimate over the planning period which began in 1978.

4.0 Project Outcomes

CASE 5.1: McPhee

Gross Square Feet	79,500
Year Constructed	1987

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Bldg. Cost
General	$3,047,463	$3,047,463	$38.33	75%
Mechanical	$424,101	$424,101	$5.33	10%
Plumbing	$230,891	$230,891	$2.90	6%
Electrical	$367,916	$367,916	$4.63	9%
Subtotal	$4,070,371	$4,070,371	$51.20	
BUILDING COST SUBTOTAL	**$4,070,371**	**$4,070,371**		
Building Cost/GSF	**$51**	**$51**		

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Adjusted Cost (a)	Cost/GSF
Demolition/Excavation	$120,028	$120,028	$1.51
Paving/Landscaping	$133,984	$133,984	$1.69
Subtotal	$254,012	$254,012	$3.20
CONSTRUCTION COST SUBTOTAL	**$4,324,383**	**$4,324,383**	
Construction Cost*/GSF	**$54**	**$54**	

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Adjusted Cost (a)	Cost/GSF	% of Const. Cost
DFD	$170,323	$170,323	$2.14	3.9%
A/E	$278,560	$278,560	$3.50	6.4%
Other Fees	$9,917	$9,917	$0.12	0.2%
Subtotal	$458,800	$458,800	$5.77	10.6%
TOTAL PROJECT COST	**$4,783,183**	**$4,783,183**		
Total Project Cost/GSF**	**$60**	**$60**		

CHANGE ORDERS

GMPE	Actual Cost	Adjusted Cost (a)	Cost/GSF	% of Total Proj. Cost
General	$30,960	$30,960	$0.39	0.6%
Mechanical	$2,407	$2,407	$0.03	0.1%
Plumbing	$50,369	$50,369	$0.63	1.1%
Electrical	$19,236	$19,236	$0.24	0.4%
Design & Supervision	$48,762	$48,762	$0.61	1.0%
Subtotal	$151,734	$151,734	$1.91	3.2%

* *Construction Cost = Building Cost+Site Cost*

** *Total Project Cost = Building Cost+Site Cost+Fees*

(a) *Adjusted to 1987 construction costs in Beloit using Means Location Factors (assuming same Location Factors per 1994 Means Data)*

Case 5-2:
Beloit College Sports Center Addition
Beloit College
Beloit, Wisconsin

Architect:	Potter Lawson & Pawlowsky, Inc., Madison, WI
Prime G.C.:	J.P. Cullen & Sons, Inc., Janesville, WI
Sub Contractor M.C.:	H & H Industries, Inc., Madison, WI
Sub Contractor E.C.:	Douglas Electric, Janesville, WI
Sub Contractor P.C.:	Tri-Cor Mechanical, Janesville, WI

Narrative Summary of Project
The following sections describe the organizational context, particular problems and highlights within the facility development process, project scope and project outcomes of the Beloit College Sports Center Addition.

1.0 Organizational Context

The Sports Center was the fourth athletic buidling in Beloit College's history. The first gymnasium was constructed in 1884. With the increasing involvement in physical education and intercollegiate athletics, the building wooden structure became quickly obsolete. A gymnasium was provided for women on the third floor of Emerson Hall in 1900, and Smith Gymnasium was soon after completed in 1904 which served the College for over 40 years. The Field House (a converted surplus Army airplane hangar) was completed in 1947 due again to the pressures of increased needs of the College and served as a campus-community multi-purpose arena. A pool and indoor track were added to the facility in 1956.

2.0 Facility Development Process

Event	Date	Description
Campus planning study	1980	An outside consultant reviewed all of Beloit College's facility needs through the year 2000. The Sports Center construction project was identified as one of the highest priority by the then new President of the College.
Building committee formed	4/83	A building committee was formed to that included 12 members from several faculty, staff and students. Their first task was the selection of an architect. Four architects in all were interviewed in the process. Potter Lawson & Pawlowsky were eventually selected.
Site analysis and needs analysis	1/84	Potter Lawson & Pawlowsky hired to conduct a site analysis and needs analysis of the Beloit College Sports Center project alternatives.
Fundraising	2/84	Beloit College goes public with a fundraising campaign.
Public meetings	4/84	A series of public meetings and presentations were made to target groups within the College.
Completion of Construction Documents	8/14/85	
Bid opening	2/20/86	
Award of contract	3/3/86	
Start of construction	4/12/86	
Substantial completion of new construction	1/87	Construction of the new facility was subtantially complete and renovation of the existing field house began.
Occupancy	1/87	The completed new construction was occupied while renovation of the existing field house began
Dedication	2/6/87	Dedication cerimonies
Subtantial completion of total project	12/24/87	
Project close-out		

2.0 Facility Development Process, continued

A traditional design and construction process was followed by Beloit: A building committee was formed that chose an architect to prepare a site and needs analysis of the project, conduct a series of public meetings to discuss options, and develop contract documents that were sent out for bid.

J.P. Cullen & Sons were chosen as the prime contractor who subcontracted with all other trades on the project. The College, in addition, incurred costs independent of the prime contractor in which they acted as a contractor of services.

Three sites considered and evaluated for feasibility and the issue of demolishing or renovating the existing field house were the main issues the building committee had to resolve with public input.

3.0 Project Scope

The project consisted of new construction and renovation of an existing field house. New construction includes a 19,500 square foot gymnasium with seating capacity for 2,250, a 4,400 square foot fitness center, 3 racquetball courts, locker rooms, and faculty offices. Beloit's existing 32,800 square foot field house (an improvised WWII surplus airplane hangar constructed in 1947) was renovated for use as an indoor recreational space along with the Kresge Natatorium's six-lane swimming pool first constructed in 1956, and finally a 2,600 square foot dance studio.

4.0 Project Outcomes

CASE 5.2: Beloit

Gross Square Feet	50,700
Year Constructed	1987

Facility Development Costs

BUILDING COSTS

GMPE	Actual Cost	Cost/GSF	% of Bldg. Cost
General	$2,284,004	$45.05	71%
Mechanical	$382,119	$7.54	12%
Plumbing	$196,291	$3.87	6%
Electrical	$343,147	$6.77	11%
Subtotal	$3,205,561	$63.23	

BUILDING COST SUBTOTAL	**$3,205,561**
Building Cost/GSF	**$63**

CONSTRUCTION COSTS

SITE DEVELOPMENT	Cost	Cost/GSF
Demolition/Excavation	$269,917	$5.32
Paving/Landscaping	$288,960	$5.70
Subtotal	$558,877	$11.02

CONSTRUCTION COST SUBTOTAL	**$3,764,438**
Construction Cost*/GSF	**$74**

TOTAL PROJECT COST

DESIGN & SUPERVISION	Cost	Cost/GSF	% of Const. Cost
A/E	$225,530	$4.45	6.0%
Other Fees			
Subtotal	$225,530	$4.45	6.0%

TOTAL PROJECT COST	**$3,989,968**
Total Project Cost/GSF**	**$79**

CHANGE ORDERS

GMPE	Actual Cost	Cost/GSF	% of Total Proj. Cost
General	$87,602 (a)	$1.73	2.2%
Mechanical			
Plumbing			
Electrical			
Design & Supervision			
Subtotal	$87,602	$1.73	2.2%

* *Construction Cost = Building Cost+Site Cost*
** *Total Project Cost = Building Cost+Site Cost+Other Costs*
(a) *For all categories (breakdown unavailable)*

APPENDIX B

STATE OF WISCONSIN FACILITY DEVELOPMENT PROCESS

All public buildings case analyzed in this study follow the State of Wisconsin's building program. The following appendix presents an outline of the State of Wisconsin's building program as it has been adopted by the State Building Commission. In this appendix, the investigators have re-interpreted the State's building program according to the definition of the facility development process used in this study.

The facility development process can proceed once the State Building Commission authorizes the release of funds for the design and construction of a project that has been approved in the State Budget. There are a total of 38 steps that all State of Wisconsin agencies normally follow in the development of a building project from inception to final inspection and acceptance of the work.

2.1 Capital Budget Requests Process (State Building Program)

The Capital Budget consists of capital improvement, remodeling, renovation, maintenance, equipment purchase and land acquisition projects authorized by the State Building Commission and funded by the State Legislature. It also includes a long-range planning process used to identify agency mission, direction, goals, and future facilities needs.

The process begins with the filing of the Six Year Facilities Plan as part of the Capital Budget Request which covers specific building projects a particular agency wishes to request for the next six years. The Division of Facilities Development reviews this plan to forecast the Building Program scope, timing, and cost that may evolve during the six year time period. The Six Year Facilities Plan is reviewed by various Commission staff and Building Commission Subcommittee hearings, action is taken by a Joint Committee on Finance hearings, and finally the Legislature reviews and passes the Capital Budget resulting in the enumeration and funding of each major project, the level of funding of special category projects, and the identification of projects selected for advance planning.

2.2 Definition of Scope

The division "performs" a total of 38 distinct "functions" beginning with Function 1: *Initiation of Project* to Function 38: *Warranty Items.*

Of the 38 distinct "functions" of the facility development process, functions 1, 2, 4, and 7 define the scope of the project:

1. Initiation of Project: Management Services Section receives requests to proceed on building project from the State Building Commission or agency and hold project for Selection Committee.

2. Program Review: Capital Budget, Physical Planning Section and Project Manager review agency prepared program to assure that project is responsible to the mission of the Agency and in conformance with prior Agency approved requests.

4. Initial contact in Project Development: The Project Manager arranges a meeting with A/E, their consultants and the agency to agree on scope of program, provides A/E with explicit direction and instructions concerning authorized program requirements at kick-off meeting.

7. Evaluate Budget and Program: The Architect/Engineer performs an initial evaluation of the adequacy of the authorized budget and program. If the budget is adequate, preliminary design will be developed, if not the budget and/or scope will be revised.

2.3 Staff/Consultant Selection

DFD "very infrequently" selects architects from out of state. If the DFD can find the expertise in the state they will use these architects. If expertise cannot be found within the state, DFD will encourage state architects to affiliate with out-of-state firms. Affiliation is seen as a good mechanism for introducing new design ideas into the state.

Of the 38 distinct "functions" of the facility development process, functions 3, 5, and 6 outline the staff/consultant selection procedure:

3. Selection of Architect/Engineer: Selection Committee review request, confer with agency, and recommend selection of architect/engineer to the Secretary.

Selection Committee

A selection committee is assembled which consists of a group composed of 6 state employees appointed by the secretary of the DOA, one being designated the chairperson and a minimum of 3 who shall be registered architects/engineers.

If the project has an estimated cost which exceeds $250,000, the agency for whom the project is to be constructed will be requested to appoint a representative to serve as an additional member on the committee for the selection of an architect/engineer for that project. An absence from the agency is considered a waiver of their vote.

The key to whether the selection procedure will be by nomination or by advertisement is based on the estimated project cost. The selection by nomination procedure is used for projects costing less than $2,500,000 and the selection by advertisement procedure is used for projects more than that amount.

An eligible architect/engineer must meet or exceed the following criteria:

(a) Responsibility: Has more than one architect/engineer as a responsible member of the firm.
(b) Experience: Has been in business for a period of not less than 3 years.
(c) Residency: Has a permanent office within Wisconsin, where responsible direction of all services will be based. Out-of-state firms will be considered when the selection committee determines there are no Wisconsin firms qualified or available to provide the services required.
(d) Capability: Has been responsible for the design and completion of a project with a total construction cost or size of at least 50% as large as the construction cost or size of the project under consideration.
(e) For those projects which are estimated to have a project cost of less than $250,000, the criteria for eligibility stated in a, b, and d may be waived.

Selection by Nomination

The selection by nomination procedure is normally conducted once a month, usually about 10 days following the Wisconsin State Building Commission meeting. Each Selection Committee member is furnished an agenda containing information on currently funded projects, and a manual containing architect/engineer data records in the State who have expressed a desire to do work for the State. The selection by nomination procedure is as follows:

1. Firms are nominated which committee members feel are best suited for the projects on the agenda.
2. Pros and cons of each nomination are discussed.
3. A vote is taken to determine the first and second place recommendations for each project.
4. The recommendations are submitted to the Secretary of the Department of Administration for approval.
5. Selected architects/engineers are provided with project programs prior to negotiation of the contract.
6. Once an architect/engineer is selected they meet with the department's designated representative to negotiate a contract, a summary of which is distributed to the

selection committee chairperson. Negotiations are based on complexity and estimated value of the project. Various combinations of these considerations are used to determine an overall percentage fee, which is converted to a fixed lump sum fee for contract purposes.

Selection by Advertisement

When the project under consideration costs $2,500,000 or more the selection committee are required to follow a more detailed procedure called selection by advertisement, which includes advertisement, review and interview processes.

1. Advertisement: An advertisement is published to announce that submittals will be accepted from firms interested in the proposed project.

2. Review Process: Eligible architect/engineers must submit a proposal indicating interest in providing architectural services. The selection committee convenes to review and screen background information on architect/engineer proposals. Each firm is rated on a screening form, the forms are tallied and the four or six firms that have the highest scores are then notified that they have made the "short list" for firm interviews.

   Proposals submitted by architects/engineers meeting eligibility criteria shall then be reviewed for the following qualification criteria:
   (a) Past performance on projects for which the architect/engineer has been responsible.
   (b) Production capabilities
   (c) Current workload of state projects under contract by the architect/engineer
   (d) Experience or specialization in the type or function of the project begin considered.
   (e) Geographic proximity.

3. Interview Process: Qualified architect/engineer's who pass the initial screening of the Qualification Questionnaires are interviewed by the selection committee for the purpose of presenting their understanding of the scope of services required and their proposed method of meeting the program. Usually firms are given approximately 30 days for preparation for the interview.
   The negotiation process for the selection of advertisement of the architect/engineer is the same method described for the selection by nomination procedure.

Performance Reporting

Department staff members involved in specific phases of the work will submit independent written evaluations of the architect/engineer performance of the professional service to the department's representative who is responsible for the general supervision of project implementation. Reports may be based on the following criteria:

(a) Design ability to meet program, schedules, and budgets.

(b) Accuracy and completeness of contract documents as evidenced by the number and character of addenda and change orders required.

(c) Administration of contracts, payments and construction documents as evidenced by the timeliness of the service rendered.

(d) Responsiveness to field observations and construction activities and requirements as evidenced by the timeliness of the service rendered.

(e) Overall professional responsibilities demonstrated.

5. Negotiation of Architect/Engineer agreement: Management Services Section negotiate contract with A/E.

6. Preparation and Execution of Architect/ Engineer agreement: Management Services Section writes the A/E agreement contract based on agreed terms, supervises its distribution and execution.

2.4 Design Development and Review

Of the 38 distinct "functions" of the facility development process, functions 8-13 outline design development phase procedures:

8. Completion of Preliminary Design Documents: The A/E develops preliminary design drawings and outline specifications within the parameters established by the authorized program and budget, and updates estimates of project cost and schedule.

9. Prepare Design Report: The A/E prepares the design report in conjunction with the preliminary documents. The report represents a brief summary of the scope of the project. The concept and budget report was originally conceived as a simplified explanation for the building which serves as a tool to explain the building to legislators.

10. Review of Design Report: Project Manager and Division Staff distribute and arrange for the review of the Design Report. Obtain staff and agency comments and recommend necessary revisions.

11. Approval of Preliminary Documents: Project Manager along with technical staff schedule review meetings with agency, designer, Construction Representative, and staff as required to review preliminary drawings and specifications in detail.

12. Evaluation of A/E for Preliminary Phase: Project Manager, Division Staff and Agency evaluate A/E's performance.

13. Design Report Approval: The State Building Commission reviews the Design Report and authorizes release of funding for further development.

2.5 Construction Documents & Estimates

Of the 38 distinct "functions" of the facility development process, functions 14, 15, and 27 outline construction document phase procedures:

14. Preparation of Working Drawings and Specifications: A/E to direct and coordinate the development of working drawings and specifications, based on approved preliminary documents and verify budget.

15. Approval of Working Drawings: Project Manager and Division Staff review and approve final drawings and specifications before the project is let for bid. Project Manager consolidates all questions and comments for action by the A/E. PM circulates A/E responses to review comments.

27. Evaluation of A/E for Working Drawing Phase: The Project Manager, Division staff and Agency evaluate the work of the A/E.

2.6 Bids & Contract Negotiation

Of the 38 distinct "functions" of the facility development process, functions 16-26 outline bidding and negotiation phase procedures:

16. Coordinate Scheduling of Bid Openings: Management Services Section with input from the Project Manager and the Construction Administration Section maintain a master list of all

projects and coordinate scheduling of bid openings with the Project Manager who reviews the schedule with the Construction Administration Section Chief. A Construction Coordinator is assigned to the project.

17. Preparation of Invitation to Bid: A/E prepares an Invitation to Bid and submits it to the Project Manager.

18. Publication of Invitation to Bid: Management Services Section arranges for the publication of the Invitation to Bid on a scheduled date.

19. Distribution of Drawings and Specifications: Management Services Section obtains the required number of drawings and specifications and distributes them on request to potential bidders and issues agenda.

20. Bid Opening: Management Services Section receives all bids and publicly opens and reads them.

21. Recommend Contractors: The A/E and Construction Administration Section review bids and recommend the award of contracts to the Project Manager who reviews it with the Construction Administration Section Chief.

22. Preparation of Project Budgets: The Project Manager reviews the total funds available and recommends a project budget. Administration Section prepares a budget letter.

23. Approval of Project Budget: The Division Administrator reviews the recommendation and approves contract awards and project budget.

24. Process Contracts & Letter of Transmittal: Management Services Section processes contracts and transmits them for approval to contractual parties.

25. Approval of Contracts: The Governor and the Division Administrator transmit contracts to signatories for action.

26. Notification to Proceed: Management Services Section and the Division Staff upon receipt of approved contract, prepare notice to proceed.

2.7 Construction & Project Management

Of the 38 distinct "functions" of the facility development process, functions 28-38 outline construction phase procedures:

28. Construction Meetings:
    A. Preconstruction Planning Meeting: A/E, Regional Construction Coordinator and Construction Representative discuss intent and direction.
    B. Preconstruction Meeting: A/E, Regional Construction Coordinator and Construction Representative make necessary arrangements with all contractors and involved parties.
    C. Construction Progress Meetings: Construction Representative conducts meetings with A/E and contractors.

29. Administration of Construction (Construction Phase Activities): The Construction Coordinator and Construction Representative administrate and coordinate all construction phase activities and ensure conformance with plans and specifications. The Regional Field Office is the primary central file during construction phase activities after the award of contract. The A/E responds to requests for information, prepares construction bulletins, writes change orders, construction site visit reports and reviews and approves contractor payment requests. The Project Manager reviews construction bulletins, change orders and payment requests.

30. **Responsible Inspection of Construction: The A/E and Construction Administration Section are responsible as required by the Contract to document changes or make clarification's of contract documents in response to RFI's (Requests for Information).**

31. Change Order Procedures:
    A. Requests for Information: The A/E, PM, Contractor, and or Construction Administration Section to prepare requests for information and send to the Construction Representative at the regional field office, A/E and PM.
    B. Review: The A/E and Construction Administration Section review request to determine validity, consult with PM and recommend acceptance or rejection.
    C. Construction Bulletin: The A/E and Construction Administration Section prepare and send to the contractor to obtain a quotation and negotiate price with the contractor.
    D. Change Order: The A/E prepares change order and sends to the Construction Representative who will review and send to the PM.
    E. Review Scope/ Cost/ Design Issues: The PM reviews, processes and recommends the change order and tabulates responsibility.
    F. Approval: The Governor, Agency, Division, Administrator or Project Manager reviews recommendations, approves and signs the change order. Source of approval is contingent on cost implications of the change order: less than $15,000 by Project Manager; less than $30,000 by Division Administration; greater than $30,000 by Governor.

32. Payment Procedures
    A. Request for Payment: The contractor submits request for payment to the regional field office.
    B. Review Request: The Construction Representative initials and sends the request for payment to the A/E.
    C. Evaluate Payment Request: The A/E and Construction Administration Section review the request, correct if necessary and forward to the Division.
    D. Approval of Request: The PM reviews and approves the request.
    E. Audit of Request: Management Services Section checks all computations, makes corrections if required, obtains necessary approvals, processes and distributes the request.

33. Completion of contract work: Complete testing and punch list items., turn over service contract to agency, and the Contractor starts up systems, tests and demonstrates operation of systems as specified.

34. Final Inspection: Construction Administration Section, A/E and agency representatives conduct the final inspection and recommend acceptance of the facility.

35. Substantial Completion: The A/E Division Representative and Contractor send letters notifying contractors and the agency.

36. Project Close Out: Management Services Section obtain the necessary approvals including final payment release from the PM, obtain agency final acceptance, make final payments, close out contracts and contingency fund and terminate the project after preparing the close out letter signed by the PM.

37. Construction Phase A/E Evaluation: The Construction Representative prepares an evaluation of the A/E with the advice of others and submits it to the Construction Administration Section Chief and then to the PM. The PM Coordinates the overall A/E evaluation and discusses the evaluation with the A/E. The PM sends the results to management services for entry into the A/E database.

38. Warranty Items: The Contractor is responsible for any problems which arise with warranty items. The PM assures that the A/E takes whatever action is required to resolve problems.

2.8 Occupancy & Facility Management

When an agency occupies state office buildings, DOA has responsibility for maintenance. The DOA is considered the owner of the building, and the agency is considered the tenant. When the building is owned by a private owner, the DOA is responsible for lease negotiations between the landlord and the agency.

APPENDIX C

STUDY FRAMEWORK QUESTIONNAIRE

0. 0 CASE STUDY SELECTION PROCESS

0.1 Organizational/Building Match

The goal of this section is to identify organizations which have comparable building programs to the State of Wisconsin.

0.2 General Building Type

College, Classroom
College, Dormitory 2-3 story
College, Dormitory 4-8 story
College, Laboratory
College, Student Union
Community Center
Garage, Parking
Gymnasium
Hospital, 2-3 Story
Hospital, 4-8 Story
Library
Medical Office, 1 Story
Medical Office, 2 Story
Office, 2-4 Story
Office, 5-10 Story
Office, 11-20 Story
Swimming Pool, Enclosed

1. 0 ORGANIZATIONAL CONTEXT

The first phase of the process of matching concerns identifying comparable organizations from which to draw a set of buildings. The organizations are matched as closely as possible based on several factors:

1.1 Organizational Structure

a. Type of organization

1. Private Developer
2. Private University
3. Public University
4. Public State Agency

b. Structure of the organization (institution or corporation)

[Obtain an organizational chart]

1. Number of staff and management levels/layers
2. Number of subdivisions/departments within the organization
3. Centralization/Decentralization of administrative decision making
4. How staff and management levels/layers relate to the facility development process

c. Size of the organization

1. Number of employees in the organization

1.2 Organizational Experience

a. Facility development experience

1. Years of experience

2. Number of buildings/facilities the organization constructs per year

3. Total development cost expenditures per year

b. Facility management experience

1. Number of buildings which are currently owned, operated, and managed by the institution or corporation

2. Number of buildings which are currently leased by the institution or corporation

3. Amount of capital expenditures allocated for management of buildings per year

1.3 Organizational Function

a. Function of organization

1. Stated goals and mission of the organization

b. Motivations for development

1. How these motivations/reasons relate to facility development

2. Goals and objectives for constructing this building

1. More space

2. To make $

3. Improve delivery of service

4. Other

2. 0 FACILITY DEVELOPMENT PROCESS

Once the organizations are matched, information concerning procedures used for development is gathered, compared and analyzed. The following set of questions are organized by the stages in the facility development process:

2.1 Definition of Scope

a. Procedures, if any, for defining the scope of a project

b. Levels in the organization where decisions concerning the scope of the project are made

d. Comparability between the case study's definition of scope and expectations for other projects

2.2 Staff/Consultant Selection

a. Procedures, if any, concerning the delegation of staff and consultants to a particular project

b. Policies which suggest different combinations of in-house staff and outside consultants

c. Decision criteria and sequence for consultant selection

d. Who makes the final decisions concerning consultant selection

e. Comparability between the case study's staff/consultant selection and expectations for other projects

2.3 Design Development and Review

a. Procedures for design review

b. How concept budget estimates are factored into design

c. Who makes the final decisions concerning design

d. Comparability between the case study's design development and review stage and expectations for other projects

2.4 Construction Documents & Estimates

a. Procedures for construction documents and estimates

b. Sequence of decisions for reviewing construction budget estimates

c. How budget estimates relate to decisions concerning construction document revisions

d. Who makes the final decisions concerning completion of the construction documents

e. Comparability between the case study's construction documents and estimates stage and expectations for other projects

2.5 Bids & Contract Negotiation

a. Procedures for bidding and negotiation

b. How construction costs relate to final decisions concerning contract negotiation

c. Who makes the final decisions concerning contract negotiation

d. Comparability between the case study's bidding and contract negotiation and expectations for other projects

2.6 Construction & Project Management

a. Procedures for construction and project management

b. Who makes the final decisions concerning construction and project management issues

c. Comparability between the case study's construction and project management and expectations for other projects

2.7 Occupancy & Facility Management

a. Procedures for facility management

b. Types of maintenance policies

c. How buildings are managed and operated on an on-going basis

d. Operations and management responsibilities of the owner and responsibilities of the building tenants

e. Who is responsible for facilities management and who makes the final decisions on facility management issues

f. Comparability between the case study's occupancy and facility management and expectations for other projects

3.0 PROJECT SCOPE

At the second level of comparison, the overall project scope for all case study buildings are matched as closely as possible. Project program requirements are the controlling factors for comparing case study pairs. The parameters that are identified for matching include:

3.1 Program

a. Who prepared the detailed program *[In-house staff or consultant]*

b. Special building performance/durability standard requirements

c. Quality/finish standard requirements

e. Budget

3.2 Location Factors/Site Conditions

a. Urban or suburban context

b. Relative cost market *[i.e. Milwaukee vs. Stevens Point]*

c. Parking accommodations

d. Amount of grading/clearing/building demolition required

e. Site/contextual constraints *[i.e. Campus enclave vs. unencumbered site]*

3.3 Size/Form/Configuration

a. Total square footage

1. Per floor

2. Footprint

3. Floor area ratio

4. Efficiency ratio? *[net/gross]*

b. Number of stories

c. Overall building configuration
Bar -shape
L-shape
U-shape
H-shape
O-shape
Other/combination

d. Special design features *[atrium, plazas, passive solar, special interior or exterior finishes, special function spaces]*

e. Compact or loose organization on the site

f. Surface/volume ratio

g. Perimeter/floor area ratio

3.4 Construction Materials & Building Systems

a. Construction Type

1. Structural System [C.I.P. concrete ,Precast concrete, Steel Frame, Etc.]

2. Mechanical System

3. Enclosure System

b. Performance

1. Anticipated design life

2. Level of Finish

3.5 Occupancy

a. Primary users

b. Other users

c. Daily pattern of building use

d. Seasonal pattern of building use

e. Total occupancy

4.0 PROJECT OUTCOMES

Finally, once all five case study pairs have been successfully matched the outcome variables are measured, compared and analyzed. These dependent variables include:

4.1 Land Costs

a. Total cost of land acquisition

b. Cost per square foot

c. Cost/square foot for special site work *[Hazardous materials or environmental remediation etc.]*

4.2 Project Costs

a. Total cost of improvements: building costs, construction costs, project costs

b. Cost per gross square foot

c. Unit costs by subcontracts as per DFD worksheets

4.3 Furnishings and Equipment Costs

a. Movable equipment budget

b. Total movable equipment cost per square foot

c. Interior partitions and built-ins budget

d. Total interior partitions and built-ins cost per square foot

4.4 Delivery of Building

a. Total implementation time *[From project inception to occupancy]*

b. Schedule completion influences *[Fast-tracking, seasonal conditions, unforeseen conditions]*

c. Complications that affected the move-in process

d. Tenant move-in costs

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