MATCHING PEOPLE AND THEIR FACILITIES: USING THE ASTM/ANSI STANDARDS ON WHOLE BUILDING FUNCTIONALITY AND SERVICEABILITY

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ABSTRACT

Recently, the US State Department (Administration/Foreign Building Office-A/FBO), has implemented a process for upgrading the way user requirements for its embassies are defined, so that they can be more responsive to the needs of the staff at the posts, and for verifying that the designs of new embassies respond to these requirements. This is part of broader thrust at the US State Department to improve the appropriateness of the facilities to the mission of the organization, to ensure that the portfolio of properties, both owned and leased, keep pace with that mission, and to provide an audit trail between the corporate demands and the resulting facilities.

For this, one of the tools A/FBO uses is a set of ASTM (American National) standards for Whole Building Functionality and Serviceability (ASTM, 2000), at several stages of the planning, procurement, design, and evaluation process, with the methodology known as “Serviceability Tools and Methods”. This methodology provides a tool for portfolio and asset management, and is part of a more general focus on the requirements of the users of constructed assets. The paper places the ASTM standards and this approach in the context of the current work on life cycle management, on the decisions and information flows that are part of the performance audit trail, and on the need for a central knowledge base useful, understandable and accessible to all stakeholders.

KEYWORDS:

functionality; indicators of capability; portfolio management; serviceability; statements of requirement

INTRODUCTION

Value Chain For Portfolio Management, and The Critical Role Of Information

For an enterprise, the primary measure of value of a workplace is its functionality. Whether it be private sector or public, an enterprise uses facilities to conduct its business: to provide workplaces for its staff, to provide places to meet its customers, to manufacture its products, and for a range of other business purposes. (The term enterprise is used to include private sector corporations, public corporations such as post offices, and government departments and agencies.)

Workplaces and other corporate real estate assets are usually far more important for their effect on the ability of the enterprise to accomplish its mission, and to its consequent profitability, than for their market or financial value. Enterprises are coming to value real property assets primarily as factors of production, analogous to machine tools, delivery trucks, and computers. They are all part of the infrastructure of the enterprise. This principle holds true, whether the property is owned, leased, or occupied under some other form of tenure.

This paper is about tools and methods for specifying the performance requirements for facilities, and for measuring how well a design proposal, or an existing facility meets those requirements.
Figure 1 shows enterprise-wide functions at the left. It shows the overall enterprise strategy as a direct decision driver of the overall real estate strategy. The overall enterprise strategy and the overall real estate strategy are mediated by the enterprise’s internal culture and practices, and by the strategic environment and culture external to the enterprise. Information from other stakeholders and investors is also a resource for the enterprise decision-makers.

Workplace Demand is likely derived from scenarios by the core business units of the enterprise. What is the range of likely futures for which workplaces will be required, to a horizon of three or five years, and for the longer term? What levels of service and functionality in workplaces will be required at various levels of corporate achievement, for each of the main core business units. In some organizations, a set of several scenarios is updated for each annual budget cycle, and also when abrupt major changes occur in the environment external to the enterprise, such as a market crash or a political upheaval in a key market area. Estimates of probability or risk are attributed to each scenario. For e-businesses, when the planning horizon is shrinking to very few months, some say even weeks, strategies for change and agility are even more relevant. (O’Mara, M., 1999)

Portfolio managers take into account the anticipated needs for workplaces for the core functions, and for infrastructure support, and the corporate financial strategy of the enterprise. They then direct what existing facilities are to be retained by asset managers, and at what levels of functional capability. They also identify projects that must be delivered to maintain the inventory in balance with demand, and what repair and alteration projects (R&A) should be funded.

Figure 1. Enterprise-based view of the groups that provide workplaces, and of the flows of decision-making responsibility, and of information.
When a reliable basis for demand projections is not available to the multi-year horizons of real estate, construction or leasing, portfolio managers rely on a range of forecasting methods to manage the risks associated with workplace provision. The portfolio manager may even create straw-case scenarios for the enterprise, and test them for plausibility with occupant managers, as a basis for demand projections.

Figure 1 also shows a crucial element: the Data Base for Real Estate Management. The decision flows in Figure 1 require a comprehensive data base about the portfolio, and about individual assets, to support decision-making. In Figure 1, the arrows flowing in and out of the Data Base for Real Estate Management make the point that all CRE functions need access to this shared data base.

Of course, the data base should include more than the specific data about each real property asset, whether leased or owned, and data about each project under way. It should also include data at the portfolio level, that is, the summary data, or roll-ups, that are created from the raw data and serve as intermediate data tools for portfolio management.

Portfolio Management assembles the roll-up totals and summaries in groupings to compare demand profiles of occupant groups from core business units; inventory of facilities, considered by size, geographic region, functional category, age, tenure (own, lease, etc.); gap analyses for the portfolio between required levels of demand and levels of service provided; values including book, replacement, etc.; risks associated with each facility or group of facilities; serviceability, i.e. capabilities of facilities, whether needed or not at this time, including building condition; priority rankings for projects to maintain serviceability; considerations for tradeoffs on investment; and so on.

Unfortunately, in many large enterprises, this data base does not yet exist. Too frequently, data is incomplete, and what should be components of a single comprehensive data system are instead kept in separate data bases, often in formats not compatible with each other. Today, even the very best real estate data bases are still inadequate. An analysis by Fransson and Nelson (Fransson, W. and Nelson, D, April 2000) asserts that the level of data integration required for high-level portfolio management decisions simply does not exist. The authors report on their findings from the Corporate Real Estate Portfolio Management Alliance Project, that comprehensive solutions have yet to be created. They compare the situation to that of corporate information systems in general, before the advent of software for Enterprise Resource Planning (ERP). Comprehensive report of the findings from that project can be found in an issue of the Journal of Corporate Real Estate (O’Mara, M., Ed., April 2000).

Other stakeholders and investors are shown at the bottom of Figure 1. Information about the users of facilities, both occupants and others, including visitors and the general public, and their facility needs, are basic inputs to the managing of enterprise operations, and of course to the enterprise’s information infrastructure.

When Portfolio Management determines that a new facility must be provided, the requirements for the facility must be specified with sufficient precision to permit selection from among available existing facilities or to instruct an architect to start concept design, and planning and massing studies. Programming, as it is called in North America, or briefing, as it is identified in the Commonwealth countries, was a recognized stage in the design process as taught at the Ecole des Beaux Arts in Paris in the mid-nineteenth century. For further information, see also (Szigeti and Davis, 2000). In North America, the first independent professional practice in the programming and evaluation of buildings was launched in 1965 (Davis, G., 1969). This starts the life cycle of a facility.
Life Cycle Of Facilities

Figure 2 diagrams the life cycle of a facility. The functional program should focus on aspects of the project requirements that are important for the enterprise, and direct the best allocation of resources within the given cost envelope. The objective is to get best value for the users and owners. A “knowledgeable client” will prepare, or commission, a clear “statement of requirements”, including indicators of capability that are easy to audit and are as unambiguous as practicable. This is essential when providers want to design “better” features but users have other priorities, as often happens.

For each facility, the portfolio-level requirements, plus the more detailed programming data, are the foundations for the cumulative knowledge base of shared data and support data, diagrammed at the center of Figure 2. Throughout the life cycle of a facility, many people, such as facility managers, users, operations and maintenance (O&M) staff, financial managers, and others, should be able to access this data base. Although some proprietary software packages permit access to some of the data, there is no comprehensive system that links O&M work orders and costs to operating budgets, charge backs, functional effectiveness for occupants, and bottom-line value to the core operations of the enterprise.

A start on the standards that would permit this is now under way. It seems likely that the standards that exist or are being developed in several venues will all be linked through software standards using Data Type Definitions written in XML. A set of such standards are described in the next section.
THE ASTM STANDARDS

Corporate management, shareholders and occupants expect workplaces and corporate real estate executives to meet rigorous, consistent and measurable demands for quality and functionality. (Lundin, 1996)

In the early 1980’s, work started explicitly to create and standardize tools and methods to meet that need. The first comprehensive kit of tools and methods were approved as ASTM in 1995, recognized by ANSI in 1996-97, and published as a Compendium under the title of ASTM Standards on Whole Building Functionality and Serviceability (ASTM, 2000). Corporations and governments have pilot-tested them and are adopting them. They are being taught and used in several countries.

By providing knowledge about what occupant groups require and how a portfolio of assets supports the goals of the organization, these ASTM standards establish the foundation of the information for portfolio and asset management strategies.

What Are These Standards

These ASTM standards provide a broad-brush, macro level method, appropriate for strategic, overall decision-making. They deal both with demand (occupant requirements) and supply (serviceability of buildings). They can be used at any time, not just at the start of a project.

They include two matched, multiple-choice questionnaires and scales, formats for describing the organization, and function-based tools for estimating how much floor area an organization needs. One questionnaire is used for setting workplace requirements for functionality and quality. It describes customer needs - demand - in everyday language, as the core of front-end planning. The other, matching questionnaire, is used for assessing the capability of a building to meet those levels of need, which is its serviceability. It rates facilities - supply - in performance language, as a first step towards an outline performance specification. Both cover over 100 topics and 340 building features, each with levels of quality calibrated from 0 to 9 (less to more). It is particularly suitable as part of the front-end performance requirements for a design-build project, and for comparing several facilities on offer to buy or lease.

At the heart of the standards are two practices. One is about the process of working with the occupant groups. This process of communicating with the other stakeholders, of valuing their input, of being seen to be responsive, is often as important as the outcome itself, and will often determine the acceptability of the results. Each set of scales can be used separately and independently of the other. Each can be used to add understanding and information about the other.

The scales were designed to bridge between “functional programs” written in user language on the one side, and “outline specifications and evaluations” written in performance language on the other. Although it is a standardized approach, it can be easily adapted to reflect the particular needs of a specific organization. For organizations with many facilities that house similar types of functions, the scales capture a systematic and consistent record of the institutional memory. They speed up the functional programming process and provide comprehensive, systematic, objective ratings in a short time. There are other tools which accompany the scales and which are not yet standardized. These include several kinds of methods and tools, along with documents and computer templates for using them. These are:

1) Functional requirement barchart profile. (standard)
2) Building serviceability barchart profile.
3) A barchart match between these two profiles, showing surpluses and shortfalls of capability of a facility, or a design, to meet the functional requirements.
4) Descriptive text about the organization, in a standard format.
5) Quantity spreadsheet profiles.
6) Building loss features (BLF) rating table.
7) Footprint and layout guide.

An additional set of scales, now being pilot tested, enable building managers to specify building condition in fine-grained detail, and compare against portfolio management requirements.

Why Use The ASTM Standards

By using these standard tools and methods to specify workplace functionality and serviceability:
(1) senior business and government executives can enhance organizational effectiveness,
(2) corporate real estate and facility managers can enhance their credibility when proposing more functional and appropriate facilities to corporate senior executives,
(3) the occupant groups, who are the knowledgeable “customers” and the ultimate drivers, will better understand the costs and benefits of more functional and humane facilities, and know how to demand them.

This approach has been explicitly designed to:

• Enable senior executives, and the managers and users of workplaces, to demand that such standards be understood and used by their facility managers and real estate professionals.
• Enable facility managers and real estate professionals to easily procure and manage their use.
• Enable property and facility professionals, and all stakeholders, to become proficient in using them.

They are also straightforward, easy to use and update, and simple yet comprehensive and systematic. In one case, a company that operates in many countries decided to test whether it should outsource the provision, operation and maintenance of its workplaces in North America. It invited five of the largest outsource providers, world-wide, to submit proposals, and it also directed that its in-house staff provide a sixth proposal. To put all bidders on an equal footing, and to achieve comparability of proposals, the company specified that they would be required to provide a specific level of service as measured using the ASTM standards. Each bidder obtained copies of the printed standards, and submitted a proposal. The proposals were assessed for the likelihood that each would in fact deliver the specified level of service, and on price. In the evaluation it was found that several bidders, and the in-house group, were tightly clustered on price, and committed to the same level of service. At the same time, because the standards are performance-based, there was some innovation in how each bidder would meet the requirements.

EVALUATIONS: THE NEED FOR FEED-FORWARD

Not only do most large organizations lack a comprehensive facilities data base; they also fail to develop an institutional memory of lessons learned. They are too often dependent on what best practices have been recognized and remembered by individual real estate and facility staff members, and passed on informally to their subordinates and successors.

As each facility project is commissioned, whether it is new construction, remodel or refit, both the facility, and the process for executing it should be evaluated. Each phase of each project should be considered as a potential source of lessons, including programming, design, construction and commissioning.

Many firms review the project file after completion and note whether the project was completed within budget, and on schedule. Some firms assess how well each new or remodeled facility meets the need of the business users who occupy it. Customer satisfaction surveys, post-occupancy evaluations, lease audits, and building condition reports, are becoming more common.
Essential knowledge can be captured as a formal institutional memory of what works well, what works best, and what should not be repeated (Baird, G., Gray, J., Isaacs, N., Kernohan, D., McIndoe, G., 1996). The ASTM Standards described above represent a new generation of tools giving Real Estate professionals the means to evaluate the “fit” between facilities and the users they serve. These tools use indicators of capability to assess how well a proposed design, or an occupied facility, meets the functional requirements specified by the business units, and facility occupants. Even a small business, with only a few dozen staff, needs to capture and conveniently access the key facts about its workplaces, how they are used, and lessons to apply “next time”.

Figure 3. The need to feed-forward lessons learned from each project

Wise firms keep the members of their successful project teams working together on successive projects, so that when the balance and chemistry in a team work well, lessons learned are more effectively carried forward from project to project, and teaming skills are enhanced.

EVALUATIONS: STRATEGIC TO IN-DEPTH

Many types of information should be contained within the overall data base of a real estate and facilities department. Figure 4 diagrams the range of kinds of data.

At left is the body of data created during design and construction of a facility, or during subsequent remodel or rehabilitation. Although this data is essentially created in a brief period and then retained for the life of the facility, it should be edited after construction to accurately reflect the “as-built” condition of the facility, and later the “as modified” facility. The vertical dashed line between this kind of data and the operating data that comes thereafter symbolizes the commissioning process.
Space planning and furniture layouts, and later the data about which individual occupies which workplace, together with phone numbers and other occupant data are also part of the left hand data bodies. Also included are piping diagrams, electrical diagrams, and diagrams that show where all the cables and phone wires are located.

At top of the main part of the diagram, the four broad bands indicate the kinds of data that are regularly used in a corporate real estate and facilities department. Portfolio and asset managers need summary data and key indicators for setting strategy for their portfolios and for the assets in them.

For property managers, who must allocate resources and keep facilities operating smoothly, condition reviews are needed for each annual budget cycle, to prioritize projects for repair and alteration. This data has much detail, such as condition of paving and striping the parking area, and condition of floor coverings and door hardware.

Maintenance personnel need ready access to product data, maintenance records, instructions on how to repair equipment. All too often this is either not handed over at time of commissioning, or is in manuals and files which are either missing or locked up when a repair technician is called in after midnight to repair a mechanical failure.

Operating instructions, including design set points and objectives, should also be available for verification, together with explanations of routine and special procedures.

All of this data is best made available electronically, so that any person with a need to know can access it when and as needed, wherever they might be at time of need. It seems likely that within a few years, this will be practicable using standard Data Type Definition tables, and other software standards.

Figure 4. Levels of information for portfolio and asset management of facilities
QUALITY MANAGEMENT AND ISO 9000

Quality is described in ISO 9000 as the “totality of features and characteristics of a product or service that bear on its ability to satisfy stated and implied needs” (ISO, 1994). Those who provide a product or service, e.g. a facility, and its management and operation (O&M), should ascertain the explicit and implicit requirements of the customers (occupants and owner), decide to what level those needs should be met, meet that level consistently, and be able to show that they are in fact meeting those requirements.

The starting point for Quality Assurance programs is the ability to determine and assess features and characteristics of the product or service, to relate them directly to customers’ needs, expectations and requirements, and to document it all in a systematic, comprehensive and orderly manner. A Quality Management System should include the means to monitor the compliance of all production phases, and to verify that the final product meets those stated and implied needs of the customer.

The ASTM Standards provide that starting point for a quality management system (Davis and Szigeti, 1996). They include the means to monitor and verify compliance, with respect to facilities. These standards provide explicit, objective, consistent methods and tools applicable to the field of building construction and real property.

USE AT STATE DEPARTMENT FOR THE OFFICE BUILDING CHANCERIES (OBCs)

The use of these ASTM Standards on current projects for Chanceries of the US State Department is a demonstration of how the concept of Quality as defined by ISO 9000 can be implemented as part of a Quality Assurance Program. These standards are now used to audit the functionality of a request for proposals (RFP) and of design-build proposals against an established Profile of Requirements. In January 1999, this use of the ASTM Standards received the support of the Assistant Deputy Secretary responsible for Foreign Buildings (A/FBO) at the US State Department. The US State Department has also applied the ASTM Standards to design-bid-build RFPs and proposals.

Steps In Process To Date
The ASTM Standards have been used at the US State Department to:

(a) Rate the current “Design Guide” for several major projects, and the design concepts prepared by architects in response to the Design Guide.
(b) Ascertain the imputed user requirements profile for a US Office Building Chancery (OBC), by “reverse engineering” from the Design Guide.
(c) Prepare a detailed cross-reference table, giving section number and text quotes to link the Design Guide and the ASTM Standard Scales. This table included the rating levels for each feature and topic covered in the Design Guide, and identified those topics that were not covered by the Design Guide, or not addressed in the Design Concept, or both.
(d) Identify scales that required editing, and identify topics for which there are no scales at the present time, to respond to the unique requirements of the OBCs.
(e) Prepare a “Main” Requirement Profile for the overall base building, and seven “Variants” for different zones of an OBC. This was done in collaboration with a project leader from the department of state, who conducted or participated in over 40 group interviews of staff and in-house experts, and who had previously conducted a series of post-occupancy evaluations (POEs), from which data was available.
(f) Rate the RFP levels of functionality required for a set of design-build projects.
(g) Rate proposals from the respondents to RFPs for OBCs to be procured through the design-build process, and compare the ratings of the proposals to the rating of the RFP. Prepare a “gap analysis” of the significant differences.
(h) Compare the rating profiles of the RFP and of the proposals against a selection of topics from the Profiles of Requirements, against each other, and against generic requirement profiles which had been developed by the International Centre for Facilities.

(i) Prepare a “gap analysis” of the significant differences.

(j) Train a cadre of professionals to use these tools.

Lessons Learned

In the course of these projects, we learned that using the standards saves elapsed time, speeds programming and evaluation, and enables consistent comparisons of the functionality of design proposals. Architects and engineers used the standards for quality assurance of their own work, and to verify that proposed designs were in compliance with functional requirements. When functional shortfalls were identified, project managers were able to make informed decisions on resolving each problem.

It was important to have one manager designated as the person with day-to-day responsibility for introducing the standards, scheduling briefings and coordinating the changes in procedures. This was a part-time task, taking about a quarter of this person’s time over several months. In addition, the manager reported to a more senior person who spent time providing policy and guidance, and attending meetings, enough hours to total one to two days a month during the period.

CONCLUSION

Major Trend Towards Standardization

There is a major trend towards a better understanding of “client requirements” and the start of a movement to improve the procurement process. In the UK a Benchmarking Study of procurement has been undertaken by the UK government (The Government Construction Client’s Panel, 1999). In this study, some of the findings make it clear that the process of adequately defining “client requirements” is very important. That study identifies the standardization of key practices, of information technology and of document handling as essential to achieve positive changes. The current CIB pro-active programme and developments in the US under the leadership of the Facilities Information Council of the National Institute of Building Sciences are making strides in the same direction.

Current Discontinuities

These efforts have all identified silos of professional languages, lack of linkages and translations between phases of the project delivery process, islands of information and automation, no complete audit trail, as impediments to the improvement of the quality of facilities and to their responsiveness to the requirements of the stakeholders.

Need for Further Work

This paper presented a framework for portfolio management, for the flows of decision-making activities and for the interactions with a central knowledge-base. It also reported on the use of recently developed ASTM standards. These are the first to respond to the need for translations between professional languages in the Building Industry. (Szigeti, Davis, Atherton, and Henning, 1997)

In the next few years, further work will be needed to develop a means of aggregating and dis-aggregating information and data, a set of harmonized terminology, clear and accepted definitions. Portfolio and Life Cycle Management will need to pay attention to the break-down of silos of professional languages, to improved understanding of “requirements”, and to a broader view of the “Value Chain” from Enterprise Demand through
Portfolio and Life Cycle Management back to the Enterprise. This chain needs to include a two way path from Enterprise Demand to (a) Whole Buildings and Constructed Assets and on to (b) Products and Materials. Similarly, the Audit trail will need to provide a chain of accountability for (a) Warranty of Fitness for Purpose and (b) Duty of Result rather than Duty of Reasonable Care and Skill (CIB W87).

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