The Space Utilization Inquiry Tool (SUIT™)

An Enhancement of Standard Building Capacity Assessments

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Abstract:

Explanation of the Problem. Standard facilities management practices include periodic building capacity assessments. In our K-12 (Kindergarten – 12th Grade) school facility management practice, capacity assessments consists largely of inflexible and purposeless calculations: the number of pupils each school facility can hold based on an arbitrary number of pupils per floor area. Buildings occupied by more pupils than the official capacity are rated as "over capacity", and those by fewer pupils as "under capacity". Such a perfunctory examination lacks crucial information: how well are the spaces suited to the present and future activities and functions for which they are used?

Approach. In response, our company's specialists have developed a straightforward and transparent tool to look more deeply into the suitability of existing school buildings for specific academic programs and future uses. SUIT™, the Space Utilization Inquiry Tool, uses a survey of building users and decision-makers to assess their responses to positively-worded issue statements. Each statement is evaluated by school district stakeholders on two five-point Likert scales: (l) actuality of the statement from the respondent's viewpoint; and (2) significance of the statement also from the respondent's perspective.

Results. We will present the structure and function of SUIT™, including sample survey results and how they can be used. SUIT™ can be adapted to a variety of building types besides schools.

Keywords: school buildings; space analysis; program suitability; Likert scale

Introduction:

A key issue in facility management is the number of people a building, or a rented portion, can hold effectively, efficiently, and economically. Typically, this is labeled "building capacity". It is calculated most often on the basis of a floor area allotment per person. Table 1 lists some sample floor areas per person for different types of workspaces. These figures are from the U.S. General Services Administration (General Services Administration, 2012, 27). This agency of the United States Government manages office space for all government departments and agencies in leased

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and owned space across the United States, its territories, and in foreign nations. The following observations, findings, and remarks accompany Table 1 (General Services Administration, 2012, 26).

> *"In the 2000s, facility mangers in both the Federal government and private sector typically thought they needed 200 to 400 square feet per person to build an effective office workspace. Based on GSA research, today's prevailing standard workspace average is a little more than 190 USF (Usable Square Feet) square feet per person, and the space allocation could hit a mere 60 square feet in the next 5 years.*
>
> *As a continuous stream of GSA survey results and extensive research findings shows us, organizations have been gradually dialing back on office workspace allocation and grandness for years. As trends in today's workplace environment, such as telework and desk sharing offer organizations flexibility and optimal workspace usage. However the general slowdown in economic activity has accelerated the trend as sobered facility mangers are forced to let go of their old workspace and try new ways to use less space, increase operation efficiency, and reduce overall workspace costs.*
>
> *Our findings indicate that there are numerous other contributing factors at play in the push to make the allocation of the workspace smaller and more communal. Many responders are emphasizing teamwork, and the new mobile workforces that are accustomed to working anywhere but at a desk are turning up their noses at the hierarchical formality of the traditional workplace. In addition, familiar technologies such as laptop computers, smart phones and videoconferencing are finally beginning to affect the office workplace. Much like GSA's Central Office, the new workplace is designed to squeeze together workstations while setting aside a few rooms where associates can conduct meetings and rooms to have private telephone conversations. Ideally, GSA's design creates a workplace that is more open, collaborative, and efficient while utilizing fewer square feet per person (General Services Administration, 2012, 26)."*

Thus the numbers in Table 1 are merely a snapshot, while the narrative quoted above describes a dynamic of trends across many years and decades in technology and work ethic that will influence work behavior, operational arrangements, and office configurations. Although GSA acknowledges these trends and undercurrents, they offer no evidence of a dedicated method for inquiry into these phenomena.

Tab. 1: Floor Areas per Person in Office Space

Position	Usable Square Feet (USF)	Configuration
Executive	300	Private Office
Director	250	Private Office
Manager	200	Cubicle
Supervisor	120	Cubicle
Technical	80	Cubicle
Support Staff	80	Cubicle
Clerical	64	Cubicle

In consulting with public school clients across the United States, we saw the same situation

occurring: school capacity based on a rigid allotment of floor area per student was no longer enough to decide on the adequacy of a school building or school design. Instead, a methodology was needed to determine the suitability of an existing school or of a new school design on the basis of changes in technology and pedagogy, as evidenced by a recognition of new teaching and learning styles and newfound approaches and practices in these areas.

Ordinary, traditional school capacity analyses, while needed as a gross reference base, are insufficient to portray the true student capacity of existing building stock. Instead of the basic question,

> *How many students can your schools hold, how many do they hold now, and how many will they likely need to hold in the future?*

one needs to ask the broader question of:

> ***How will the pedagogic, programmatic, and technical changes in the school district likely influence floor area requirements in schools, and how must spaces be reconfigured, and spatial relationships changed, to implement these changes?***

For example, school districts are increasingly not only renaming their "libraries" "media centers," but are reconfiguring them to hold fewer hardcopy documents in favor of an increased cache of electronic media. This results in a completely new relationship between floor area and student enrollment, especially when there is no longer a perceived need for dedicated library shelves and the media center can be accessed remotely and virtually. Schools that have made this shift find themselves with new expanses of space in their media centers that can be repurposed in any number of ways.

The literature abounds in research concerning the influences of educational trends on school design. Prominent in this literature has been a series of papers on the influence of educational trends on the design and construction of schools by Kenneth R. Stevenson, Ed. D., (2002, 2007, 2010) of the University of South Carolina in Columbia. His monograph of 2010, titled *Educational Trends Shaping School Planning, Design, Construction, Funding and Operation*, is the most recent update of discourses he prepared under the same title in 2002 and 2007. Even he has admitted to revising his forecasts as the social, political, and economic climates have changed since he began writing his observations:

> *"Before presenting the updated trends, a note of forewarning is extended to the reader. The first two editions of this NCEF "Trends" work (2002 and 2007) tended to*

> *envision a relatively rosy, almost idealistic future for public education. The new version does not. A continuing recession, escalating political polarization, rising racial/ethnic tensions, a growing national debt, and a widening divide between the haves and the have nots portend a future fraught with unprecedented challenges to and clashes over the form and substance of public education in America… In essence, this work reflects the belief that, as an old adage suggests: "We can't control the future, but we can help shape it"* (Stevenson, 2010, 1)."

In its most current incarnation, Stevenson's monograph offers 15 key trends and observations as they are likely to influence the planning, design, construction, funding and operation of public schools in the United States. These trends forecast, among others, more flexible and changeable school facilities, increasing educational delivery by electronic means, and a restructuring of the teaching profession into expert educators similar to medical doctors, assisted by a cadre of technicians and assistants who carry out educational protocols and orders. His observations and speculations have the following message for school facilities planners and designers:

> *"How can effective learning experiences be delivered when the expectation is that the nation may well have fewer and fewer qualified teachers in the decades to come? And, how will districts address increasing enrollments when adequate funding is not available to construct or update school facilities? The emerging answer is: Through virtual learning experiences – experiences that occur at any location, at any time, and focus on the topic of choice of the learner. In this scenario, content materials are developed by the best educators in their respective fields. Highly trained distance delivery experts package the materials for effective use via multi-media devices. Student learning styles, as well as developmental stages and bio-rhythms, are considered as instructional packets are assembled… This does not necessarily foreshadow the disappearance of schools within 40 years. In fact, it is more likely in 2050 that some hybrid or blended educational delivery model, involving on-site and online learning, will be prevalent. It does, however, strongly suggest that educators and facilities professionals face a different future from what has always been. Thinking differently, particularly in terms of what school facilities will look like and the roles they will fulfill, must become a very necessary part of the long range facilities planning process.* (Stevenson, 2010, 12-13.)"

It becomes abundantly clear from the prior discussion that the mere calculation of whether or not the student population of a school building is above or below an arbitrary capacity figure no longer carries sufficient meaning, except perhaps for the most proximate moment. Of greater importance is a threefold consideration:

1. Are the school district's existing buildings suitable for the educational programs the district envisions during the coming twenty years?

2. If the existing buildings are not fully suitable, then what are the types of renovation and remodeling actions the district should initiate?

3. What types of new buildings should the school district plan, design, and construct, if any?

To help answer these questions, and to serve our school district clients in this more complete and thorough manner, we have developed a tool that permits us to assess the suitability of our clients' buildings, and the possible need for new facilities that fit future programs. The reference frame we use is our clients' view of the future, instead of a rigid, external ideological construct of what prospects are to come. We have named our tool SUIT™ – the acronym for Space Utilization Inquiry Tool.

The Structure and Function of SUIT™:

When applied in our exclusive consulting practice with public schools in the United States, SUIT™ relies on the current experiences of a school district's educators (principals and teachers), facility support staff (custodians and maintenance workers, kitchen staff, etc.), and students to define and categorize the district's existing building stock along the dimensions of pedagogical and facility suitability. This collected information is then combined with an on-the-ground assessment of every space in every school building of that school district.

- *Issue Statement Inventory*

  SUIT™ contains an inventory of factually – and positively – worded statements (issue statements) in two key categories: pedagogy and facilities. The following statements are merely examples. They will be tailored to a specific school district's conditions and situations. Examples are:

  A. Pedagogy: Educational Strategies, Programs and Initiatives

  A.1. My school provides a safe learning environment.

  A.2. All classroom doors can quickly be locked from the inside during an emergency.

  A.3. After the start of school all exterior doors are locked and the main door can be easily monitored.

  A.4. During class times, all classroom doors are locked.

  A.5. All classroom doors have unobstructed vision panels.

  A.6. Students using classroom technology can be easily monitored.

  A.7. Students using technology in common areas (such as media centers) can be easily monitored.

  A.8. Significant technology assets are deployed in each classroom. The use of computer labs is minimized.

  A.8. Classes are provided in the appropriate spaces (e.g., science in a class equipped with a fume hood, laboratory casework, secure chemicals storage, etc.)

A.9. The school is small in size or is broken into more than one school-within-a-school, or it has in place other measures to boost connectivity and familiarity among students and staff.

A.10. Room locations, size, or features do not limit educational programming options.

A.11. Classroom spaces are arranged around common space that can be used flexibly in a "learning community" format.

A.12. Some areas of the school lend themselves to quiet reflection, while other areas are most typically active and boisterous.

A.13. The school grounds provide for natural environment areas such as botanical gardens, planting beds, and other opportunities for students to be exposed to, and work with, nature.

A.14. Furnishings, fixtures, equipment, and textbooks are not obsolete in light of current teaching and learning methods, available technology, and current data and information.

A.15. All classrooms have windows to the exterior, ideally with views to natural environment.

A.16. Classrooms for younger students include restrooms and wash stations within them, to minimize class disruptions.

A.17. Elementary classrooms can be arranged to support center-based learning that is easily monitored.

B. Facilities: Space Utilization, Reconfiguration, Renovation, and New Construction

B.1. The spaces in my school can be flexibly rearranged with little cost or effort as needs and uses change.

B.2. My school has adequate seating space in the cafeteria.

B.3. The core spaces of my school (cafeteria, kitchen, gymnasium, auditorium, offices, and so forth) were expanded as classroom wings or portables were added.

B.4. Most classrooms are occupied each period.

B.5. No classes are taught in hallways or unsuitable spaces and locations.

B.6. My school has sufficient space for teacher collaboration.

B.7. There is sufficient secure storage for hazardous chemicals (both educational and cleaning).

B.8. My school has ample space in all functions and areas, with no overcrowding in any classroom.

B.9. Faculty/staff only spaces in the school (such as staff restrooms) are always locked and inaccessible to students.

B.10. There are few unused rooms.

B.11. There is sufficient refrigerator and freezer storage to store food items at the appropriate temperatures with circulation.

B.12. There are no spaces in the building designated as "off limits" due to known hazardous conditions.

B.13. Roof access is appropriately limited, secured and controlled.

B.14. Hidden areas within or adjacent to the school that might provide offenders with "cover" or provide students with a location for illicit activities have been made safer by opening them up, exposing them, sealing them off, or other measures.

B.15. Visual surveillance of exterior areas, such as parking lots, is possible through windowing or camera placement.

B.16. Bus, car, pedestrian, and bike traffic are reasonably safe from each other at entry and exit points as well as throughout the site and traffic calming strategies discourage speeding throughout the site.

B.17. The school has no "junk rooms" containing obsolete, discarded, or unused equipment, broken furniture, discarded shop tools, or hazardous materials (paint, volatile spirits, chemicals, etc.)

B.18. The school has no mobile, portable classroom or other structures that have been in place for longer than two years. Any such existing structures are expected to be removed within a one or two year horizon.

B.19. The school's core spaces (gymnasium, auditorium, cafeteria, kitchen, media center, etc.) are sufficiently sized and equipped to serve the student population.

B.20. The school has a fence that encloses and secures its site to limit access only to students, faculty, administrators, staff, and properly credentialed visitors.

B.21. Indoor air quality is good.

B.22. Students, staff, faculty, administrators, and others do not suffer from significant amounts of respiratory ailments and allergies whose source might be the building.

B.23. Few building occupants complain about environmental discomfort due to temperature and humidity extremes.

B.24. There are no excessive noises or sound distortions causing annoyances or making communication challenging in any areas of the building.

B.25. Quiet and noisy spaces are located apart from each other and create few or no functional conflicts.

B.26. Few to no interior finishes, furnishings, fixtures, and equipment appear to be damaged or broken, or in need of other maintenance and repair.

Issue statements provided in surveys are tailored to the reference frames of each school district's stakeholder group.

- *Evaluation/Rating Scales*

  Each issue statement is evaluated by district stakeholders on two scales:

  - actuality of the statement from the viewpoint of the respondent; and
  - significance of the statement from the respondent's perspective.

Each answer lies on a five-point Likert scale. The actuality scale ranges from 1 to 5, with 1 being "not at all true" to 5 being "very true". The significance scale ranges from 1 to 5, with 1 being "not at all important" to 5 being "extremely important" ("An Overview of", 2010). (The dual Likert scale approach is adapted from prior work by co-author Martineau on his Master of Architecture thesis of an "Urban Activity Model," where urban residents were asked to rate the frequency of occurrence and the importance to them of neighborhood activities and features.)

- *SUIT™ Survey Instrument*

The issue statement inventory serves as the basis for client customization. While clients cannot remove issue statements from the list, they may create, with assistance from our staff, issue statements to be added to the inventory. The customized survey is then administered to a variety of school stakeholders:

- faculty;
- staff (kitchen, cafeteria, office, custodial, etc.);
- administrators; and
- students.

If a school district has a high rate of community usage, then community members would be an additional stakeholder group. Stakeholder responses are weighted equally and analyzed within each category, and on a cross-comparison basis for similarities and differences.

All SUIT™ surveys are administered in a secure online environment. Our survey technology allows us to require respondents to provide significance scales along a distribution, ensuring that not everything is ranked as "extremely important". A portion of a completed issue statement inventory by one stakeholder might look as shown in Table 2:

Tab. 2: Hypothetical Actuality and Significance Scores for Selected Issue Statements

Issue Statement	Actuality	Significance
A.1. Teachers, administrators and other appropriate staff are thoroughly trained before major new educational policies, procedures, programs or other strategies are implemented.	4	5
A.2. Special education programs are conducted alongside regular elementary, middle, and high school programs.	3	2
A.3. My school uses learning community teaching approaches.	1	1
A.4. My school provides a safe learning environment.	2	5

- *Issue Categorization/Prioritization*

  Once survey results have been received, we categorize them by user group as follows:

  I. Most urgent issues: issue statements with the lowest actuality ratings and the highest significance ratings are potentially the most urgent issues to be addressed.

  II. Least urgent issues: issue statements with the lowest actuality and the lowest significance ratings.

  III. Secondary issues: issue statements with mixed results, either by user group or overall. These issues may require follow-up, such as more in-depth interviews with key stakeholders and decision-makers, before they are placed in the prioritization order.

- *Issue Implementation*

  Subsequently, we prepare an implementation plan for the school district. This plan addresses typically issues of a programmatic nature. We include these issues in an educational program action plan. Simultaneously, we perform an "activity-facility translation" of all of the relevant issues and prepare educational specifications (or "EdSpecs", the term used in USA for school facilities program) to permit the physical accommodation of the initiatives contained in the educational program action plan. The latter will provide the most realistic facility utilization picture available.

Application in a US School District

The application of SUIT™ in a small school district in the US illustrates its value as a superior technique to other facilities analysis methodologies. Located in New Hampshire, the district had state-level size requirements for the physical classroom space and the number of students in a class. For example, a high school classroom should be at least 800 square feet and have no more than 30 students, requirements that had been unchanged for many years. The district projected nearly flat enrollment for the next 10 years. Faced with a mostly aged building stock and limited

funding but needing to respond to new educational concepts like competency-based education, the district undertook a facilities assessment using SUIT™ to help guide future decision-making.

SUIT™ survey instruments were customized and fielded by stakeholder group: school board members, school-based educators, high school students, community members/parents, cafeteria staff, maintenance/custodial staff, bus drivers, and secretaries. More than 300 stakeholders participated, a high level of input that later provided the results with greater weight among decision makers. Tabs 3 and 4 provide the most salient results from the input provided by high school educators and high school students, respectively. As shown, the SUIT™ methodology brought to light space adequacy concerns among the educators and students. The low actuality scores indicated that the building users did not feel these items were happening in their school but the high significance scores indicated these items were important to them.

Tab 3: Sample High School Educator SUIT™ Results for Space Usage

Issue Statement	Actuality	Significance
My school can be flexibly rearranged with little cost or effort as needs and uses change.	1.7	4.1
There are ample break-out spaces in my school for informal student gatherings to meet, study, discuss, or socialize.	1.9	4.0
My school has circulation spaces that allow for people to stop and speak with each other without disrupting others who want to walk past.	1.9	4.0
Classroom spaces are arranged around common space that can be used flexibly in a “learning community” format.	1.9	3.6
There is a variety of formal meeting spaces for small, medium, and large groups available to students in the school.	2.0	4.0

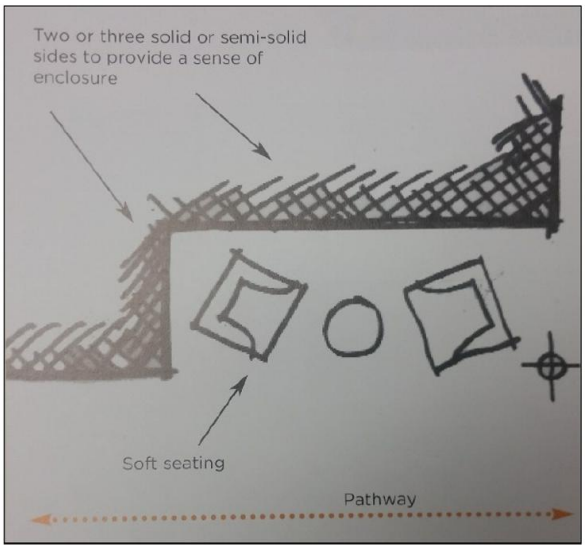
Tab 4: Sample High School Student Responses for Space Usage

Issue Statement	Actuality	Significance
There are a number of informal alcoves, nooks, or other meeting spaces available for students to study, chat, and socialize.	2.5	4.3
There are ample break-out spaces in my school for informal student gatherings to meet, study, discuss, or socialize.	2.6	4.2
There is a variety of formal meeting spaces for small, medium, and large groups available to students in the school.	2.8	4.1

The preliminary design work for the district’s high school reflected and honored these concerns. The master plan drafted included consideration for a dedicated, flexible student use space, what came to be termed “a space of their own”. This space was incorporated into an expanded foyer area that that also met the need for an improved administrative suite and professional office space for teachers (needs that were identified in other SUIT™ issue statements).

Additional break-out spaces were recommended throughout the school, by carving "cave space" from the existing footprint, comprised of portions of existing hallway and classroom square footages. Tab 5 provides a sample of what was recommended.

Tab 5: Alcove or Cave Space



Source: Nair, P., Fielding, R., and Lackney, J. (2013). The language of school design: Design patterns for 21st century schools. Designshare.com.

These recommendations were directly the result of SUIT™. It is unlikely they would have been perceived as strong needs based solely upon consultants' observations, nor would they likely have surfaced among stakeholders without the structure and space usage language SUIT™ provided.

The SUIT™ results from an elementary school in the same district pointed out different concerns among that building's users. Tab 6 provides some of the salient SUIT™ results. As shown, there were a number of space adequacy and space usage issues. Given the tools to speak the language of facilities designers, the educators were able to clearly identify the ways in which their building was not supporting the type of educational programming they desired to provide. There was overcrowding in many areas, some teacher-student small group work was being conducted on the floor, in breezeways, and core spaces such as the "gymnacafetorium" were so undersized and overscheduled that they were no longer effectively serving their purpose (in this case many classes had taken to eating in their classrooms), and the needs of special student populations for space had been neglected. While this school was well within the state guidelines as to the square footage of the classrooms provided and the number of students per classroom, it fell short of meeting the needs of teachers and students engaged in modern concepts of learning.

Tab 6: Sample SUIT™ Results for an Elementary School

Issue Statement	Actuality	Significance
Space Adequacy		
My school has ample space in all functions and areas, with no overcrowding in any classroom.	1.8	4.6
There is sufficient space in the teacher workroom.	1.0	4.6
The core spaces of my school (cafeteria, kitchen, gymnasium, etc.) were expanded as classroom wings were added.	1.9	4.6
Specialists have sufficient space to work with special education students.	1.5	4.9
Elementary classrooms provide nooks or otherwise recessed spaces to house center activities in semi-private settings and without encroaching in the main classroom area.	1.4	4.1
Space Usage		
There is a variety of formal meeting spaces for small, medium, and large groups available to faculty and administrators in the school.	1.5	4.8
No classes are taught in hallways or unsuitable spaces.	1.6	4.9
The spaces devoted to special education are appropriate.	1.7	4.8
There is a variety of formal meeting spaces for small, medium, and large groups available to students in the school.	1.5	4.1
There are ample break-out spaces in my school for informal student gatherings to meet, study, discuss, or socialize.	1.4	4.4
The school has designated and sufficient space for teacher collaboration.	1.4	4.6
There is designated and suitable space within the school for teachers to meet with parents or conference with students.	1.7	4.4
There is designated space within the school for students to engage in small group work.	1.5	4.6

The preliminary design work for this elementary school reflected and honored the concerns of its educators. The master plan drafted included consideration for:

- A new space to be used as a cafeteria and occasional auditorium, allowing the "gymnacafetorium" to be used solely as a gym;
- Increased storage options for teachers and students outside their classrooms in order to free space within them; and
- Adding a "specialist suite" to better accommodate work with special student populations.

As with the high school master plan elements, it is unlikely these elements would have been perceived as strong needs based solely upon consultants' observations, nor would they likely have surfaced among stakeholders without the structure and space usage language SUIT™ provided.

Conclusion:

The methodology presented in this paper was developed for use and application in the K-12 school consulting practice of our firm. However, the approach described in the structure and function of SUIT™ is equally useful and applicable with many other building types. This

includes offices, hotels, stores, government buildings, transportation facilities, and many others. Prototype buildings developed by chain establishments are especially applicable to our approach.

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