Designing an accommodation strategy: findings from an architecture school

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Abstract

Purpose – This study aims to explore the need for space (demand) and the provision thereof (supply) in the Faculty of Architecture building at Thammasat University Rangsit campus using variables from the designing an accommodation strategy (DAS) framework; these variables are incorporated to test and improve the framework. Another purpose is to examine the planning and development of the faculty building to understand its strategy, which serves as a means to contribute to the planning and development theory.

Design/methodology/approach – A case study of the Faculty of Architecture building was conducted at Thammasat University in Thailand. The DAS framework was used to reconstruct and examine the development process of the building to determine the gaps between supply and demand in terms of building space, to reflect on the building plan and process and to make suggestions as to how the DAS framework might be improved. Research methods included interviews and document analysis concerning space requirements and provision in the Faculty of Architecture building.

Findings – The gaps between supply and demand in terms of the faculty building space are affected by the condition of the building (i.e. building obsolescence), the number of building users and the changing environmental context. This study shows that both pre-design and post-occupancy evaluation are essential to collect data concerning the match or mismatch between supply and demand of space and to assess users' needs and preferences concerning the faculty building. Regarding the building development process, factors impacting the step-by-step planning of the real estate interventions include the organisational context (public/private sector) and the management of the construction project (time, cost, quality). The DAS framework is found to be useful for structuring the information-generating processes necessary to determine gaps between demand and supply in terms of space and for making decisions regarding real estate interventions.

Research limitations/implications – Additional case studies in different environmental and organisational contexts are required to test the DAS framework and improve data validity. This study was conducted during the COVID-19 pandemic period, which affected data accessibility.

Practical implications – The results provide insight into the influence of various factors on the decision of corporate real estate. The DAS framework can be used to explore the range of demand for and supply of space and to find an optimal match.

Originality/value – This paper shows valuable steps in planning and development of educational real estate and a first application of the DAS framework in Thailand. The findings confirm the importance of the physical learning environment of architecture schools, particularly the studio spaces required in architecture education.

Keywords Online education, Post-occupancy evaluation, Architecture education, Design studios, Pre-design evaluation, Users' needs and preferences

Paper type Case study

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1. Introduction

The demand for educational spaces and facilities in universities is changing owing to the transformation of the internal contexts of these institutions, with these contexts including objectives and structures, as well as corporate and real estate strategies. Changing learning approaches and information and communication technology (ICT) have also significantly impacted the demand for educational spaces and the planning thereof. It is expected that changes in the purpose and process of learning, including the growing use of ICT, will be reflected in the design of learning spaces in practice (Beckers, 2015). In the field of architecture education, undergraduate architecture degree curricula consist of both participating in architecture design studios and studying theoretical subjects, which take the form of lectures for the five-year Bachelor of Architecture and the four-year Bachelor of Science in architecture degrees.

The architecture schools of 34 Thai universities offer both undergraduate and postgraduate degrees in architecture (Architect Council of Thailand, 2021). Despite novel instructional approaches such as online learning, the demand for classrooms on university campuses has increased owing to an increasing number of students (Thammasat University, 2021). However, the coronavirus (COVID-19) pandemic that emerged at the beginning of 2020 has impacted learning in architecture schools and thus the demand and supply in terms of faculty buildings and the long-term approach to architecture education.

The changing of space demands owing to the changing environmental context poses challenges to the School of Architecture at Thammasat University that requires to adopt a strategic approach with regard to the long-term needs of the faculty building. A sound real estate strategy requires a clear understanding of the demand for space and supply of space and well-thought steps in the planning and development process.

2. Literature review

2.1 Learning environment in architecture schools

Learning involves a cognitive process of acquiring knowledge and information through experiences (Sgambi *et al.*, 2019). A learning environment features a wide range of characteristics which largely overlap with those found to be crucial to student satisfaction (Wiers-Jenssen *et al.*, 2002). In Lancaster and Di Milia's (2015) study, the learning environment was considered to include all facilities and activities related to learning. The facilities can be non-physical, such as curriculum and learning and teaching methods, and physical, such as classroom, laboratories and libraries. Furthermore, social relations among people involved in learning, such as teachers and friends, are also considered part of the learning environment (Hopland and Nyhus, 2016).

Sgambi *et al.* (2019) argue that universities' teaching strategies are commonly classified into either passive or active. Their study emphasises the importance of active teaching experiences in architecture courses. In architecture schools, architectural design courses are considered being of fundamental importance to architecture education. Typically, an architecture curriculum consists of design studios, which serve as the core of architecture education, and theoretical subjects that support the design process (Saghafi, 2020). The design studio is the environment wherein students learn to design and nurture their creativity through active learning (Ceylan *et al.*, 2020). However, the findings of Saghafi (2020) showed 14 strategies which link knowledge acquisition and knowledge application in design studio in architecture education. These strategies (e.g. directing pre/post-design research, architecture and project programming, assessing a project based on a theory) are not limited to the design studio but are also applicable in teaching and learning in the theoretical subjects.

2.2 Relevance of physical spaces

Meyer and Fourie (2018, p. 422) describe the physical spaces of design studios as venues for sharing notions. Design pinup spaces, which are used for critiquing designs, enable cross-pollination across all years of study, whereas the atrium spaces for design critiques (known by students as design crits) provide observers with interesting insights. Furthermore, the reading rooms grant access to a physical repository of information resources, and the archives offer background information on noteworthy historical architects. Spaces also include a computer laboratory and dedicated laser-cutting, 3D printing and model-building facilities. A previous study shows the relevance of physical spaces in the assessment of students in architectural design studio projects (Sgambi *et al.*, 2019), which includes evaluation through continuous communication between student and lecturers from different disciplines as well as assessments of their ability to work with others when undertaking an architecture project.

In a broader context, a university campus can support collaborations between stakeholders such as students, academic staff and networking partners both in and outside the university. Physical spaces not only enable different stakeholders to come together (Huhtelin and Nenonen, 2015) but also support students' learning process (Brooks, 2011; McArthur, 2015; Lundahl *et al.*, 2018). In her study on university campuses, Den Heijer (2011) illustrates the significance of the physical aspects of university buildings and the spaces within such buildings (e.g. academic workspaces, studio spaces and libraries), which serve as meetings place and facilitate social and intellectual exchanges. Similarly, Ninnemann (2018) emphasises the importance of physical spaces that may have symbolic significance for universities' images. In terms of value provision, physical spaces create social value by facilitating the formation of relationships between people, creating or enhancing opportunities for positive social interaction, and reinforcing social identity and civic pride (McMillan, 2006, p. 266). Organising physical settings according to organisational goals and desired behaviour can also create social value (Bitner, 1992).

Although physical spaces are relevant to the learning environment of architecture education, recent studies indicate the increasing possibility of adopting virtual learning environments for future design courses in light of the development of ICT (Alnusairat *et al.*, 2020; Ninnemann *et al.*, 2020; Saghafi, 2015). In fact, virtual design studios have been implemented recently in most architecture design courses owing to the COVID-19 pandemic. Saghafi (2015) shows that virtual design studios implemented in parallel to face-to-face learning facilitate constructive learning through uninterrupted access to studios for discussion, group interactions and the documentation of design processes.

2.3 Designing an accommodation strategy

An organisation's choices with regard to its real estate might be complicated by changing user demands owing to the influence of both internal and external contexts. Shifts in corporate policies, organisational objectives, structures and work patterns impact decisions regarding corporate real estate. New technologies, economic situations, demographic factors and the labour market also impact decisions concerning corporate assets. The designing an accommodation strategy (DAS) framework (De Jonge *et al.*, 2009; Den Heijer and De Jonge, 2012; Van der Zwart *et al.*, 2009) was developed by the Department of Management in the Built Environment (previously known as Real Estate and Housing) of the Faculty of Architecture and the Built Environment at Delft University of Technology to provide a methodology for making accommodation decisions by balancing supply and demand in terms of real estate (Figure 1). It was developed to address the strategy decision processes in the fields of both real estate and strategic management and the challenges associated with each. The framework can be used for various types of multi-level decisions concerning real estate.

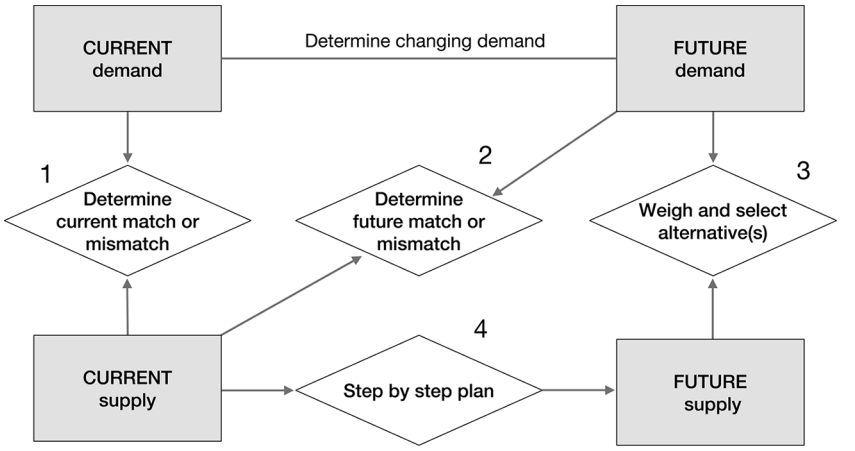

Figure 1.
Designing an accommodation strategy (DAS) framework

Source: Adapted from De Jonge *et al.* (2009)

The following are the four phases of the accommodation strategy design process (De Jonge *et al.*, 2009):

(1) Phase 1 – determining the match or mismatch between current demand and current supply.

This phase involves considering the following question: what is the match or mismatch between the current demand and the current supply? Steps involved in the process include: performing an inventory of the current space needs and space use (current demand), assessing the quality and quantity of the current supply at the building and portfolio levels, and comparing both current supply and demand to determine the match or mismatch. There are also sub-questions, such as the following: what are the problems of the various stakeholders in the current situation? What are the current supply and demand? What is the mismatch (i.e. what is the problem statement)?

(2) Phase 2 – determining the match or mismatch between future demand and current supply.

This phase involves a "what if" or "scenario" approach. The timeframes for the future demand of organisations vary between three and five years. The main question is as follows: how can an organisation cope with uncertainty? The sub-questions include the following: what is the future demand, and what is the match or mismatch between the future demand and the current supply? This phase involves comparing the estimated future demand with the current supply, which yields a prediction of the future accommodation mismatch should supply remain at its current level.

(3) Phase 3 – designing, weighing and selecting alternatives to bridge the mismatch.

Alternatives are designed and weighed according to the strategic assumptions. The question to be answered is how does the future supply need to be defined to match the future demand through designing and evaluating alternatives for the future supply? The sub-questions are as follows: what are possible solutions, and how can they be evaluated by all stakeholders?

(4) Phase 4 – transforming current supply into selected future supply.

This phase involves two main questions: how can the solution selected in the former phase be implemented? and do the specifications of the proposed solution in terms of the time and resources required prompt corporate real estate managers to rethink the proposed solution and attempt to generate new solutions? In this phase, the transition from the current to the future supply scenario is specified in a step-by-step plan describing the main changes required to an organisation's portfolio and buildings; the phase concludes with a schedule and a financial plan.

In the context of the School of Architecture, demand and supply, respectively, refer to the requirements in terms of physical space and the provision of the faculty building for this purpose, including studio spaces, workshops, library, amenities and service areas. This paper discusses the real estate interventions focused on the School of Architecture building in light of the four phases of the DAS framework.

2.4 Problem formulation and research questions

Previous studies have shown a concern regarding the use of ICT in education impacting universities' real estate planning (Becker, 2015; Den Heijer, 2011). However, the 2020 data from Thammasat University's registrar's office show that, in recent years, the number of students has increased when compared to past years (Thammasat University, 2021).

The studio spaces in the Faculty of Architecture and Planning are essential to architecture education and are required to support the increasing number of students studying architecture. Until recently, the pandemic has forced most universities to offer online education, including for design courses. Changing demands in terms of space and space usage pose challenges to the School of Architecture, as it needs to adopt a strategic approach to adjusting and meeting long-term needs. The purpose of this study is to explore the process of assessing the Faculty of Architecture building's need for (demand) and provision of (supply) space according to the four phases of the DAS framework, as well as to test and improve the framework. Another purpose is to examine the development process and plan for the faculty building. The paper aims to answer the following questions:

Q1. What are the gaps between demand and supply in terms of faculty building space?

Q2. How has the School of Architecture prepared for the faculty building's renovation and development to cope with the changing environmental context?

3. Research perspectives, strategies and methods

The naturalistic approach (Lincoln and Guba, 1985) was chosen as the system of inquiry. Exploratory research was conducted at the beginning of the study to link the theoretical framework with empirical contexts; this was followed by explanatory research to develop an understanding of the potential link from the empirical evidence. The naturalistic inquiry, which is also known as the interpretive paradigm, is intended to understand phenomena in their naturally occurring states and is a discovery-oriented approach in the natural environment. In this perspective, the researcher's background knowledge influences the social construction of reality (Miles and Huberman, 1994; Groat and Wang, 2002). In this study, both inductive and deductive reasoning were applied. Deductive reasoning involves deriving specific questions from the larger context of theory, whereas inductive reasoning involves explores insights based on a case study.

The research steps presented in Figure 2 describe the process, which ranges from the initial literature review and case study to drawing conclusions and offering

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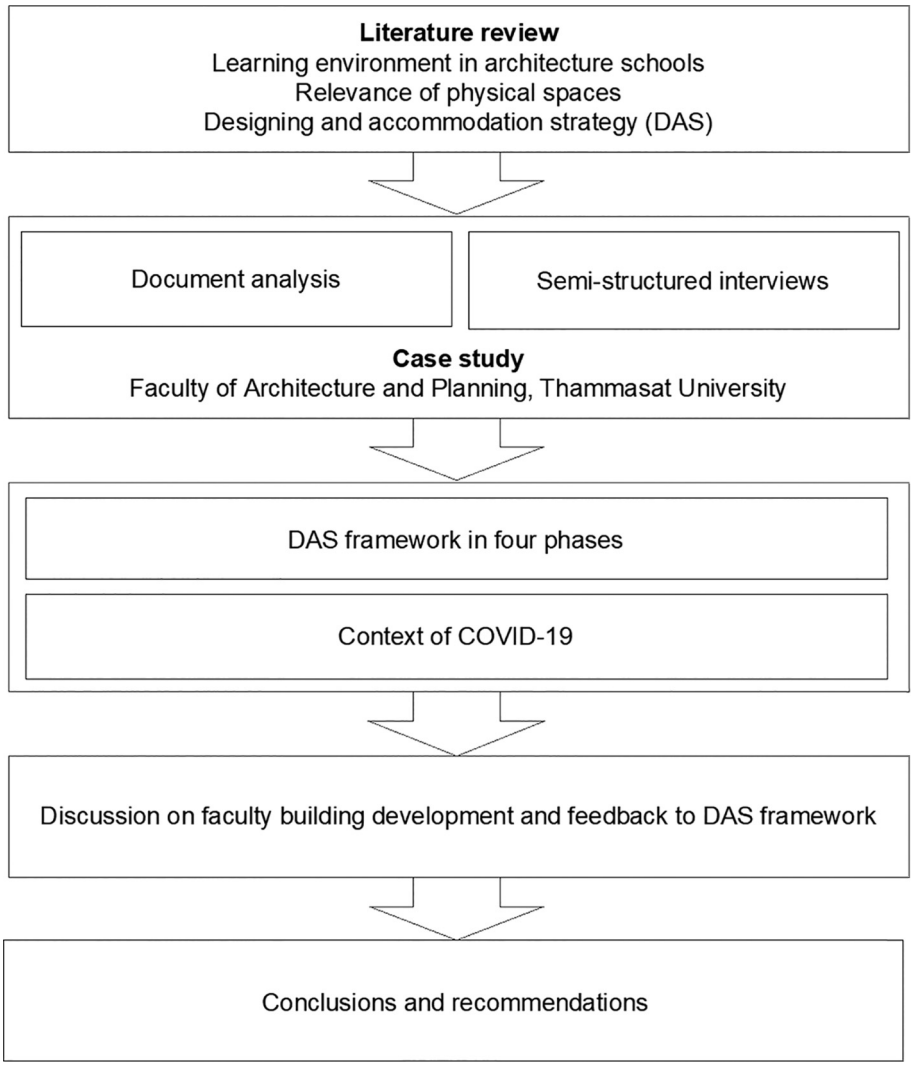

Figure 2.
Research steps concerning the DAS framework and a contextual background

recommendations (indicated by an arrow connecting each step). The author conducted a field study focused on the Faculty of Architecture and Planning (APTU) at Thammasat University as part of the case study method. Data collection involved document analysis, followed by semi-structured interviews. The document analysis, which was based on a report concerning a faculty building development project (Tantiwanit, 2019), was used as an input to describe the development process of the faculty building in light of the four phases of the DAS framework from the author's perspective; this description was in turn used to determine the gaps between demand and supply in terms of building space and to suggest improvements to the framework. The document analysis collected data from the report on the number of users and their requirements (e.g. settings regarding students' activities in

classrooms and design studios) that were calculated to square metre area requirement. In terms of the relocation, square metre area of the new space that was equal or close to the space in the previous location was included in the new space demand.

A student from each school year (i.e. from first to fourth year), who is active in a student committee, and the assistant dean, who serves as the head of the faculty building development project, were selected for the interviews. Each of the four students was asked about his/her demand on the faculty building in terms of quality (e.g. functionality and comfort of the spaces) and quantity (e.g. number of seats and other furniture settings) of the spaces. Questions to the assistant dean focused on the whole faculty building development process as well as his feedback on the process and outcome (i.e. impacts to stakeholders). The data from the interviews with the students concerning their requirements with regard to building spaces were used to verify the findings concerning space demands of the document analysis, whereas the data from the interview with the assistant dean focused on data regarding the faculty building development process, which was used as an input to reflect the entire process from the author's perspective.

Criteria for case selection included location, the physical characteristics of architecture schools (e.g. studio spaces, workshops) and building characteristics (i.e. single-tenant building). The study selected a case in Pathumthani Province owing to the province's real estate development potential, which influences the demand for and supply of faculty buildings and impacts decisions concerning the development and management of the university campuses in the province. Pathumthani, a central province adjacent to Bangkok, is among Bangkok's metropolitan regions and covers an area of 1,526 square kilometres (Pathumthani City Hall Office, 2021). The province has a high growth rate owing to its well-developed urban infrastructure, including basic facilities and services, and transportation and communication systems, which have both attracted investment from the private sector and led to the establishment of universities. Four universities in Pathumthani offer architecture degree programmes: Thammasat University, Rajamangala University of Technology Thanyaburi, Bangkok University and Rangsit University.

In terms of building characteristics, the buildings belonging to the architecture faculties at Thammasat University and Rajamangala University of Technology Thanyaburi are classified as single-tenant buildings. The other two architecture schools' buildings are multiple-tenant buildings; the architecture faculties of these universities have adopted a different approach for their respective buildings in that the spaces of these buildings are used by both architecture students and students belonging to other faculties. Furthermore, architecture students are allowed to use other learning spaces on university campuses. The first phase of field research, however, was hampered by limited access to these areas of these universities owing to COVID-19-related restrictions. In addition to the three main case selection criteria, the Faculty of Architecture and Planning at Thammasat University was chosen as a case study based on the willingness to cooperate. The study was conducted between October 2020 and January 2021.

4. Case description

Thammasat University's Faculty of Architecture and Planning was historically created as an institution under Thammasat University tasked with developing an academic programme in architecture and was subsequently established as the Faculty of Architecture in 2001. The Faculty of Architecture currently offers 13 programmes, consisting of 7 undergraduate and 6 postgraduate programmes in architecture, interior architecture, landscape, real estate, urban design and planning and design management. The student population consists of 1,535 undergraduates and 246 postgraduates (as of the end of 2020). The faculty has 78 academic and 51 administrative staff.

4.1 Physical environment characteristics

The faculty building is located on Thammasat University's Rangsit campus on Paholyothin Road in Pathumthani Province. The campus is connected to the motorway and accessible by public transport (taxi, bus and train). In addition, a plan to implement mass transit via the Bangkok Skytrain (Rangsit–Thammasat extension line) is currently being implemented. Figure 3 shows the faculty building's location and the surrounding areas on Thammasat University's Rangsit campus.

The six-storey building, which has a total area of 20,649 square metres, can be classified in terms of space usage as follows: executive office, student areas, classrooms and computer rooms, studio, staff areas, academic staff areas, faculty lounge, research areas, service areas and other areas (Tantiwanit, 2019). Table 1 presents the different areas of the faculty building in terms of square metres and space usage percentage. Figure 4 shows the ground floor plan, which includes student, service and staff areas. Plates 1 and 2 illustrate the exterior of the faculty building and the learning environment's interior spaces.

5. Research findings

The findings of the document analysis and interviews highlight the importance of different aspects of the requirements in terms of space and the provision thereof of various stakeholders. This section describes the results based on the four phases of the DAS framework, followed by a description on the school's policy with regard to learning approaches and access to the faculty building during the COVID-19 pandemic.

5.1 Phase 1 – determining the match or mismatch between current demand and current supply

Table 2 presents students and staff's quantitative and qualitative requirements concerning various aspects of the spaces in the faculty building.

Source: Google Earth (2020)

Figure 3.
Thammasat University's Rangsit campus, where the Faculty of Architecture and Planning building is located

Areas	Square metre	(%)
Executive office	170	1
Student areas	1,873	9
Classrooms	2,948	14
Studios	2,613	13
Staff areas	367	2
Academic staff areas	845	4
Faculty lounge	155	1
Research areas	260	1
Service areas	1,668	8
Other areas	9,749	47
Total	20,649	100

Notes: Student areas include the auditorium, the student centre, the graduate study room, the library, the workshop and the storage for student activities. Classrooms include lecture rooms, computer rooms and seminar rooms. Service areas include the stationery shop, the printing shop, the canteen, restrooms and building system rooms. Other areas include halls, walkways, stairs, elevator halls and balconies

Table 1.
Total usable area of the faculty building classified by space usage (Tantiwanit, 2019)

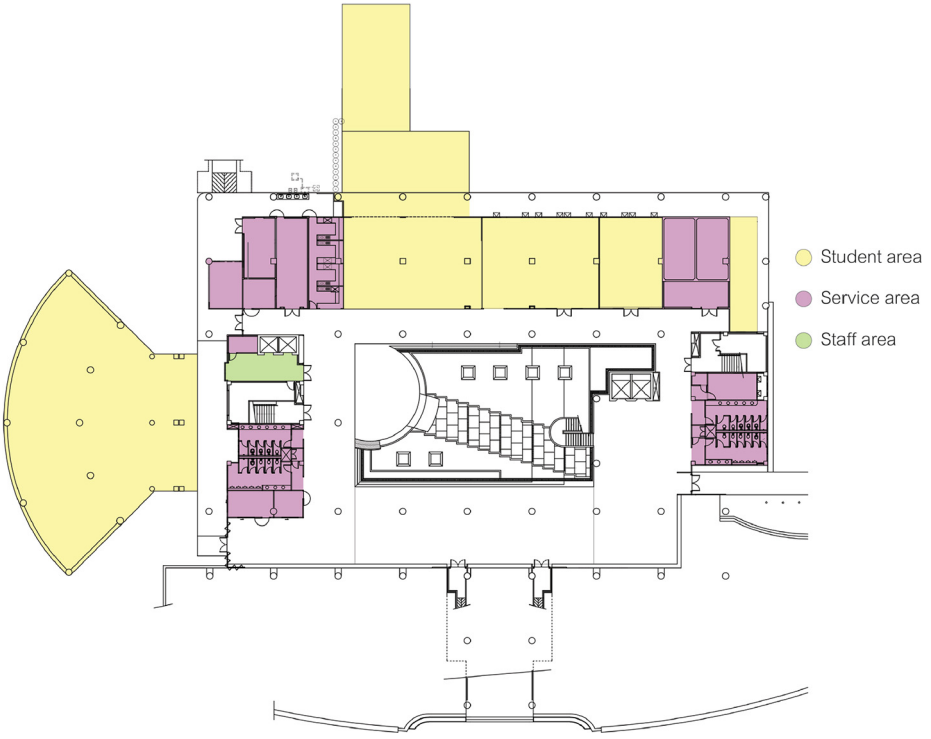

Figure 4.
Ground floor plan (Tantiwanit, 2019)

The findings indicate that the current building conditions do not sufficiently meet both students and staff's current needs in several areas. Completed in 2007, the faculty building has faced both physical and functional obsolescence. The demand for more studio spaces and student activity areas, as well as flexibility in terms of the use of spaces, is high. In

particular, the studios and classrooms have different occupancy rates depending on timetables, which cause a mismatch between space demand and supply.

The average percentages in terms of classroom and studio usage are 75.93% and 56.25%, respectively. However, the regular timetable for each semester specifies that design studios be held on Mondays and Thursdays, which results in 100% occupancy rates for studio spaces on Mondays. In contrast, higher demand for classroom space occurs on Wednesdays and Fridays, including four classrooms that reach 100% occupancy. In terms of qualitative demand, improvements with regard to the quality of learning spaces and facilities are required in several areas that can be described in three types of building obsolescence including the following:

(1) physical obsolescence – the improvement of lighting colour and level in auditorium, lighting in walkways and restrooms, studio facilities, restroom facilities and parking surface materials;

Plate 1.
Exterior of the faculty building (photo taken by author)

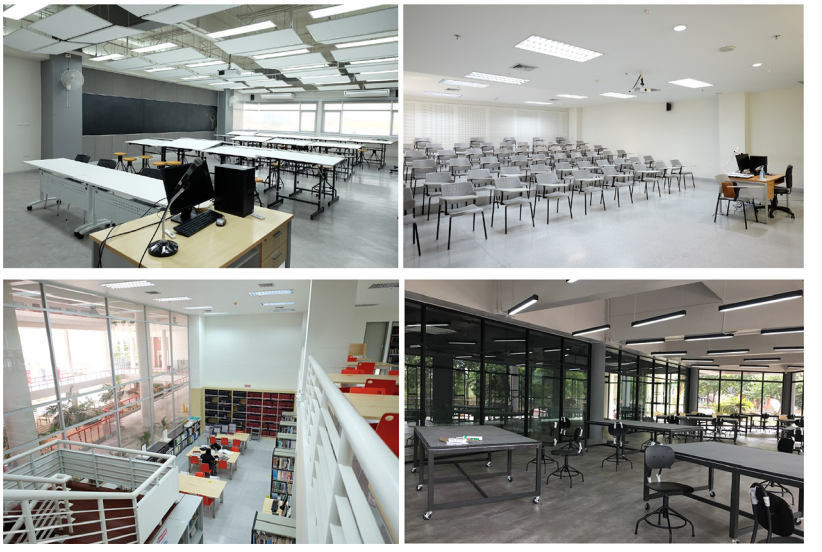

Plate 2.
Faculty building's learning environment (photo taken by author)

Building areas	Quantitative demand	Qualitative demand
Student areas	– Coworking spaces (413 sq.m.) – Student storage for student activities (90 sq.m.) – Extension of library (106 sq.m.) – Student areas on mezzanine (85 sq.m.) – IT facilities (e.g. PC, AC power plugs and sockets)	– Improvement of lighting colour and level in the auditorium – Common areas that are flexible for multipurpose use, such as project-based studying, recreation, and other school activities – Improvement of the graduate study room
Classrooms	– Computer rooms (408 sq.m.) – Classrooms (120–150 seats) (690 sq.m.) – Multipurpose space (i.e. student areas, workshop space) (505 sq.m.) – Meeting rooms (287 sq.m.)	– Improvement of classrooms and computer facilities – 24-hour accessibility of student's working areas
Studios	– Extra studio spaces (636 sq.m.)	– Improvement of studio facilities – Studios for particular year groups – 24-hour accessibility to studio spaces
Staff areas	– Admission office (54 sq.m.) – First-aid room (21 sq.m.) – Academic staff areas (227 sq.m.) – Administrative staff areas (73 sq.m.) – Research units (330 sq.m.)	– Improvement of staff areas – Relocation of first-aid room
Service areas	– Increased canteen space and supporting facilities (i.e. tables and chairs) – Additional printing facilities – Staff areas (39 sq.m.) – Vending machine (26 sq.m.) – Storage space (178 sq.m.)	– Improvement of lighting in walkways and restroom areas – Improvement restrooms facilities – Improvement of ramp for disabled persons at the building entrance
Other areas	– Hall of fame/exhibition area (116 sq.m.) – Increased parking spaces – Additional motorcycle and bicycle parking spaces	– Improvement of parking surface materials to concrete or asphalt – Shading structure for parking spaces – Parking spots to support accessibility of buildings from both entrances

Source: Tantiwanit, 2019

Table 2. Quantitative and qualitative requirements concerning faculty building spaces

(2) functional obsolescence – the requirement for flexibility of common areas, 24-hour accessibility to studio spaces, relocation of first-aid room, installation of ramp for disabled persons and additional parking spots; and

(3) technological obsolescence – the improvement of computer facilities.

Although various stakeholders (i.e. students, administrative and academic staff) were involved in the building development project, the findings show that the greatest demand for space is from students, as they account for the use of 36% of the total usable area of the building (with the spaces used including student areas, classrooms and studios) that is the second largest area after the other areas (47%) including halls, walkways, stairs, elevator halls and balconies. Requirements on the part of administrative staff include a new admission office, the relocation of the first-aid room and improvements to the staff areas on the third floor. The demands of the academic staff include improved studios and graduate study rooms and expanded classroom spaces.

5.2 Phase 2 – determining the match or mismatch between future demand and current supply

The data indicated that the increasing number of students in each academic year was the main concern owing to the limited building capacity. As a result, the faculty management committee considered the plan for building a new faculty building to support future demand. However, there were arguments concerning the suitability of the approach, with the school's board of directors claiming that it could be affected by fluctuations in the number of building users and liabilities in terms of operating costs (i.e. electricity, water and building services costs). The building development committee was aware of the new building's low-occupancy scenario. Furthermore, the new building will require high investment and operating costs as the building's total costs. As a result, the strategic approach to the development of the faculty building has tended to use the current building space to enhance the flexibility of learning space to in turn respond to the uncertainty posed by the changing environmental context. The plan to preparing for various spaces to cope with changes in environmental context came as an approach for the faculty building development project. The faculty planned to improve the quality of building spaces and facilities and to maximise the utilisation of unused space in and around the faculty building to promote usability of learning space and meet future space needs.

In addition, one of the school's objectives and priorities is to focus more on research and related activities (e.g. research projects in cooperation with external partners and increasing the number of publications). The school's approach of increasing the number of postgraduates and limiting the number of undergraduates not only supports the goal of strengthening research but will also help to balance the gap between the future demand for and the current supply of building space given that there are currently more undergraduate than postgraduate students (1,535 and 246 students, respectively, or a 6:1 ratio). The school's concern with regard to maintaining a suitable number of students relative to the available building space and facilities has led to undergraduate admissions being restricted. The school planned to admit 425 undergraduates and 145 graduates, amounting to a total of 570 new students, in 2021. The school has set a goal figure of 545 new students (390 undergraduates and 155 postgraduates) for each of the next four years (2022–2025) in order to stabilise the number of students using the faculty building. The estimated number of new students aligns with the faculty management committee's strategic plan for the next three to five years. Members of the committee serve for three years, meaning that it will be necessary to ensure that the next committee continues to support the current strategic plan.

5.3 Phase 3 – designing, weighing and selecting alternatives to bridge the mismatch

With regard to Phase 3 of the DAS framework, steps have been taken towards selecting interventions or the type of change (Jensen and Van der Voordt, 2020) to be made to the faculty building. In 2019, the building development committee established the building assessment plan, which involved user participation. The committee included the project management team and representatives from both the administrative and academic staff and students and was in charge of hearing suggestions regarding the planning and development of the faculty building from all stakeholders.

Workshops and meetings were held to identify the requirements of various stakeholders including administrative staff, academic staff and students. Workshops were set in the format of assignments to comment on the current building followed by raising questions. The stakeholders proposed approaches, which would be subsequently discussed with the community, and one approach would ultimately be selected as the plan for the faculty building development project.

According to the post-occupancy evaluation (POE) process, the full user participation method developed by Kernohan *et al.* (1992) includes the participant groups, facilitators and managers who attended the evaluation, which involves three core events: an introductory meeting, a touring interview and a review meeting. The findings of the interview with the head of the building development project indicated that the workshop assessments could have been more effective had they been led by facilitators who were familiar with the evaluation process rather than by representatives of each stakeholder group. Workshops were conducted as once-off events that mainly involved inquiring as to participants' requirements and opinions regarding building spaces. However, an introductory meeting and touring interview could have been added to improve the participants' understanding of the purpose, process and outcome of the workshops (Kernohan *et al.*, 1992). In addition, before the evaluations were conducted, test runs of the generic evaluations of the three core events could have been conducted to generate expected results (Barrett and Baldry, 2003). Figure 5 presents a diagram depicting the alternatives' selection steps from workshops and meetings between stakeholder groups concerning the development of the faculty building.

Five meetings were held to gather feedback on approaches to developing the faculty building from the various stakeholder groups as follows:

(1) The first meeting involved hearing the suggestions of different stakeholder groups based on information from administrative staff and students' workshops. Particular approaches were proposed as alternatives 1 and 2.

(2) Alternative 3 was developed based on alternatives 1 and 2 during the second meeting and was subsequently discussed by the stakeholder groups during workshops.

(3) The third meeting was held to receive feedback on alternative 3 from representatives of the stakeholder groups (i.e. academic staff, administrative staff and students) and to propose alternative 4 for discussion in the next meeting.

(4) The fourth meeting involved hearing feedback on alternative 4 from representatives of all stakeholder groups based on the previous workshops, with the goal being to identify the most viable building development approaches, which would be presented in the next meeting.

(5) The fifth meeting involved the school community's hearing on the suggestions proposed concerning the development of the faculty building.

The outcomes of Steps 1–4 were consensus opinions regarding approaches to the development of the faculty building, whereas Step 5 focused on the school community's feedback on the final alternative. The main differences between alternatives were size and allocation of the spaces; for example, the increasing size of exhibition area in alternative 4 (186 sq.m.) from alternative 1 (90 sq.m.) and the replacement of classrooms in alternative 2 with computer rooms in alternative 4.

During the workshops, some conflicts occurred over the proposed solutions; for example, the administrative staff did not approve of making any change to the executive office or moving the academic staff room. They also suggested that the spaces adjacent to the elevator should not be exclusively assigned to research but should instead be made available for other learning activities. Generally speaking, disagreements or differences of opinions concerning the building development approaches were resolved by discussions in

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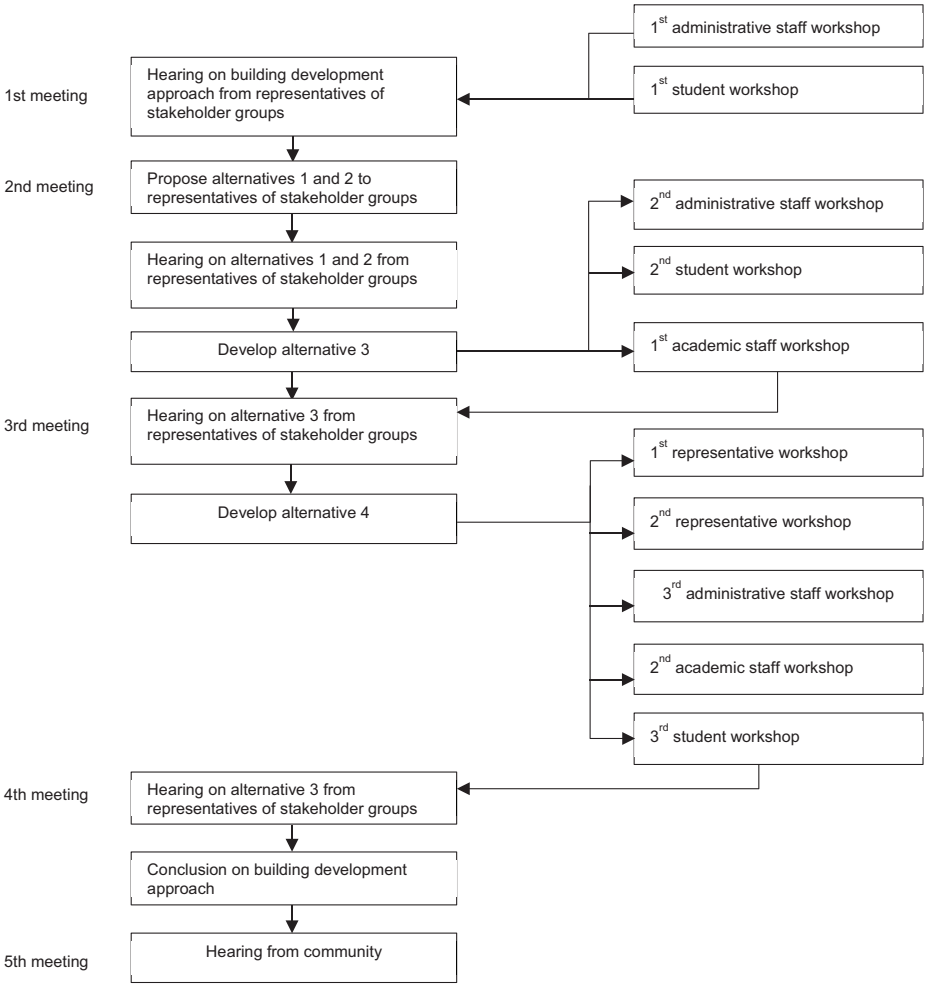

Figure 5.
Steps involved in the selection of alternative approaches to the development of the faculty building (Tantiwanit, 2019)

the workshops in most cases. However, voting was used to reach collective decisions when conflicts continued.

Based on alternative 4, Table 3 shows a summary of the approaches to the development of the faculty building that emerged from the faculty workshops and meetings (Tantiwanit, 2019). The approaches prioritised the development of student areas, studio spaces and classrooms by improving the existing spaces and adding more spaces on the roof deck. The improvement measures focused on making more efficient use of building spaces.

5.4 Phase 4 – transforming current supply into selected future supply

The faculty building development plan identifies the following key tasks and sub-tasks required for the completion of project phases in the 2019–2022 fiscal years:

Building areas	Building areas before change (sq.m.)	Building areas after change (sq.m.)	Building development approaches
Executive office	170	170	– No change
Student areas	1,873	2,167 (16% increase)	– Add learning space outside classrooms, including multipurpose space, group spaces and studying areas on the first, second and M floor – Relocate computer room from the second floor to the fourth floor and change the old computer room to learning space
Classrooms	2,948	3,026 (3% increase)	– Relocate classrooms to the roof deck and add additional classrooms – Add a seminar room on the fifth floor
Studios	2,613	2,872 (10% increase)	– Change classrooms on the sixth floor to studios – Add more studios on the roof deck
Staff areas	367	454 (24% increase)	– Rearrange the space to be more efficient – Renovate working areas and first-aid room
Faculty areas	845	1,080 (28% increase)	– Relocate faculty room of interior architecture programme to the fifth floor – Arrange faculty rooms for international instructors and staff
Faculty lounge	155	155	– No change
Research areas	260	330 (27% increase)	– Arrange all research units to the roof deck
Service areas	1,668	1,729 (4% increase)	– Arrange the first-aid room in the third floor next to staff areas
Other areas	9,749	8,731 (10% decrease)	– Change studios on the second floor to hall of fame

Source: Tantiwanit, 2019

Table 3. Faculty building development approaches

- Development plan for 2019 (1 October 2018–30 September 2019) – The plan included the installation of two sets of elevators that were in preparation for the expansion of the new roof deck.
- Development plan for 2020 (1 October 2019–30 September 2020) – The plan specified the extension of the roof deck to include new classrooms, studios, research units, storage and restrooms, followed by the conversion of classrooms into studios on the sixth floor and seminar rooms on the fifth floor.
- Development plan for 2021 (1 October 2020–30 September 2021) – The plan included the modification of library and learning space outside classrooms, which was linked to the relocation of the computer room, followed by the relocation and renovation of academic staff rooms on the fourth and fifth floors. Furthermore, the plan involved improving the quality of staff and first-aid rooms.
- Development plan for 2022 (1 October 2021–30 September 2022) – The plan included the extension of the seminar rooms next to the main elevators.

The COVID-19 pandemic has impacted education in every nation; this was also the case for the School of Architecture at Thammasat University given that the resulting restrictions limited access to the school's physical environment. The school policy in response to the demand for space during COVID-19 was to offer three learning approaches: on campus, online and hybrid. Depending on the pandemic situation, students and faculty staff were required to strictly comply with the above policy. "Hybrid" learning, which was offered as an alternative to on-campus or online learning, involves a combination of learning in the faculty building and distance learning; this approach was offered for those students and members of academic staff who were not willing to be physically present on the campus. "Live studios" were offered to support both online and hybrid learning. All faculty members were subject to certain requirements before they were allowed to access the building, including wearing a mask and passing a temperature check at the building entrance. While occupying the building, all building users were asked to maintain personal hygiene and maintain physical distance from one another. Automatic hand sanitizer dispensers were installed at doors and elevator entrances across the building.

Although students have been practising online education as a distance learning approach owing to the pandemic, the findings of the interviews indicated that they were eager to return to the learning conditions that existed previously. In many cases, the ICT support provided to students (e.g. PC or laptop with a camera or the Internet) in the virtual learning environment was relatively limited, which caused difficulties in communication, especially in online design courses.

6. Discussion

Various factors that determine the required space and the provision of the faculty building as well as the process of selecting alternative approaches to the faculty building development and the means of implementing the selected approaches will be discussed. The lessons learned regarding the application of the DAS framework and the impact of the COVID-19 pandemic on the learning environment context are reflected upon here.

6.1 Faculty building development

The findings of the interviews indicated that the building users were less likely to use particular building spaces if they did not realise that they were part of the building development process or did not have access to relevant information. This proved to be the case with the faculty lounge development project. Previously, the unused space under the auditorium was designated as a student activity area but was still used as a storage space because its design did not take into account users' needs and preferences. To address this issue, a pre-design evaluation (PDE) (Ornstein and Andrade, 2012) was conducted based on a meeting with students to determine their requirements with regard to both the qualitative and quantitative aspects of the space. Approaches that promote stakeholder engagement help designers understand users' needs and preferences and reduce negative feedback during the occupancy stage. The space under the auditorium was subsequently designated as a multipurpose space including workshop, studio and student activity area. A flexible approach to designating spaces was considered an appropriate approach for this strategy.

The lack of a thorough understanding of user behaviours prevented the assigned building spaces and facilities being exploited to their full potential. The findings showed that the student lounge would be required to offer additional work settings and support facilities in addition to sofas. In contrast, the new workshop was provided with group tables accommodating six to eight persons; however, it was later found that students are also required to work in smaller groups of two people and preferred to relax on sofas after

working for long periods of time. The findings showed a strong demand for more studios and workshops, which reflects the significance of active learning in architecture education (Ceylan *et al.*, 2020).

The spaces of the faculty building were arranged to cater for various needs of different stakeholders, including students, administrative staff and academic staff, to prevent conflicts between these groups in terms of both current and future space requirements. Students and academic staff showed to have similar space requirements regarding learning space conditions (improvement of computer facilities) and the need for larger classrooms and studios.

However, discussions and the voting system were used to resolve conflicts between different stakeholders. As expected, there was a significant demand for more design studios, which reflects the importance of these studios in architecture education (Saghafi, 2020).

In addition to the current requirements regarding and provision of space in the faculty building, other factors came into play, such as policy on security, investment costs and communication with stakeholders. During the interview, the assistant dean indicated that the school's security system had to consider and compensate for the 24-hour access to the building, which usually involves higher investment and operating costs. The school already provided storage space for collecting trash and recycling, but miscommunication with students could have led to students' demand for space.

The strategic planning intended to stabilise the number of students over the next four years in order to improve the provision and quality of resources will help to balance the gap between demand and supply in terms of space in the faculty building.

In the study, allowing for a high degree of flexibility though "adaptive building," which involves designing and organising a building to enable cost-effective changes and flexible use without having to make adaptations (Arkesteijn *et al.*, 2016; Geraedts *et al.*, 2017) was found to be the appropriate solution for responding to changes in an environmental context. The implementation of flexibility has shown in the multipurpose space under the auditorium. This unassigned space is easily adaptable to various students' activities. The use of furniture on wheels (e.g. tables, chairs, stools) in lecture rooms, studios and multipurpose space supports flexibility of the learning spaces. The decision to redevelop the existing building instead of building a new building helps to reduce not only construction costs and time but also the environmental impact and thus contributes to the sustainability objective. Interior spaces of lecture rooms, studios and multipurpose space that have been improved in terms of materials, furniture settings and lightings promote aesthetic quality or "the look and feel" of the new learning environment.

The appearance of the built environment promotes symbolic value, and the building's contribution to its context, location and broader historical development and sense of place, is identified as cultural value (McMillan, 2006). The physical presence of students and teachers in the built environment of the school, their interactions in the physical space of the building and the management of the building and supporting facilities help to create social value by facilitating the formation of connections between people and promoting social interaction. In the broader scope of the university campus, this statement also aligns with the findings of Den Heijer's (2011) study, which notes the significance of a physical campus as a meeting place that facilitates social and intellectual exchanges among the members of an international community.

6.2 The designing an accommodation strategy framework application

In this study, the DAS framework has been applied by the author to analyse the real estate strategy and development process of a faculty building. In terms of the building

development process, pre-design and post-occupancy evaluation were conducted to gather feedback from users, which was an important part of the data collection process. The ex-post analysis was used as a means to determine building development approach. It was necessary to understand different user perspectives and different meaning of values from different principles described as design thinking (Arkesteijn *et al.*, 2016) that had to be taken into account to avoid conflicts and to create value. Design tools such as ethnographic observations and user journey mapping should be included in the data collection process of the pre-design evaluation to provide solutions for the building (re)development.

Regarding the full user participation in the POE (Kernohan *et al.*, 1992), well-trained facilitators have an essential role in leading and controlling the workshops to collect necessary information and should be appointed from the start of the project. Before workshops are conducted, three core events (i.e. introductory meeting, touring interview and review meeting) should be tested to improve the implementation process.

To evaluate the supply side, the net usable and gross areas of the faculty building, as well as assessments of the occupancy and frequency of use of spaces, were used to assess the efficiency of the building. However, this evaluation did not include a quantitative aspect, meaning that aspects such as an inventory list and classifications of the physical working and learning environment were not included. The lack of these data caused difficulties in the analysis of the current building conditions and affected the duration of workshops and meetings and the quality of their findings. The interview with the assistant dean, who served as the head of the building development project, revealed that participants expressed mixed opinions and repeatedly addressed certain issues during workshops on a wide variety of building components and conditions, which increased discussion time and impacted the workshops' key deliverables (i.e. the approaches on planning and development of the faculty building).

In terms of the qualitative assessment, the problem posed by the limited accessibility of studio spaces was mentioned. However, other aspects, such as the physical, functional and technological obsolescence of the building (Chotipanich, 2010; Pourebrahimi *et al.*, 2020), were not clearly stated. In comparison to the demand side, students identified requirements concerning the improvement of the quality of the building and its facilities. However, the findings from the report on the faculty building development project did not clearly elaborate on the quantitative data (e.g. capacity in terms of square metres and number of support facilities) concerning some areas, such as the extension of canteen and additional parking spaces, which affected the overall project plan (e.g. in terms of time and cost estimation).

The step-by-step plan helped to identify the key deliverables required for the completion of the project phases in each fiscal year. The findings indicated factors impacting the implementation of the plan. Thammasat University, which is a public university, receives partial funding from the Thai government. The procurement process of APTU is obliged with the public sector's organisation system that engages steps, processes and authorisations of involved parties that are more complicated than the private sector system. Some of the planned deliverables were changed because of delays and unexpected complications associated with the procurement process. In addition, changes were made to the project development process in response to particular situations. For example, the renovation of a classroom was planned to test the suitability of the new arrangements and to determine whether the other classrooms should be renovated. However, the plan was changed, and it was decided to renovate all of the classrooms simultaneously given that this would be more efficient in terms of time, cost and quality and would reduce potential interference with teaching activities. The renovation of classrooms and studios was considered to be a high priority given students and teachers'

requirements with regard to space. Other areas, including the library, were initially planned to be renovated but were subsequently deprioritised to ensure that the classrooms and studios would be renovated before students returned to the institution.

6.3 Impact of COVID-19

The COVID-19 pandemic has changed the ways in which organisations operate their businesses and use the spaces available to them. With regard to the impact of the pandemic on university spaces, temporary measures such as temperature screenings at the entrance to the faculty building and social distancing may not be maintained over the next three to five years. The arrangement of health-related equipment such as thermal scanner with face recognition and automatic hand sanitizer dispensers that has been provided will remain as one of the school's support facilities. No major physical changes (such as those to the building structure and the building service engineering) were made to the case study building. However, ICT and support facilities for distance learning have been implemented, and it is expected that ICT will be used to support the new learning approach adopted by the school, both currently and in the future. The changes in terms of how education is offered owing to the pandemic have emphasised the increasing importance of online education.

Compared with the normal situation, DAS during COVID-19 concerns more on the health-related requirement and provision concerning the building spaces such as the cleanliness and the arrangement of physical distancing of public spaces (e.g. canteen, restrooms, stairs, elevator halls). The flexibility of the learning environment (e.g. multipurpose space) that accommodated the changing school's space requirements has been initiated and tended to continue in the post-COVID period. Not only the school had to concern about the physical learning environment, but the negative effects from the learning approaches (i.e. hybrid and online learning) such as loneliness, isolation and stress of students and academic staff also had their impacts on school performance and thus has to be considered for the long-term plan.

Leadership was considered as the most important competency with regard to the management of corporate real estate in the time of the crisis. During the pandemic, the faculty dean was the centre of command who directed and empowered other management team personnel to take charge of the situation. Communication was necessary to make communal understanding of school's directions and strategies on the learning approach during crisis.

7. Conclusions and recommendations

This study assessed the demand for and the supply of space in the faculty building of an architecture school using the DAS framework. The mismatch between demand and supply in terms of space within the faculty building was found to be caused by building condition (i.e. building obsolescence), the number of users of the building and the changing environmental context (e.g. the impact of the COVID-19 pandemic).

7.1 Implications to the development of the case study building

The findings show that the dilemma in terms of balancing the gap between the supply and demand of space in the building lies in changing number of students and their demand for space. One of the major issues associated with the mismatch between the demand for and supply of space was found to be caused by building obsolescence (in the physical, functional and technological domains), which has not been addressed to respond to students' changing requirements. The second dilemma is because of differences in perspectives between students

and the school's management team with regard to requirements regarding and the provision of space (e.g. the need to have 24-hour access to the faculty building and security concerns).

In addition to square metre capacity and function of spaces, the findings show the needs for other aspects such as flexibility, sustainability and aesthetic quality that have to be considered when determining demand, supply, match or mismatch with regard to buildings and real estate. In terms of value creation, the study showed the importance of a physical learning environment that supports active learning in architecture education and contributes to the sense of place as a cultural value.

7.2 Recommendations regarding the development of the designing an accommodation strategy framework

The DAS framework is found to be useful for structuring the information-generating processes required to determine the gaps between demand and supply and for making decisions regarding the real estate interventions. Data in the DAS framework were used to discuss during the four phases to generate information necessary to develop a corporate real estate management strategy.

The first phase of the DAS framework was used to determine the gaps between current demand and current supply in terms of building space as a starting point when data were readily accessible. Determining the (mis)match between future demand and current supply was considered to be complicated by the uncertainty with regard to the environmental context. The study identified factors impacting the step-by-step plan for the transformation of the current to the future supply, including organisational contexts, such as organisation type (public or private sector organisation), and the management of the construction project in terms of time, cost and quality.

Lessons learned of the DAS framework are listed as follows:

- Top-down approach supports implementation process. Organisation has a plan to apply the DAS framework but may have a challenge implementing it because the process relies on the participation between stakeholders in different perspectives and roles. A clear strategic direction from senior management that is transformed to operationalised action plans helps the data gathering process from different stakeholders more effective.
- Communication plan fosters stakeholder engagement. A clear communication plan (e.g. notification of project timeline, objectives and key results and processes throughout the project phases) lets stakeholders of the project know and understand their parts in the implementation process and thus participate more with less resistance.
- How to choose data collection techniques to incorporate PDE to the DAS framework depends on project characteristics. PDE is used for understanding various needs and preferences of stakeholders in the project development stage that can be applied to the DAS framework. Each project has unique characteristics with distinct scopes, scales, objectives and resources and thus requires different techniques (e.g. document analysis, interviews, occupancy measurements, workshops and scenario studies) for data collection that align with such characteristics.
- Post-occupancy evaluation should be added to the DAS framework to provide feedback for further improvement. Regarding the cyclical process of assessing building performance, POE should be added to the DAS framework to check whether the purposes of the selected alternative were achieved and to address problems to add value to solutions and make improvements to the new DAS process.

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