AFFORDING STUDENTS' WORK-ABILITY IN CAMPUS PUBLIC SPACES

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ABSTRACT

This study addresses the increasing prevalence of informal learning activities and the corresponding demand for public places within academic environments that effectively afford the work-ability function. The research specifically investigates how students at Institut Teknologi Sepuluh Nopember, Surabaya, utilize various public places—originally not intended as workspaces—to support their academic tasks. Focusing on six locations (Canteen, Mosque, Plaza, Library (office), and Dormitory Hall), the study explores the phenomenon of students affording work-related activities in unconventional settings. The research employs qualitative observation methods, dismantling the theory of affordance through three analytical lenses: Architectural Structure, User Interpretation, and Behavior Response. These components allow for an in-depth understanding of how spatial conditions contribute to user adaptability. Data collected from on-site observations were further analyzed using the Sorensen Similarity Coefficient, generating a similarity index within the range of >0 to ≤1. An index value above 0.500 is considered indicative of a significant link between specific architectural elements and affording work-ability. Findings reveal that students afford work-ability through: (1) the adaptation of multipurpose architectural structures, (2) the effective use of expansive floor areas with open layouts, (3) engagement with accessible and user-friendly environments that enable flexible use, and (4) reliance on adequate shading systems as part of the enclosure elements. These insights contribute to the evolving discourse on responsive campus design, emphasizing the need for spatial adaptability that reflects actual user behavior beyond predefined functional intentions.

Keywords: *Affordance, Behavior, Public-Places*

INTRODUCTION

In recent years, numerous studies have examined the concept of affordance within architectural contexts, particularly in relation to academic environments. The increasing demand for public places on campus reflects their evolving role as informal learning environments (Amal, Amalia and Amin, 2019; Wang, 2020; Harris, Birdwell and Basdogan, 2024). Such spaces contribute to enhanced motivation, mood, spatial quality, and perceived learning benefits (Adityawirawan and Kusuma, 2021; Ramu, Taib and Massoomeh, 2022), while also fostering social interaction and collaborative learning (Salih *et al.*, 2024). Understanding students' spatial preferences and behaviors is essential to prevent misinterpretation of design intentions, as shown in Figure 1*,* the phenomenon of public spaces changing into learning spaces for students also occurs at ITS. This is what prompted the conduct of this research to find out what is happening.

Figure 1. Students Working Activity in Multiple Places

Affordance theory provides a robust framework for understanding user interaction with the built environment by bridging perceptual psychology and physical design (Norman, 2013). While some scholars emphasize sensory perception as the primary receptor of affordance (Gibson, 2014), others integrate cognitive processes to interpret perceived functionalities (Norman, 2013). This theory has been widely adopted in architectural research, particularly where design intersects with user behavior (Maier and Fadel, 2009). Studies have shown that affordances in academic settings—such as corridors, corners, and open spaces—can facilitate diverse learning interactions (Kim *et al.*, 2011; Reinius, Korhonen and Hakkarainen, 2021) Further highlights that spatial features and on-site services significantly enhance students' learning experiences compared to remote or flexible models. An effective campus learning environment requires three key components: environment, beyond formal classrooms (e.g., open spaces, corridors). Features that facilitate meaningful user interaction, and functional services that support academic and social activities, collectively enhancing the overall quality of informal learning and student engagement (Valtonen *et al.*, 2021).

This study seeks to investigate how students interpret work-ability affordance throughout various locations on campus, thereby creating and interpreting work-ability affordances (Figure 1). This research mainly placed on Institut Teknologi

Sepuluh Nopember (hereinafter referred to as "ITS"). By examining this phenomenon, the research aims to contribute to a nuanced understanding of affordance-based design in public and educational environments, addressing the interplay between user behavior, space utilization, and design flexibility.

THEORY / RESEARCH METHODS

The Importance of Informal Learning Activity

In recent years, the demand for informal learning spaces in higher education has grown significantly. Students increasingly prefer physical learning environments—such as classrooms, lecture halls, and student plazas—to enhance their academic experiences (Valtonen *et al.*, 2021). At the university level, many students choose to work informally, whether studying independently, collaborating with peers, or socializing. These spaces are expected to support comfort and functionality through high air quality, acoustic insulation, and aesthetic value. Additionally, service-related needs such as extended operational hours are frequently emphasized (Valtonen *et al.*, 2021). Such environments are understood to support both individual and collaborative work models (Woodman, 2016).

Further, studies have identified that collaborative learning is significantly influenced by the physical characteristics of the space. For example, open-plan layouts tend to facilitate group interactions (Reinius, Korhonen and Hakkarainen, 2021). While existing literature provides insights into user behavior and decision-making, it often lacks emphasis on the architectural aspects that enable work-ability and other forms of affording behavior. This research calls for deeper investigation of affordance by examining the relationship between Architectural Structure, User Interpretation, and Behavior Response. A comprehensive understanding of these interconnected dimensions is essential for designing learning spaces that align with users' functional and psychological needs. (Sun and Abdul Aziz, 2024)

The Affordance Theory

The affordance theory is rooted in two distinct paradigms: the *Gibsonian* (1979) and *Normanian* (1999) perspectives. Gibson's theory emphasizes the direct opportunities for action that the environment offers to an organism, perceivable without requiring cognitive processes or interpretation, as seen in Figure 2 (Gibson, 2015). Conversely, Donald Arthur Norman, in his book The Psychology of Everyday Things, extends affordance theory by incorporating the subject's prior knowledge and cultural experience. Norman posits that these factors influence how individuals interpret and respond to affordances, presenting a departure from Gibson's direct perception model (Norman, 2013). This dichotomy highlights a fundamental tension between intrinsic properties of the environment and the experiential influences of the perceiver.

The concept of affordance has evolved to encompass overlapping domains and interdisciplinary applications. By deconstructing it into two aspects—abilities

and effectiveness—as they pertain to the interaction between the environment and its users. This approach highlights the dynamic and interdependent relationship between these elements, offering a nuanced framework for understanding affordance within diverse contexts (Chemero, 2003). Building on Chemero's (2003) framework, this study defines *abilities* as the inherent capacities of both users and environments—ranging from anthropometric and physiological traits in individuals to functional features embedded in architectural spaces.

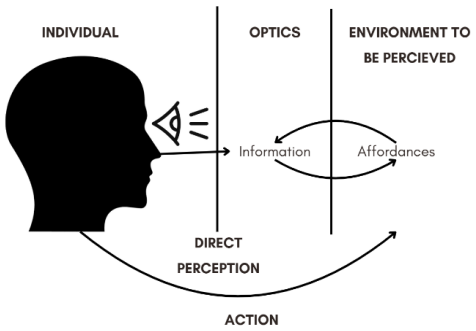


Figure 2. Visual Direct Perception
Source: Adapted from Gibson, 1979

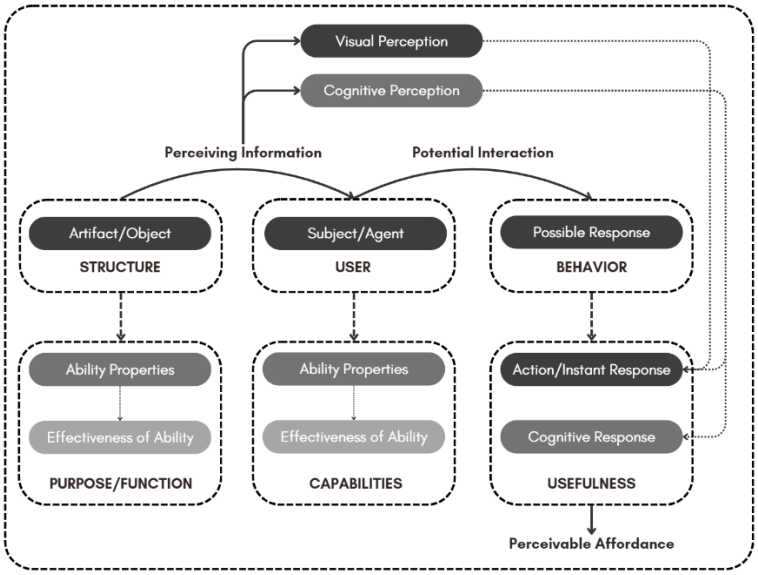


Figure 3. Diagrams of Affordances Theory
Source: Adapted from Gibson (1979), Norman (1999), Chemero (2003), Maier (2009)

As can be seen in Figure 3, these abilities are understood as *dispositions* that hold the potential to facilitate action, while effectiveness assesses the actual performance of these dispositions under real-world conditions. This includes how cultural, cognitive, and experiential factors influence users' capacities to utilize

affordances, and how architectural features support intended activities. Adopting Gibson's ecological perspective, this research utilizes field surveys to document how students perform work-related tasks in public areas across the Institut Teknologi Sepuluh Nopember (ITS) campus. Observational data was used to interpret user engagement with specific Architectural Structures through the lens of User Interpretation and Behavior Response. The study offers empirical evidence that informal learning and workability can be afforded by architectural settings, regardless of their designated function, providing new insights into user-environment interactions in higher education contexts.

Research Framework

The methodological foundation of this study is grounded in qualitative research principles, as emphasized by (Groat and Wang, 2013) in Architectural Research Methods. They assert that qualitative research prioritizes the interpretation of meaning within natural settings, focusing on how respondents comprehend their contextual circumstances. This approach allows for the integration of diverse methodological frameworks, enabling a comprehensive exploration of complex phenomena.

Furthermore, the qualitative research process involves an iterative and interactive cycle of data collection. This process is complemented by systematic data reduction, presentation, and the formulation and verification of conclusions throughout the study. Together, these methods provide a robust framework for capturing the nuanced dynamics of the research context (Miles and Huberman, 2014).

This research relies heavily on field observations, systematically deconstructing each architectural element to analyze and describe various aspects of both subjects (users) and objects (artifact/structure) (Figure 4). The data, which includes types of space, structure, enclosure and machine. In this research context, space related to the 3D field shaped by structure and use, it provides a setting to conduct various human behavior. While the structure related to the load bearing system that supports and provides firmness to the aforementioned building (Wilkinson, Dickerson and Ji, 2018). The enclosure elements are defined as the envelope separating interior and exterior and provide controls of environmental flow (e.g. air, heat, moisture, etc.). As for architectural machines defined as mechanical/services capsulated inside the spaces and provide environmental and behavioral control towards the user, which integrated to the building function and form (Capon, 1999; Wilkinson, Dickerson and Ji, 2018).

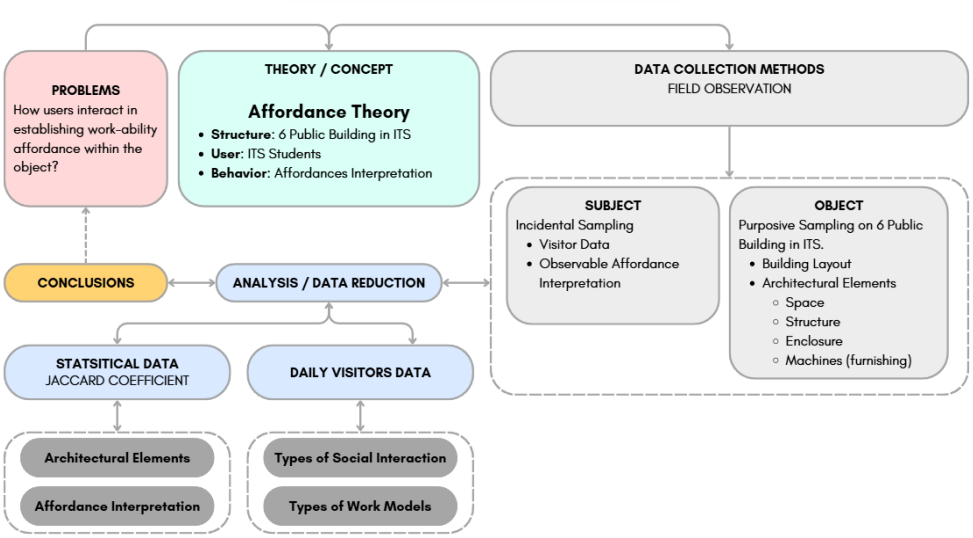


Figure 4. Research Framework

Research Sampling

Subject Sampling

This study employed incidental sampling, wherein participants were selected based on two primary criteria: (1) their physical presence at the research site, and (2) their engagement in work-related activities. All individuals observed performing such activities were considered participants. This approach aims to reflect user preferences in selecting public places as working environments, regardless of individual attributes such as gender, age, anatomy, culture, or experience (Gibson, 2015). While this method facilitates accessibility, it is acknowledged that it may limit generalizability and introduce potential bias (Etikan, 2016).

Object Sampling

The selection of research objects was guided by several relevant publications and based on specific criteria outlined in the accompanying table. This study focuses exclusively on public places within the ITS campus, excluding designated working facilities such as Creative Communal Working Spaces (*CCWS #1 and #2*). Instead, the research highlights buildings not originally intended for work-related activities yet frequently utilized by students as informal working environments. The criteria used for deciding public places can be seen in Table 1.

Table 1. General Criteria of Public Places

References	Aspect	Context	Criteria
(Zhang and He, 2020)	Ownership	Legal status of the building	The research objects must be located within the ITS campus area.

References	Aspect	Context	Criteria
(Lorenzo *et al.*, 2023)	Accessibility	Physically open access to the building (accessible)	Public buildings must be accessible to all students without any restrictions.
(Zhang and He, 2020)	Management & Maintenance	Cleanliness and maintenance quality, provided by authorized staff.	Buildings must be well-maintained and supported by adequate cleaning and maintenance staff.
(Lorenzo *et al.*, 2023)	Inclusivity	Non-programmed building. (flexible function)	The building should accommodate diverse forms of social expression and facilitate vast social interaction.
(Lorenzo *et al.*, 2023)	Functionality	The ability to support a wide range of activities, both active and passive, ensuring continued relevance to the surrounding community or society.	The building must support a variety of activities, with more than one function beyond Informal Learning Activities.

Source: Zhang and He, 2020 & Lorenzo, 2023

Architectural Elements

To address the stated research problem, key architectural aspects were examined, as outlined in Table 2, emphasizing behavioral contexts. The analysis distinguishes between fixed and semi-fixed elements as containers of behavior, and non-fixed elements as user responses, in order to understand how students afford the *work-ability* function within various spatial configurations (Rapoport, 2005).

Table 2. Observation Focus on Architectural Element

Architecture Elements	Sub-Categorized Elements	Context in Research (Behavior Container)	Examples
Space	Ambiguous/Flexible Space (Woodman, 2016)	Space designed to accommodate multiple functions or shift in meaning/use.	Coworking zones, gallery-hall hybrids, multi-purpose hall.
	Circulation Space (Ching, 2014)	Space primarily for movement and transition.	Hallways, ramps, staircases, bridges.
	Functional/Programmatic Space (Capon, 1999)	Space is categorized by intended activity or use.	Library, office, lecture hall, etc.
	Open Space (Aydin and Ter, 2008)	Space with visual or physical openness, partially or fully undefined.	Courtyards, plazas, atriums, etc.
	Transitional Space (Ching, 2014)	Space that connects or mediates between other spaces.	Portico, foyer, veranda, colonnade, etc.

Architecture Elements	Sub-Categorized Elements	Context in Research (Behavior Container)	Examples
Structure	Load Bearing Structure (Al-Alwan and Mahmood, 2020)	Provide vertical support and transmit gravity loads.	Columns, beams, trusses, load-bearing wall systems, etc.
	Foundational Elements (Kalay Yüzen and Ökem, 2025)	Earthworks, foundations (mound or site levelling).	Floor level, split level, mezzanine, etc.
Enclosure	Curtain Wall System (Kumar and Raheja, 2016)	Basic separation between interior and exterior; thermal and visual barrier.	Glass panel façade with aluminum framing, etc.
	Double-Skin Façade (Iwaro et al., 2014)	Thermal insulation, solar control, acoustic buffer, adaptive environmental performance.	Twin-layer glazed façades with ventilated cavities or Rooster.
	Roof Enclosure (Kumar and Raheja, 2016)	Shields from precipitation, solar exposure; contributes to energy and environmental control.	Roofs, overhangs, green roofs, etc.
	Single-Skin Wall (Kumar and Raheja, 2016)	Basic separation between interior and exterior; thermal and visual barrier.	Traditional masonry or concrete external walls.
	Specialty Envelopes (Iwaro et al., 2014)	Combination of multiple enclosure provides certain advantages.	Specialized design façades or multifunction skins.
Machine	Furnishing-Accessories (Rapoport, 2005)	Furnishing elements exist to provide various behavioral activity.	Tables, chairs, sofas, etc.

Research Analysis

Coding Co-Occurrence Analysis

Co-occurrence analysis is applied to explore the relationship between affordance ability and architectural elements that demonstrate potential support. Defined through segment overlap, co-occurrence identifies overlapping codes that signify interaction. Architectural elements may afford multiple functions simultaneously (Maier and Fadel, 2009; Maier, Fadel and Battisto, 2009; Norman, 2013; Gibson, 2015). The Similarity Index, represented through clustering diagrams, illustrates how affordances correlate with architectural features, as can be seen in Figure 5. Among available measures, Jaccard and Sorensen coefficients are frequently used in statistical standardization; however, they have limited capacity in expressing statistical significance (Podani, Pavoine and Ricotta, 2018). While widely adopted in biological and ecological research, these indices function as binary measurements, indicating presence or absence of phenomena (Podani, Pavoine and Ricotta, 2018; Hammond and Pokorný, 2020).

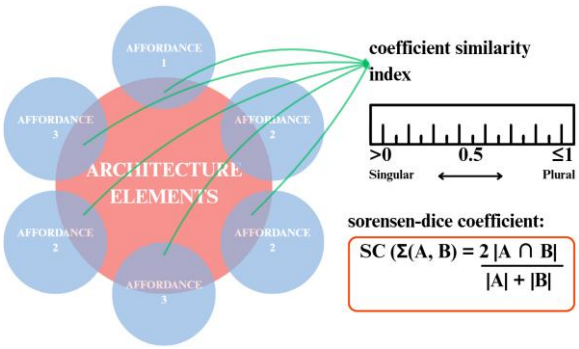


Figure 5. Similarity Index Methods in Research Context

In this research, the Sorensen similarity index (hereinafter referred to as "SSI") captures the degree to which "architectural elements" codes overlap with "affordances" codes, without quantifying the significance of those relationships. The Similarity Index primarily reflects the existence and distribution of overlapping attributes across coded datasets. In research context, Sorensen similarity index value higher than 0,500 considered to specify to singular architectural element. In contrast value lower than 0,500 considered to plural architectural element as can be seen in Table 3.

Table 3. Index Similarity Interpretation in Research Context

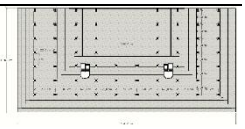
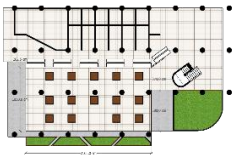
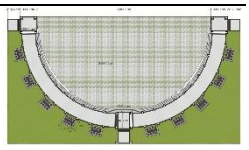
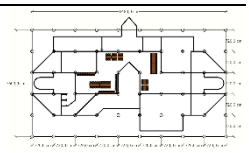
Similarity Index	Index Value	Data Interpretation
0.000 – 0.050	No Similarity	No architectural element affords work-ability
0,100 – 0,490	Low Similarity	Each architectural element affords work-ability
0,500 – 0,990	High Similarity	Several architectural elements afford work-ability
1,000	Perfect Similarity	One specifies architectural element affords work-ability

RESULTS AND DISCUSSION

Typology of Public Places in ITS Campus

Table 4 represent each public building on the ITS campus that presents unique layouts and functions, reflecting the diverse architectural and functional purposes of these spaces. Based on existing journal studies, public buildings on campus can be categorized into distinct types, each serving specific roles and accommodating various activities. These categorizations provide a framework for analyzing how different layouts influence user interactions and functional affordances within the campus environment. (Oldenburg, 1999; Aydin and Ter, 2008; Cunningham and Walton, 2016; Karimullah, 2023; Pu and Yang, 2024).

Table 4. Typologies of Public Building in ITS Campus

References	Building Name	Actual Function	Documentation	Layout
(Oldenburg, 1999)	ITS – Coffee Point	**Canteen**: Located on the second floor of ITS Mart building. Generally, it is used as dining activity. With total of accessible area at least ± 134 m^2.		
(Karimullah, 2023)	ITS – Manarul Ilmi Mosque	**Mosque**: Located in the center of ITS main campus. Mainly use as praying activity. With total accessible area at least ± 20.098,24 m^2.		
(Oldenburg, 1999)	ITS – Main Canteen	**Canteen**: Located between the SSC building & ITS Science Tower. Mainly use as dining activity. With total of accessible area at least ±1.100 m^2.		
(Aydin and Ter, 2008)	ITS – Library Circular Park	**Plaza**: Located between the main Rectorate Building, ITS Library, Dr. Angka Open Space, & ITS Development Studies Department. With total area of ± 310 m^2.		
(Cunningham and Walton, 2016)	ITS – Library, specifical-ly Second Floor	**Library** Located inside the main ITS Library, on the second floor. Mainly used as waiting room or study activity. With total accessible area at least ± 295 m^2.		
(Pu and Yang, 2024)	ITS – Student Dormito-ry Hall	**Dormitory Hall** Located inside the dormitory cluster inside the campus. Mainly used as residential area. With total of accessible area at least ± 220,5 m^2		

Statistical Observation Data

In terms of location-specific analysis, a total amount of 1661 visitors were found to conduct work-related activities in the 6 destined public places. **Figure 6** represent the demographic patterns observed in these public buildings, which indicate that users tend to select locations with specific elements that facilitate their work activities. Notably, the ITS Dormitory Hall (35%) and Manarul Ilmi Mosque (29%) emerged as the most preferred locations for work, despite not being designed as proper working places. On the other hand, the ITS Main Cafeteria and the second floor of the ITS Library were the least preferred. Interestingly, despite the second floor of the library being architecturally equipped to support diverse activities, it does not attract as many users as expected (Figure 6).

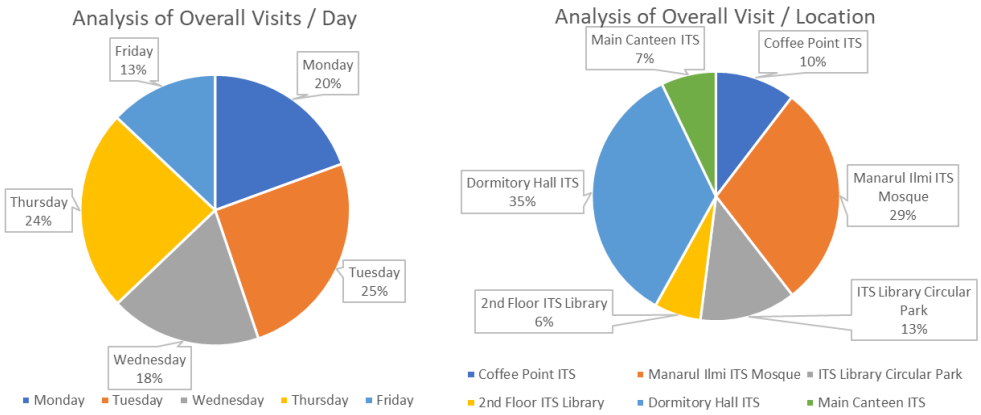


Figure 6. Statistical Chart of Visitor Data

Statistical data of work activity types as seen in Table 5 reveals that 727 users, representing 44% of the sample, utilize ITS public places for paper-based models. Meanwhile, 934 users, or 56% of the sample, engage in computer-based activities within the same spaces. Figure 7 shows that ITS Dormitory Hall emerges as the most preferred location for paper-based activities, followed by the ITS Library Circle and the Manarul Ilmi Mosque. Conversely, computer-based model is more frequently performed in the Manarul Ilmi Mosque, with the Dormitory Hall and Coffee Point serving as the second and third most popular choices, respectively. Overall, the analysis identifies the Manarul Ilmi Mosque and the Dormitory Hall as the primary locations for students to conduct both paper-based and computer-based work activities (Figure 7 and Table 5).

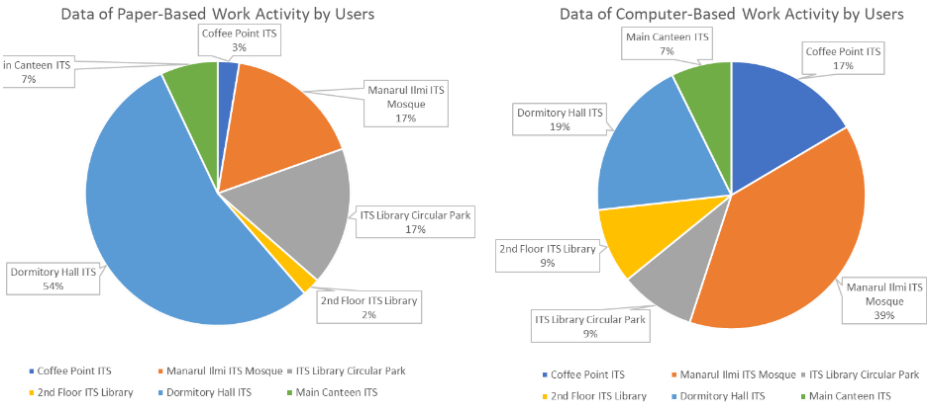


Figure 7. Statistical Chart of Work Activity Types

Table 5. Data of Work Activity Types for Each Object

Overall Paper-Based Activity Type Analysis						
Total	Coffee Point ITS	Manarul Ilmi Mosque ITS	ITS Library Circular Park	2nd Floor ITS Library	Dormitory Hall ITS	Main Canteen ITS
727	19	123	123	16	395	51
Overall Computer-Based Activity Type Analysis						
Total	Coffee Point ITS	Manarul Ilmi Mosque ITS	ITS Library Circular Park	2nd Floor ITS Library	Dormitory Hall ITS	Main Canteen ITS
934	154	360	85	85	182	68

Statistical data of social interaction types indicates that 1,345 users, accounting for 81% of the total sample, engage in collaborative work, while 316 users, or 19%, perform individual tasks. This suggests that public places at ITS are predominantly designed to facilitate social interactions (Table 6).

Table 6. Data of Social Interaction Types for Each Object

Data of Collaborative-Work Activity by User						
Total	Coffee Point ITS	Manarul Ilmi Mosque ITS	ITS Library Circular Park	2nd Floor ITS Library	Dormitory Hall ITS	Main Canteen ITS
1345	98	379	178	50	544	96
Data of Individual-Work Activity by User						
Total	Coffee Point ITS	Manarul Ilmi Mosque ITS	ITS Library Circular Park	2nd Floor ITS Library	Dormitory Hall ITS	Main Canteen ITS
316	75	104	30	51	33	23

The data further reveals that collaborative working is most prevalent in the ITS Dormitory Hall and the Manarul Ilmi Mosque, whereas individual working is more commonly observed at the ITS Coffee Point and the Manarul Ilmi Mosque. Consequently, the Manarul Ilmi Mosque emerges as the primary choice for students to conduct both collaborative and individual activities (Figure 8).

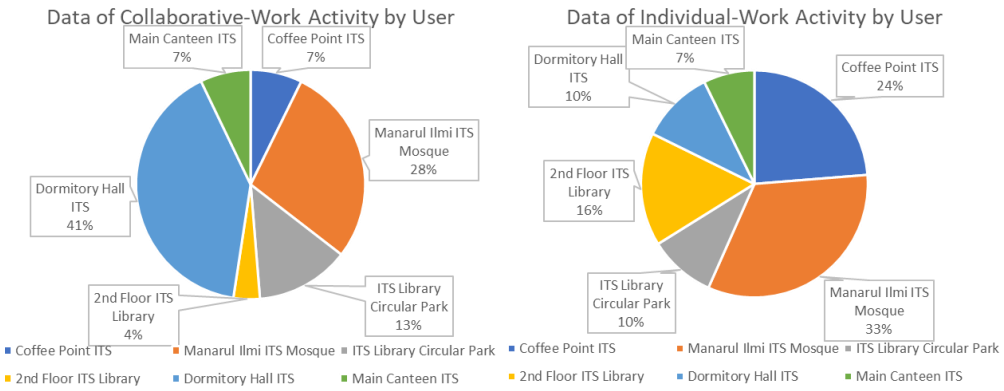


Figure 8. Statistical Chart of Social Interaction Type

Descriptive Observation Data

This section discusses the interaction between users and each architectural object, focusing on the structural characteristics of the space and the behavioral patterns exhibited by users in response to those elements.

Canteen

In this research context, both the ITS Main Canteen and Coffee Point are classified as canteen facilities based on their architectural functions. While both utilize glass-structured walls to maximize natural lighting, Coffee Point distinguishes itself by incorporating a spatial layout that separates indoor and outdoor areas, creating two distinct atmospheres.

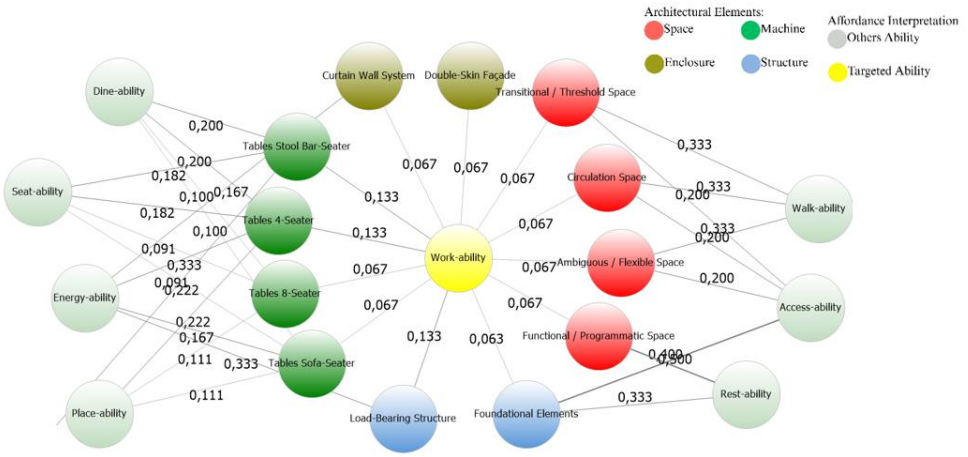


Figure 9. Observable Affordance Behavior in Canteen Building

The result, after conducting field observation, found that user the existence of work-ability shown by Sorensen similarity index (SSI). Users in canteen generally afford work-ability function through 4 architectural elements. Specifically, the machine element by Σ 0,400 *SSI,* distributed evenly through various furniture models. The machine element in both canteens provide various type of affordance as shown in Figure 10, where user preferably using tables and chair to provides dine-ability, seat-ability, energy-ability and place-ability within index range 0,093 – 0,333 (Figure 9). Additionally, the structure elements (i.e., structure column) presented by total index of Σ 0,196 *SSI*. The column in both places affords energy-ability, some students who work with computer-based models prefer to work near this element to support their work-ability, as can be seen in Figure 10c.

Generally, canteen sole function as commercial and dining activity. Each object provides different furniture yet has the same purpose as seating. And in this case, seating can be distinguished by normal seating and bar seating poses, as this type of furniture tends to be found in lounge and bar (Figure 10c and 10b).

Field observations indicate that users generally prefer larger tables to accommodate paper-based work Figure 10d. As in Figure 10a, groups of students often maximize table capacity while utilizing nearby power outlets for their devices. Even these two objects, purposively serve as canteen, yet Coffee Point ITS dominated by individual work-model as presented in Table 6. A recent regulation at Coffee Point ITS now requires a minimum purchase to access the larger indoor tables. This differs from the Main ITS Canteen, where students may freely choose seating and engage in various activities without purchase requirements. The commercial and services aspect may affect student's work preference (Dewi, Susanti and Putra, 2022).

Figure 10. Various Work-ability Affordance in Canteen (a) Group of Students Using Larger Table for Computer Work (b, c) Bar Stool Used as Individual Seating (d) Group of Students Using Larger Table for Paperwork Activity

Mosque

Figure 11 shows that users are affording work-ability through several architectural elements. The structure elements valued by Σ 0,666 SSI, are provided by foundational structure (i.e., floor and stair elevation (0,333 SSI)) and load-bearing structure (i.e., structural column (0,333 SSI)). The open-plan floor exited in the mosque's veranda, stated in the diagram as transitional space which vouched the exterior space and the main prayer hall. The Openness of the veranda also provides walk-ability (0,667 SSI) and pray-ability (0,667 SSI). Although the veranda shares the same function as the prayer hall, yet students keep affording it for work-ability. Moreover, the existence of load-bearing system (i.e., structural column) also provides rest-ability, as can be seen in Figure 12b, students utilize this element as backrest and afford work-ability more conveniently. Additionally, the roof enclosure system also provides work-ability (0,333 SSI) which is indirectly related to the seat-ability (0,400 SSI). As can be seen in Figure 12d, students use shading either provided by the roof or vegetation enclosure.

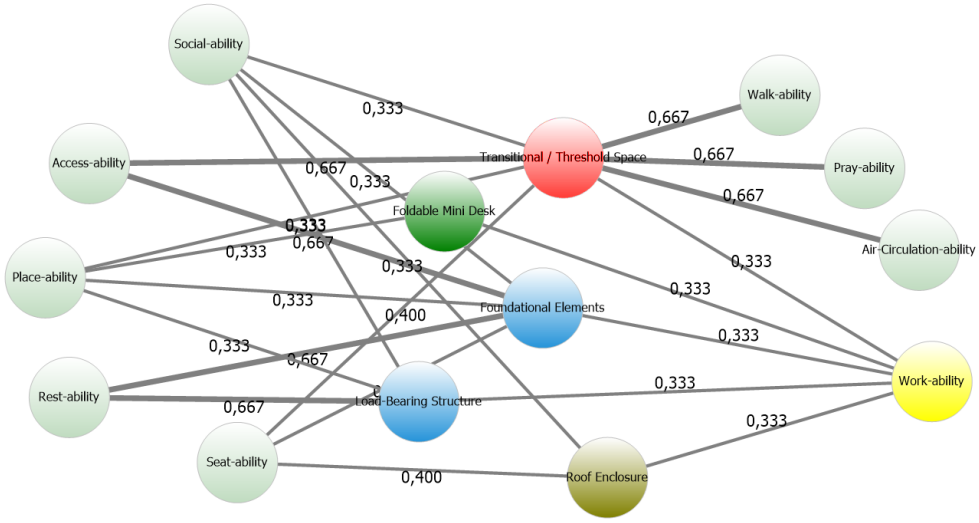


Figure 11. Observable Affordance Behavior in Mosque

The mosque constitutes a unique object in this study, functioning as a 24-hour prayer space with explicit religious purpose. It features spatial separators, including verandas and gender-specific divisions, aligning with Islamic norms and cultural appropriateness.

Due to its spacious open-plan layout, students often utilize the mosque's veranda as an alternative workspace. As illustrated in Figure 12a, some students use stair steps as makeshift tables while sitting cross-legged to reduce back strain. Others, as shown in Figure 12b, lean against the curved column bases for additional back support. Figure 12c depicts students clustering around power outlets, treating them as essential resources, while Figure 12d highlights the use of tree shade as a natural substitute for built roofing to avoid direct sunlight during outdoor study sessions. In this particular object, physical affordance may shift, change, or substitute in the course of student granted by the same valuable architectural advantages. Additionally, open layout and desk-less model working, generate more social interaction (Reinius, Korhonen and Hakkarainen, 2021).

Figure 12. Various Work-Ability Affordance in Mosque (a) A Group of Students Using Stairs as Table (b) Students Using Structural Column as Backrest (c) A Group of Students Surrounding Power Outlet for Better Work Performance (d) A Group of Students Using Tree Shading.

Plaza

Figure 13, shows the existence of work-ability affordance, in plaza's case the affordance exists in various architectural elements. The structure (Σ 0,334 SSI), especially load-bearing structure (i.e., structural column), providing other affordance such as energy-ability. This affordance only can be found on the structural column (1,000 SSI), therefore students may afford work-ability near the column, as can be seen in Figure 14d. Apart from the fact that it is occurring in the circulation space. Moreover, the circulation space greatly poses walk-ability (1,000 SSI) and access-ability (0,500 SSI).

Other element such roof enclosure (i.e., overhang roof (0,167 SSI)), also providing work-ability, in extend to that function, the overhang roof also provides better shading to the tables 4-seater, as can be seen in Figure 14 (b). The existence of machine elements in the plaza also generates work-ability function.

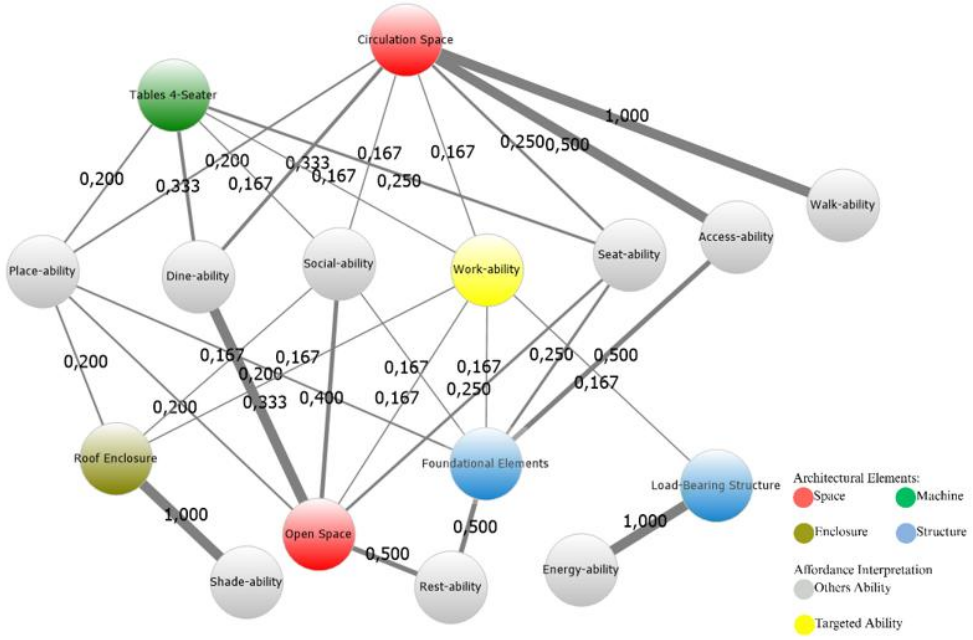


Figure 13. Observable Affordance Behavior in Plaza

Unfortunately, there is only one particular machine that exists as behavioral container in the object, that is table 4-seater. Which also providing dine-ability, social-ability, place-ability and seat-ability with range of 0,167 – 0,333 SSI. It can be concluded that the affordance provided by the machine element is arguably replaceable by other element such structural element or space element, evidence can be seen in Figure 14c and 14d. Where students may afford work-ability in such unexpected way.

ITS campus poses several plazas that can be accessed by public, considering ITS development expand horizontally. A plaza provides several functions, yet its main purposes are providing safe passage, assembly point, green space, etc. In general, ITS plaza is constructed mostly by floor structure, overhang roofs enclosure and furnishing. As can be seen in Figure 14a. The bare minimum of work-ability for ITS students is the availability of seating function, everything else will follow through. Even though this plaza does not provide consistent shading for seating area, yet they still manage to work effectively (Figure 14b).

As previously noted, the plaza lacks consistent shading, with shade availability depending on sun orientation. Consequently, student activities shift in response to the movement of the sun. Larger groups, such as a choir, were observed occupying corridors rather than using tables and chairs, which only accommodate up to eight people (Figure 14c).

Figure 14. Various Work-Ability in Plazas (a) Plaza Function as Corridor (b) A Group of Students Normally Use the Furniture (c) A Larger Group of Choir Students Use the Corridor (d) Some Students Radically Use the Power Outlet.

Some students also chose to work near power outlets on columns by the stairs, employing similar strategies as seen in the mosque setting Figure 14d. Field observations revealed that although every table in the plaza is equipped with power outlets, none are operational due to a campus-wide power disconnection caused by technical issues. As a result, students prioritize proximity to the few remaining functional outlets, often at the expense of comfort as can be seen in Figure 14d. As conclusion, the lack of energy-ability function affecting student's work behavior (Jin and Peng, 2022).

Library: Specified on 2nd Floor Office

The existence of work-ability affordance in the library which specified in 2nd floor elevation. Thus, in this case, the work-ability affordance is possessed by various architectural elements. Which mainly provided by machine elements (Σ 1,000 SSI), for instance the library provides at least 4 models machine elements such as, table 16-seater, table 8-seater, table 1 seater with and without partition. In each machine models, may provide another affordance such dine-ability, place-ability, seat-ability and social ability within range of 0,250 – 0,400 SSI. As can be seen in Figure 15, where table 1 seater with partition, allows additional affordance i.e., privacy-ability with 0,667 SSI (specified to singular machine).

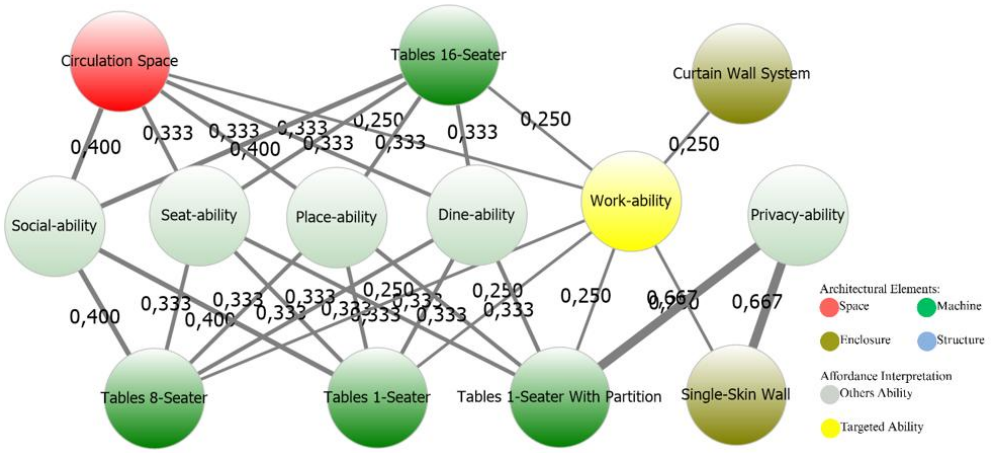


Figure 15. Observable Affordance Behavior in 2nd Floor Library

As can be observe in Figure 15, the enclosure elements such curtain wall system also providing work-ability function (0,250 SSI). Yet, single-skin wall provides more enclosed atmosphere with additional affordance functions such as privacy-ability (0,667 SSI).

In this research, the ITS Library is the only object assessed by specific floor due to its mixed-use configuration. While the first-floor functions as Creative Co-Working Space #1, it cannot be evaluated as part of the main library area. Therefore, the study focuses on the second floor, identified as having the lowest visitor count despite offering similar furnishings. Although primarily designated as an administrative office, this floor is still actively utilized by students as a workspace, highlighting a discrepancy between intended and actual use.

Statistical data (Figure 6) indicates that the second floor of the ITS Library consistently records the lowest number of visitors throughout the week. As shown in Figure 16a, access to this floor is limited—there is no elevator access, and entry is via a single staircase, potentially contributing to its underutilization. Many students are unaware of its existence as a viable workspace. Figure 16b and 16c show individuals working in an otherwise deserted area, with only a few small groups using the space collaboratively Figure 16d. Some students reported choosing this floor after the other nearby working place reached full capacity, leaving no available seating. The lack of availability of working place may affect students learning performance (Valtonen et al., 2021).

Figure 16. Various Work-ability Affordance in 2nd Floor Library (a) Access to 2nd Floor (b) (c) A Student Working Alone (d) A Group of Students Working Together

Dormitory Hall

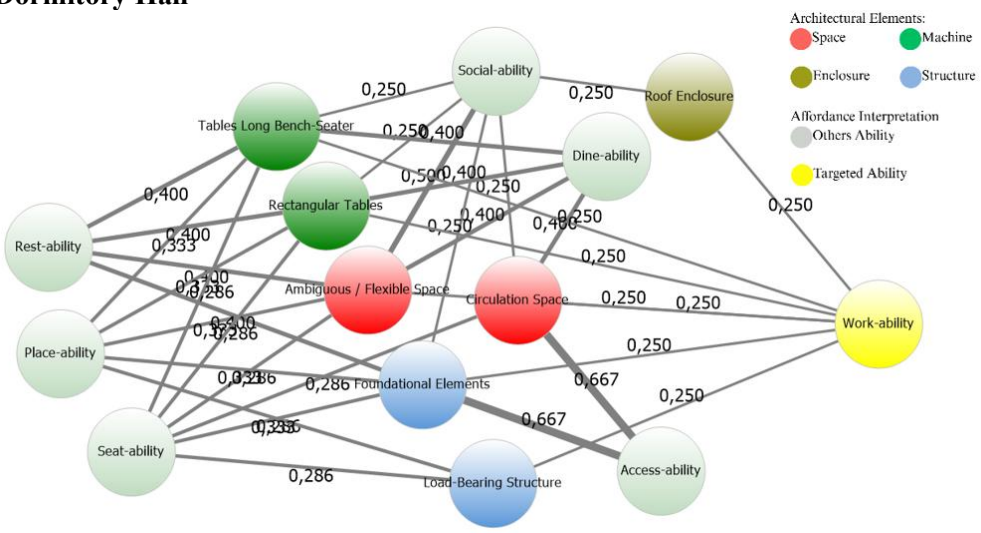


Figure 17. Observable Affordance Behavior in Dormitory Hall

Figure 17 describes the existence of work-ability functions provided by 3 architectural elements. The space, structure and machine elements are valued with total of ∑0,500 SSI. The dormitory hall's space is mainly defined as flexible space with open layout floorplan, which affords various function such place-ability, rest-

ability and seat-ability within index range of 0,300-0,400 SSI. In contrast the other part of dormitory hall functions as circulation space (i.e., corridors) and provides access-ability with 0,667 SSI. Nevertheless, students keep using it for work along with machine elements (i.e., table long-bench seaters), which originally intended for dine-ability function (0,400 SSI). Even some elements shifted from origin function, yet students keep using it as long as they granted with work-ability function. Additionally, some students forcefully use the corridors and table long-bench seater because the lack capacity of the main hall floor, as can be seen in Figure 18d.

Another element such machine elements such rectangular table in the flexible space as can be seen in Figure 18a and 18b, also provides the same affordance function as tables long bench-seater located in the corridor space. Arguably, the multi-function aspect of space may affect rectangular table's hygiene quality. Thus, it may diminish the work experience.

Figure 18. Various Work-ability in Dormitory Hall (a, b) Two Distinct Seating System in Dormitory Hall (c) Individual Student Using Long Bench for Working (d) Evening-Night Hour Tends to Attract More Visitor.

Dormitory Hall poses open-space layout as Manarul Ilmi Mosque. Mainly constructed by huge columns that directly support the roofing structure. Making the hall become semi-outdoor building. This design offers better natural lighting and natural air circulation. With better natural concepts ITS does not require cost in maintenance. One thing that distinguish the dormitory hall and the mosque is the availability of furniture. Dormitory hall provides two types of seating furniture. One for normal seating and cross-legged seating. Both have different dimensions and materials. However, to use the open-space area students need to move and prepare

the huge table before and after using it. This inconvenience influences users to use normal seating spots when they work individually.

As illustrated in Figure 18b, two distinct seating arrangements are divided by a 15 cm-thick wall. One side feature standard seating primarily intended for dining, although some students repurpose it for individual work. This choice may be influenced by the requirement to prepare the large rectangular tables independently, as shown in Figure 18a. Due to the inconvenience of setup, students often opt for the long bench seating, allowing them to work while others dine nearby (Figure 18c). Furthermore, Figure 18d demonstrates that the hall becomes increasingly crowded as the day progresses.

CONCLUSIONS

Affordance Priority

Figure 19, represent descriptive observation data which is analyzed using a coding co-occurrence method to cluster affordance occurrences with their architectural aspects. The analysis across six objects reveals that users accommodate the affordance of work-ability through four primary architectural elements. In this case, structural elements hold the most Sorensen similarity index by 0,430. Distributed through foundational element such flooring and elevation and load bearing element such structural column. These elements hold similarity of function throughout the six researched objects, especially the additional affordance like energy-ability. As the adaptation of affordance theory (Figure 3), the physics of environment shapes the behavioral respond by user. Evidence in Figure 12c, Figure 14d, Figure 16d, shows that students conveniently work collaboratively surrounding the structural column. In addition, particular column shapes also provide rest-ability function as can be seen in Figure 12b.

Another element such space, enclosure and machine hold value within range of 0,136 – 0,176 SSI. As the circulation space mainly occurs in corridors or hallways, evidence in Figure 18c and 18d, shows that work-ability may occur in corridors related to the availability of the machine element (i.e., tables long bench-seater). But in contrast, Figure 14a and 14d show different evidence that the work-ability that is not related to the existence of machine elements. According to Figure 13, it can be understood that student most needed function is energy-ability which can only be provided by the structural element such as structural column.

Additionally, through coding occurrences, work-ability was found to be interconnected with other affordances, including place-ability, social-ability, dine-ability, accessibility, meet-ability, pray-ability, and sit-ability. Users appear to perceive the affordance of work-ability in conjunction with these other functions (Figure 10, Figure 12, Figure 14, Figure 16, Figure 18). However, whether these additional affordances facilitate or hinder users' work activities remains a subject of debate and warrants further exploration.

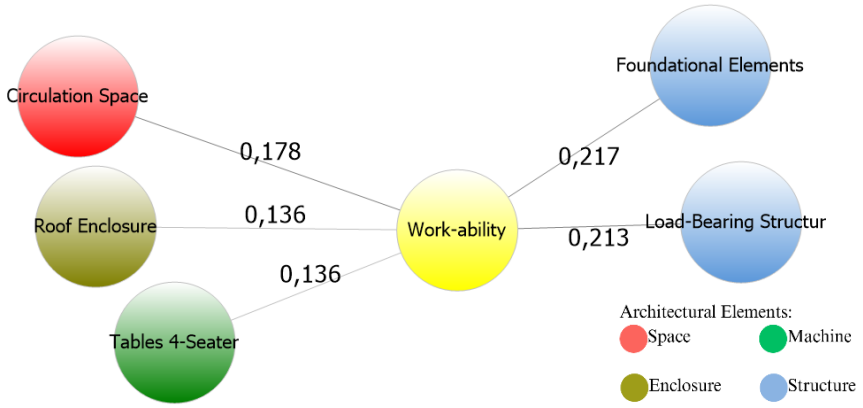


Figure 19. Overall Affordance Interpretation on Architectural Elements (6 Object)

A further exploration on the affordance effectiveness needs to be done to understand the significance of every architectural element (Chemero, 2003; Norman, 2013). As the increasing needs of informal learning space inside campus and affecting student development and performance (Reinius, Korhonen and Hakkarainen, 2021; Valtonen *et al.*, 2021; Salih *et al.*, 2024). In this context, the community plays a significant role in determining and redeveloping the actual function of public spaces (Sushanti, Setijanti and Septanti, 2022; Dewayani Perbawanti and Dwi Pratiwi, 2025). Collective interpretations of work-ability among students contribute to the emergence of new meanings and functions of public space, extending beyond their originally intended purposes. Overall, it can be concluded that all public buildings at ITS offer equal opportunities and potential for users to perform work activities. But how significant every architectural element in affording the work-ability needs further exploration.

A Pure form of criticism may emerge from the observation of behavior. (Attoe, 1978). Analysis of user behavior across all research sites reveals that each individual implicitly critiques the architectural space through their interactions. These behaviors align with Attoe's concept of criticism, where architecture is understood through its static element—structure, space, enclosure and machine. In particular, students consistently value adequate machine elements to perform their tasks effectively (Figure 19; 0,136 SSI). Furthermore, Attoe's criticism, supported by Pierre Berton's perspective, suggests that architecture is perceived as a "system of settings" tied to users' activities, routines, and learning habits. Through everyday actions, users unconsciously critique and reimagine ideal workspaces that better align with their needs and expectations. This ideal working space, as inferred from user behavior, encompasses key elements:

1. Multipurpose structural element, not only beneficial to the physical object but also directly to the user.
2. Expansive floor areas with open layouts.
3. Accessible user-friendly space, with flexible function.
4. Proper shading, provided by various enclosure systems.

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