Investigating Physical and Environmental Priorities in Office Spaces

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Abstract: To improve the quality of the built environment in office spaces, and more successfully satisfy the needs and requirements of different types of users, architects need to understand how different types of participants in the building's life cycle differ in the values they place on specific physical and environmental issues related to different office spaces.

This paper investigates priorities of different subject groups regarding a number of physical and environmental issues concerning the design of office spaces. The investigation includes three subject groups: ***architects** (designers)*, ***users** (different employees)* and ***clients** (owners)*. It addresses eight *office spaces/settings*, and nine *physical and environmental issues*, in order to raise the awareness of the issues impacting the effectiveness and performance of the office spaces.

Paper's Intent:

The intent of this paper is to determine the differences between the three subject groups in their prioritization and rating of a number of physical and environmental features in office spaces, in order to raise the awareness of the different issues impacting the office effectiveness and performance.

1. Introduction:

Performance criteria used in evaluation are developed from goals and objectives that are derived from values held by individuals, groups and organizations. The performance of a building is usually measured by a variety of groups including those using the building and those responsible for producing it (Preiser, 1993), (Preiser et.al. 2015). Key players in a building's life cycle view its success in different terms. Architects often measure success in different terms than clients, who may in turn perceive the building differently to the users. The different perceptions of performance which the various groups associated with the building subscribe to during a building's life cycle is a critical consideration in building performance modeling.

According to (Groat & Wang, 2000) and (Preiser et. Al. 2015), judgments of building performance and post occupancy evaluation (POE) are made based on the extent to which the building is providing the services that the different stake holders (architects, users and clients) require of it. Building performance and POE are intended to make buildings more responsive to the functions they support, and to the needs of the building's occupants.

To achieve the paper's intent, the following environmental features have been chosen:

1. Safety measures

2. (HVAC) Heating, Ventilating and Air Conditioning

3. Natural lighting

4. Windows and views

5. Amount and quality of space

6. Location and access to people and resources

7. Furniture, fixtures and equipment

8. Privacy and quiet

9. Aesthetics

These features may be gathered under three main categories of elements: Technical, Functional and Behavioral elements (Hult, 1996), (McKeown, 2017). There are other building performance elements that influence physical performance and affects clients, owners, organizations and building occupants (Salama, 1998), (Kamarulzaman et. al., 2011), (Ayoko & Ashkanasy, 2019 & 2020), (Davis et. al., 2011). However, these three are the most important. Technical elements deal with the survival and safety issues such as security and the performance of the building systems, like HVAC, natural lighting, acoustics, sanitation and durability. Functional elements deal with the fit between the building and the performed activities, like the amount and quality of space, location and access to people and resources or workflow, flexibility and change, productivity and operational efficiency. While behavioral elements deal with the perception and the psychological needs of the building's users and how this interacts with the facility, like privacy, social interaction, territoriality, density, use, and image.

Among these environmental features, there are some that are quantifiable or objective such as: natural lighting, acoustics, temperature and humidity, durability of materials, and the amount and distribution of space. While there are others that have qualitative aspects or subjective such as: aesthetics or beauty, visual compatibility and integration of the interior design regarding spaces, furniture, textures, colors and arrangement.

2. The Methodology:

Considering the COVID-19 pandemic, the most suitable methodology to be adopted for the data collection of this study was an *online survey*, as online surveys are safer and more secure to conduct as there is no person-to-person interaction nor any direct form of communication, besides, they can reach large numbers of people in comparison to other mediums. Also, this method makes people feel more comfortable about providing honest answers because they are interacting with a computer or a mobile.

The survey subjects were selected based on their involvement with office spaces[1]. The survey was administered to sixty subjects divided among three groups, these are: architect, users and clients. *Architects* are identified as the design professionals responsible for the programming and the design or arrangement of the office space. *Users* are identified as the individuals working within the office space. *Clients* are identified as those individuals who

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[1] The data for this study was gathered from an online survey requested from the "Al Ahly Financial Investments Management Company" Offices at Giza. The offices occupy two stories of the building, an area around 1500 m^2 including different offices, meeting rooms and services.

represented the needs of the organization to the architects and also discussed and approved the design. Subjects from eight office settings were interviewed. All settings were relatively four years old at the starting time of this investigation. All subjects were asked to consider only the private workplace, not the building or the department as a whole. Table [l] illustrates the distribution of subjects by group as well as by office settings.

The literature reveals several methods to obtain responses from people such as surveys, interviews, and attitude ranking scales. Zeisel in 1997, stated that: "an attitude scale is a special type of questionnaire designed to produce scores indicating the overall degree of favorability of a person's attitude on a topic. It is constructed that all its questions concern a single issue". This definition shows that attitude-ranking scales would be more suitable for this type of study.

Table [l]: The breakdown of subjects by status and office setting.

Subject Status	Office Settings								Subject Group Totals
	A Chairm man	B Manag-ing Director	C Secretary	D IT Room	E Accou-ntants	F R & D	G Meeting Room	H Dining / Buffet	
Architects	1	1	1	1	1	1	1	1	8
Users	5	6	4	7	5	4	6	7	44
Clients	1	1	1	1	1	1	1	1	8
Setting's Totals	7	8	6	9	7	6	8	9	60

Subjects were asked to *rank* the nine physical and environmental features from most important to least important, to measure their priority of options. Then they were asked to *rate* their level of satisfaction with each of these environmental features using a 5-point Likert scale, to measure the strength of their responses; those features having high values indicate high satisfaction, and would be as follows:
I- Low 2-Low-Moderate 3-Moderate 4-Moderate-High 5-High

Other scales of 3-point or 7-point could have been used. However, 3-point scales provide only three dimensions: low, moderate and high. To break up the evaluation into only those three dimensions would sure limit its accuracy. On the other hand, a 7-point scale would be too confusing because it would provide too many variables, and the differences between them would be too fine to detect. Therefore, the evaluation dimensions followed the 5-point scale.

Figures (1) and (2) show the case study plans of the 9th and the 10th Floor of the office building with images of the 8 space settings of the survey.

| IT Room | Research & Development | Dining Room / Buffet |

Fig. (1): The 9ᵗʰ Floor Plan of the Case Study showing 3 investigated Space Settings

Accountants   **Managing Director**   **Secretary**

Chairman   **Meeting Room**

Fig. (2): The 10th Floor Plan of the Case Study showing 5 investigated Space Settings

3. Findings and Results:

The study shows that the aggregate mean of architects, users and clients rankings of the nine selected physical and environmental priorities results in the following order of descending importance:

1. Amount and quality of space
2. Privacy and quiet
3. Location and access to people and resources
4. Safety measures
5. Furniture, fixtures and equipment
6. Aesthetics
7. (HVAC) Heating, Ventilation and Air Conditioning
8. Natural lighting
9. Windows and views

Refer to Table [2] for a representation of these values, as well as values for each subject group. While

Table [2]: The Mean Rank order and satisfactory rating of environmental priorities for selected subject groups (Subject groups are equally weighted):

Physical & Environ- mental Priority	Subject Groups						Mean Rank Order
	Architects		Users		Clients		
	Rank*	Rating**	Rank*	Rating**	Rank*	Rating**	
Space Quality	2.3	3.2	2.8	3.5	1.5	3.8	2.2
Privacy & Quiet	4.1	4.2	3.1	3.2	2.6	4.4	3.3
Location & Access	2.8	3.2	4.3	3.5	3.1	4.6	3.4
Safety Measures	4.8	3.0	4.0	2.3	4.0	4.5	4.3
F.F.& E.	4.9	3.1	3.8	3.8	5.8	4.2	4.8
Aesthetics	4.7	3.5	6.1	3.7	4.9	4.7	5.2
A.C.	6.1	3.3	4.8	2.6	5.4	3.2	5.4
Natural Lighting	5.6	3.2	5.3	3.4	6.0	4.8	5.6
Windows & Views	5.5	3.8	5.7	3.2	6.8	4.1	6.0

* Low values indicate high priorities   ** High values indicate high satisfaction

Table [2] also shows that the architects' group is the least group to match the mean rank order (2 of 9 = 22.22%). While the users come in second position in matching the mean rank order (3 of 9 = 33.33%). On the other hand, clients are the nearest group in their prioritization among all three groups to match the mean rank order of priorities (6 of 9 = 66.66%).

Table [3] shows physical and Environmental features ranked in order of priority for each subject group.

Table [3]: Different physical and Environmental features ranked in order of priority for each subject group.

Priority Ranking	Architects	Users	Clients	Mean Rank Order
1	Space Quality	Space Quality	Space Quality	Space Quality
2	Location and accessibility	Privacy and Quiet	Privacy and Quiet	Privacy and Quiet
3	Privacy and Quiet	F.F. & E.	Location and accessibility	Location and accessibility
4	Aesthetics	Safety Measures	Safety Measures	Safety Measures
5	Safety Measures	Location and accessibility	Aesthetics	F.F. & E.
6	F.F. & E.	Air Conditioning	Air Conditioning	Aesthetics
7	Windows and Views	Natural Lighting	F.F. & E.	Air Conditioning
8	Natural Lighting	Windows and Views	Natural Lighting	Natural Lighting
9	Air Conditioning	Aesthetics	Windows and Views	Windows and Views

Figure (3) shows the nine physical and environmental features ranked in order of priority as for the three subject groups.
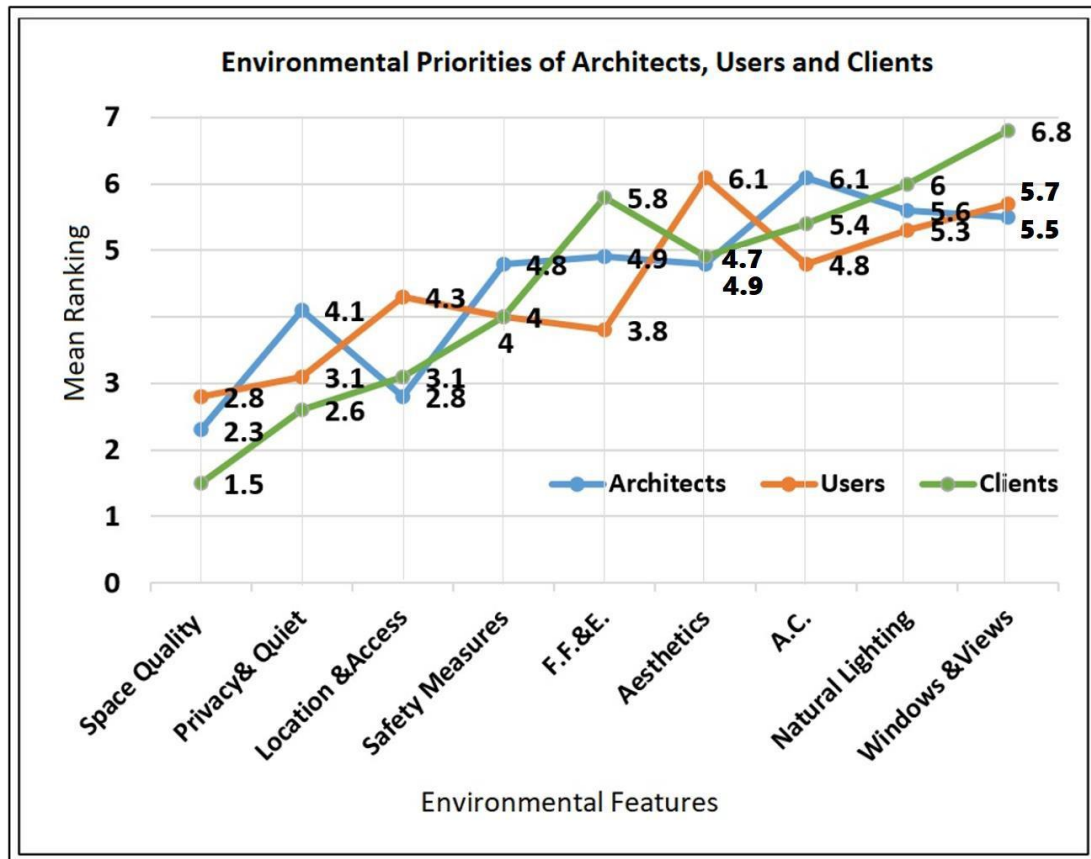
Fig. (3): A graphical representation for the ranking of the nine physical and environmental features for the three subgroups

Space:

All three-subject groups (Architects, Users and Clients) ranked space as the most important environmental priority.

Privacy and quiet:

This feature was ranked second in importance by Users, and Clients, but third in importance by architects. The lack of privacy, increased noise and surveillance may threaten interpersonal interactions and collaboration in office spaces and especially in open plan offices. Architects and designers may use different aspects of open plan office settings (e.g. movable desks, bench layouts, room dividers) in designing future office spaces.

Location and accessibility:

Location was also found to be important to subjects in this study. *Architects* selected *Location* as their second highest environmental priority. This is caused by the emphasis which architects place on the space function, its relationships and adjacency to other spaces.

However, *users* ranked Location and accessibility fifth, and *clients* ranked it third.

Figures (4), (5), and (6), show the mean priority rankings and satisfaction ratings by the three subject groups; architects, users and clients respectively.
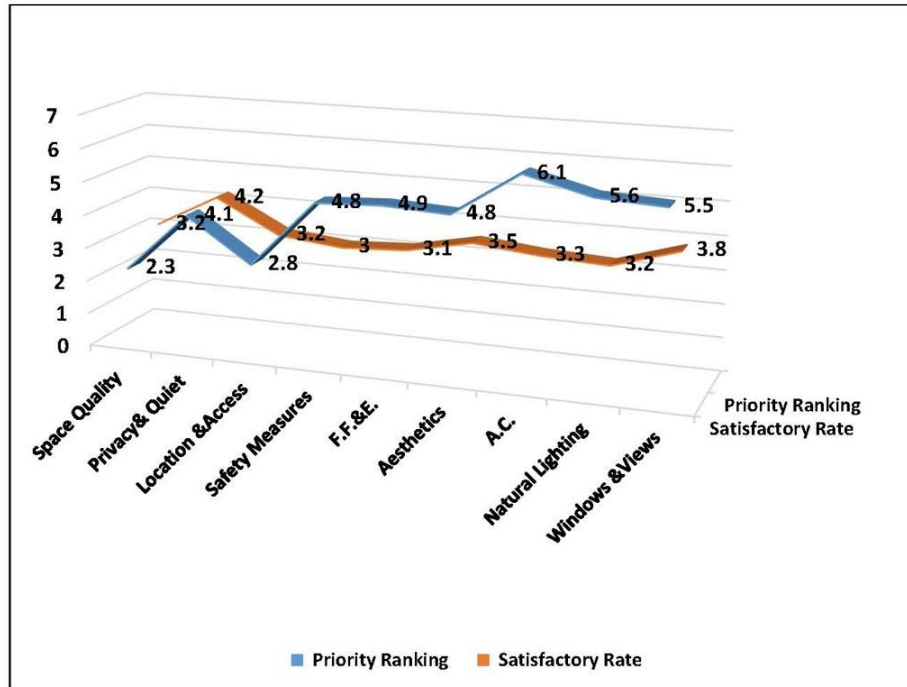

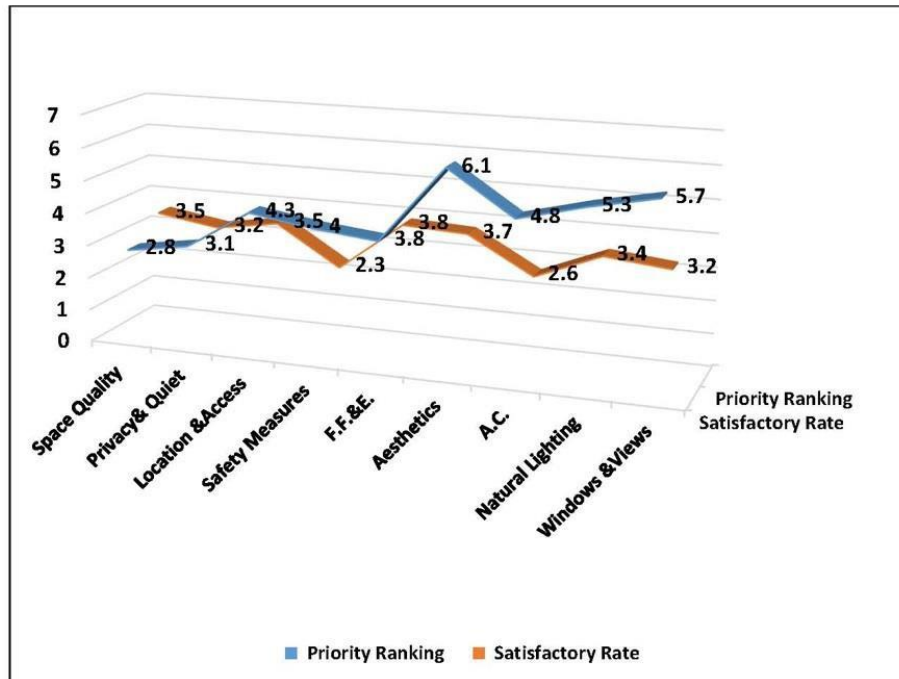Fig. (4): The mean ranking and rating for the Architects subgroup

Fig. (5): The mean ranking and rating for the Users subgroup

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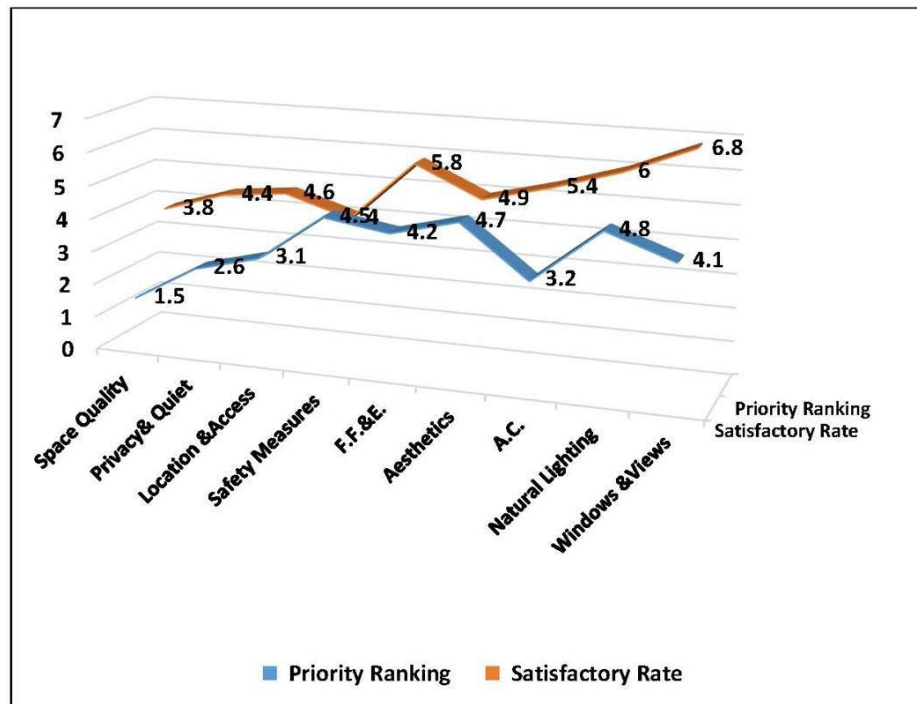**Investigating Physical and Environmental Priorities in Office Spaces**

Fig. (6): The mean ranking and rating for the Clients subgroup

Safety Measures:

Safety measures was ranked fourth by Users and clients and fifth by architects, which indicates its importance in the design of office spaces, especially for users.

Furniture, Fixtures and Equipment:

Trends in ranking F. F. & E. usually relate more closely with the type of work performed within the setting, than to the status group of the subject. Subjects in office settings that utilize computers or other types of technical equipment tend to rank F. F. & E. as a high priority.

Clients as a group tended to give this feature a slightly lower priority ranking (seventh priority), while users gave it a higher priority ranking (third). Perhaps clients prefer to think of this feature as a low priority since they have to pay a lot for it. Users, on the other hand, always experience only the benefits of new furniture and equipment. Architects ranked this priority sixth.

Aesthetics:

Aesthetics may vary in priority ranking among different subjects according to methodological differences, Aesthetics ranks higher when open-ended survey methods are used. This is because the general public's view of aesthetics is superficial. When open-ended questions are used, users tend to list visual features of their environment, many of which could be categorized as aesthetics.

In this study users ranked aesthetics as their lowest priority (eighth priority). Clients ranked aesthetics slightly below the mid-point on the scale (fifth priority). While architects ranked it as their fourth priority. Because of

the architects training, they are more sensitive to aesthetics, while clients view aesthetics as an extension of corporate image.

Air Conditioning:

Architects ranked this feature well below the users and clients (eighth), as they are sensitive to the costs involved in providing a quality Air Conditioning system. Air conditioning rankings appear to be particularly sensitive to satisfaction ratings. Those subjects rating Air conditioning as unsatisfactory also tend to identify it as an above average priority.

Natural lighting:

Natural lighting ranked near the bottom as a priority for all three subject groups (seventh by users, and eight by architects and clients). Many users commented that natural lighting is unimportant since it can be easily substituted artificially. This environmental priority received an almost high satisfaction rating from most subjects (Clients: 1/9, Architects: 5/9, and Users: 4/9).

Windows and Views:

This environmental priority ranked low in all three subject groups participating in the study. Clients ranked windows and views lowest of all nine physical and environmental priorities and also lower than architects and users.

In one of the eight office settings, windows were located only in offices of high management level employees. In this setting, windows and views became a mid-range priority rather than the lowest priority. This indicates that when environmental priorities are linked to status by the organization, the value of that priority is increased.

"The offices were on the exterior of the floor, and I had the corner office, of course, because I was the president... ...Everybody else was in a cubicle." McMurray, 2001

4. Discussion:

The results of this study indicate that environmental features become greater priorities when shortcomings exist, which matches the results of other study by (Hassanain, 2010), (Haskell, 2015). Current results also show that the nine physical and environmental priorities can be divided into two groups. In the first group, there are those environmental priorities that receive high rankings regardless of the satisfaction ratings they receive. Environmental priorities that belong to this group are amount and quality of space, privacy and quiet, location and accessibility of people and resources, and safety measures.

The remaining environmental priorities: Furniture, Fixtures and Equipment, Aesthetics, Air Conditioning, Lighting, and Windows and views, can be identified as lesser environmental priorities, as shown in figures (4, 5 and 6).

Rankings assigned by subjects to these lesser environmental priorities are affected to a greater degree by current conditions than are the top four environmental priorities. This is evident in Figures (4, 5 and 6). Those environmental features that are currently unsatisfactory in the office setting tend to rank as higher priorities than those, which are satisfactory.

Also, when an environmental priority can be identified as a status symbol within the organization, it becomes a higher environmental priority within that organization.

Another observation that can be deduced from the previous figures (4,5 and 6) is that of the three subject groups, user priorities are most affected by the current setting. This is likely that the users are generally less mobile, and thus are more conscious of inadequacies within their offices working environment.

Another finding is that architects place significantly less importance on certain practical environmental features than users and clients do. Air conditioning and privacy and quiet, showed to be two areas, which clients and users often found to be lacking.

This study has pointed out clearly, that the values of users were found to differ most from the values of clients. F. F. & E., aesthetics, air conditioning, natural lighting, and windows and views were all areas in which users and clients differed considerably.

5. Conclusion:

This study indicates that subjects typically place higher priorities on those environmental features that are not satisfactory in their office settings. The importance of the top four environmental features is influenced by the office setting to a lesser degree. These features are amount and quality of space, privacy and quiet, location and accessibility of people and resources and safety measures. The priorities of users are found to be more affected by the current office setting than are architects and clients.

Two areas were found in which greater differences exist between the subject groups, architects were found to differ with users and clients on the importance of many practical features such as privacy and quiet, and air conditioning. Many more differences were found, however, between users and clients.

The analysis of this study points out to the importance of the amount and quality of space as a major factor affecting office design and use.

By continuing to study and question the values of architects, users and clients, the forces shaping their values may be better understood. This knowledge gained will help architects to provide satisfactory office environments for those who use and commission them.

To capitalize on the outcome of this survey, Architects should put great emphasis on the amount and quality of space. One of the major factors of providing a pleasant and a healthy workplace is to consider Biophilic Design Concepts in the interior by bringing the outdoors to the indoors, to create a working place where staff can work, collaborate and relax (Browning et.al., 2014).

Future research work should address the impact of changing the workplace design to accommodate *Hybrid* and *Blended* working environments, also, how to enhance teamwork in such environments, and what other physical and environmental features should be investigated.

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