



1     **Transforming Field Data into Diagrammatic Indexes: An**  
2     **Artistic Technological Approach in Contemporary Interior**  
3     **Design Process**

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13     **Abstract.** Interior design is a complex multi-disciplinary field of study. As  
14     novice designers, interior design students require effective methods to convert  
15     the multitude of field data in the early stages of the design process into those that  
16     can be understood for further analysis. This paper develops the idea of  
17     transforming field data on site into diagrammatic indexes with the help of  
18     digital software. The aim is to provide a more practical method of analyzing user  
19     behavior and site conditions in which students focus on identifying intensities or  
20     patterns of the data observed on site rather than making descriptions of physical  
21     details as often done in conventional field surveys. Methods include identifying  
22     the aspects to be analyzed (occupancy, lighting, circulation, noise, ventilation,  
23     etc), creating suitable graphic indexes for each aspect of analysis, overlapping  
24     each diagrammatic index into one single diagram and analyzing the holistic data  
25     based on the interconnections between indexes formed. Results show that this  
26     method of representing data provide a visually artistic yet efficient way of  
27     making quick readings of the site as compared to conventional ways of  
28     collecting field data. Interior designers can also directly provide design solutions  
29     and produce innovative designs based on the site patterns observed.

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31     **Keywords:** *interior design; diagrammatic index; design process; technology;*  
32     *graphic thinking*

33     **1     Introduction**

34     Interior design is a complex, multi-faceted field of study requiring connections  
35     to other fields of knowledge in the design process [1]. This is especially the case  
36     at the initial stage of the process when designers need to observe information in  
37     order to understand various types of problems before devising a suitable  
38     solution through design. The information to be analyzed can range from those  
39     related to the human aspect, such as user behavior, activity, occupancy and

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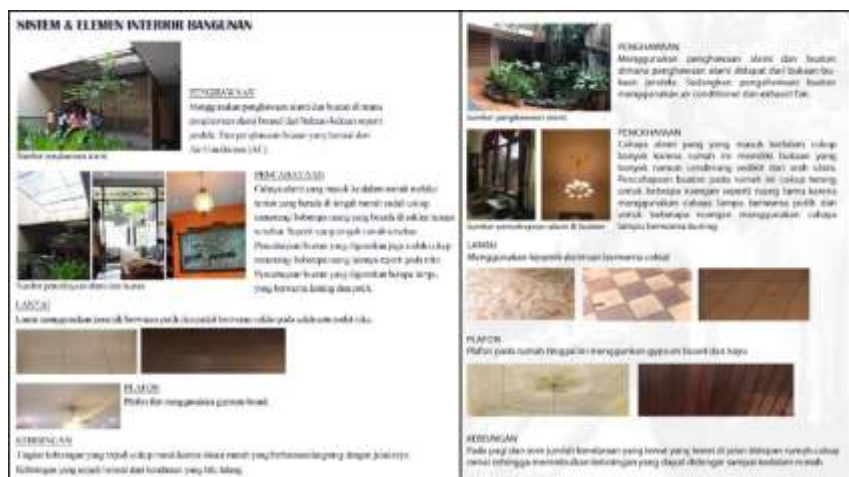
40 circulation, to physical aspects of the interior space such as the lighting quality,  
41 ventilation, view, access, acoustics, etc. With a wide range of different data that  
42 needs to be observed, interior design students as novice designers need an  
43 efficient way of viewing, documenting as well as communicating the data  
44 observed as the resulting designs must respond to the physical location as well  
45 as the social context of the design project [2]. This paper aims to develop a new  
46 artistic method for analyzing user behavior and site conditions using vectored  
47 digital software. In this method, students focus on identifying intensities or  
48 patterns of the data observed on site rather than making descriptions of physical  
49 details as often done in conventional field surveys. The paper starts with  
50 analyzing the flaws of documenting conventional field surveys, and identifies  
51 the significance of visual presentation in the whole part of an interior design  
52 process. It then proposes a new technological perspective on viewing field data  
53 using graphic indexes, inspired by contemporary landscape urbanism techniques  
54 With this new method, it is hoped that students can make a quick holistic  
55 reading from a given site through a more quantitative graphical method of  
56 observation. Consequently, novel design solutions can be produced based on the  
57 graphic patterns observed.

## 58 **2 The Role of Graphic Thinking in Interior Design Process**

59 The teaching process of interior design often begins with an understanding of  
60 the problems that need to be solved in connection to a physical site and the  
61 context of its user. This requires the process of visually decoding the  
62 relationships among spaces, and evaluating their performance with regard to a  
63 set of criteria [3]. However, much of visual coding performed in an interior  
64 design process today are mainly focused on the ideation or the design phase  
65 rather than from the very beginning of the design process itself. Meanwhile, the  
66 important stage of gathering information through field surveys depend on  
67 photographs, written descriptions or rigid database tables as the popular modes

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68 of recording information (figure 1). Hence, interior design education has been  
69 disadvantaged from a shortcoming of documentation of the many possible  
70 modes of presentation and a scarcity of specific information for students [4]. As  
71 a result, there is often a gap in the connection of the information gathered at the  
72 beginning to the design offered by the students, as novice designers. This is  
73 because the data are gathered and documented in such a way that they are  
74 visually disconnected from the site and the template they work with in the  
75 ideation phase.



76  
77 **Figure 1** Conventional documentation of field data on lighting and ventilation  
78 in the form of photographs and written descriptions that remain visually detached  
79 from the site observed.

80 A holistic design process is one where the designer's creativity is put to use  
81 throughout the design process even from the first phase: the preparation or the  
82 fact-finding phase [5]. The method in which designers study and understand  
83 information is a crucial factor in influencing idea generation [6]. Hence, when  
84 teaching the process of interior design, graphic thinking should not only be  
85 adopted during the ideation phase but at the beginning from data exploration or  
86 Understand-Observe phase before proceeding to Programming, Ideation,  
87 Prototype and Test phases. With the implementation of graphical

88 communication and documentation from the start of the design process, the  
89 problems discovered at the initial stage can lead to a more concrete form of  
90 ideation that is tightly connected to the site and the template for implementing  
91 design ideas.

### 92 **3 Diagrammatic Index Method of Field Data Observation**

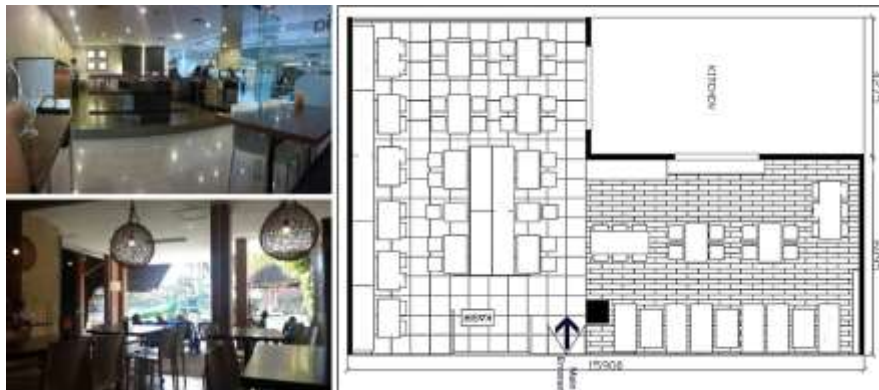
93 At present, the design methodologies of the built environment have staggeringly  
94 developed in line with the emergence of various digital software. Contemporary  
95 landscape and architectural design concept visualizations have become more  
96 structured, dimensioned and tend to become more quantified in the nature of  
97 their form with the aid of parametric digital software. In contemporary  
98 landscape urbanism process, designers often convert the data analyzed on site  
99 into patterned diagrams known as indexes, in which each index correspond to  
100 different landscape variables such as topography, streams, roads, land use, etc  
101 [7]. According to Charles Sanders Peirce's theory of Semiotics, an index is an  
102 implicated sign having a close, causal or tactile relationship with the object it  
103 signifies [8]. In this case, the index of topography is usually signified by curved  
104 vectored lines in which the proximity of lines correspond to the steepness of the  
105 slope. When different landscape indexes are overlapped into a single image,  
106 landscape designers can find a relation between one variable to another (i.e.  
107 how topography influence the dimensions and nature of the streams, etc.) [9].  
108 This research develops the same technique of transforming interior design field  
109 data into diagrammatic indexes such that interior design students can make  
110 quick readings of the site and also document them in a professional and artistic  
111 manner as popularly done in contemporary landscape urbanism. In this research  
112 students were given a task to observe a public space and document all the  
113 variables of their field data into different diagrams of index, with the boundaries  
114 of the site or the floor plan as the background template for each index. Methods  
115 include identifying the aspects to be analyzed (occupancy, lighting, circulation,

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116 noise, ventilation, etc), creating suitable graphic indexes for each aspect of  
117 analysis, drawing the indexes with the use of any vectored software (i.e.  
118 Autocad, Rhino, Grasshopper, Adobe Illustrator, Corel Draw, etc) and then  
119 overlapping each diagrammatic index into one single diagram. The intensity of  
120 the variable observed can be quantified through the units of the vectors. In this  
121 way, the role of computer technology in contemporary design process does not  
122 merely act as medium for presentation but as a partner in the design process of  
123 knowledge integration, decision support and design tools, as argued by Reffat  
124 (2007) [10]. Students were then expected to analyze the overlapped index in a  
125 holistic approach based on the interconnections between the indexes they could  
126 observe and make statements of the site problems that need to be solved before  
127 proceeding to the stage of interior design programming and ideation.

### 128 **4 Results and Discussion**

129 There were two objects taken as samples for this research. The first object for  
130 field analysis is a local serviced restaurant located in an electronics mall in  
131 Surabaya, Indonesia. Visitors have to pay for their meals first before they get  
132 seated. When ready, the food will then be served to the table by the employees.



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**Figure 2** Initial documentation of field data of a local restaurant on a weekday afternoon.

136 The field survey was conducted during a weekday in the afternoon. In this  
 137 research, the goal of the observation was to analyze user occupancy in relation  
 138 to the interior design quality observed. At the initial stage of the observation,  
 139 students first measured the dimensions of the restaurant and drew out the floor  
 140 plan (figure 2).



141

142

**Figure 3** Diagrammatic Index of Occupancy.

143 Students then determine the variables they were going to analyze and planned  
 144 the form of index for each of the variables. They observed the user activity and  
 145 site conditions for a duration of two hours. The first aspect they analyzed was  
 146 occupancy. The index for occupancy was signified by dots in which each dot  
 147 correspond to a single user (figure 3). Many dots in an area signified high  
 148 occupancy while little or no dots signified low occupancy. Based on the  
 149 observation, there were twice more visitors who preferred sitting on the west  
 150 than the east area of the restaurant, despite the same capacity on both areas. To  
 151 identify what aspects influenced the visitors to prefer sitting on the west area,  
 152 the students observed the interior quality of the restaurant. The first aspect they  
 153 observed was the lighting quality. As the field survey was conducted in the  
 154 afternoon, most of the lighting used at that time was natural lighting. Hence,

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155 they analyze the spread of natural light inside the restaurant. The index for  
156 natural light was signified by a gradient of yellow colour (figure 4). Darker  
157 shades of colour signified low light intensity whereas lighter shades of colour  
158 signified high light intensity. Based on observation, areas close to the windows  
159 on the north and the south received much more light intensity, whereas the  
160 middle areas were darker. The area on the west wall was also well lit due to the  
161 presence of mirrors on the wall.

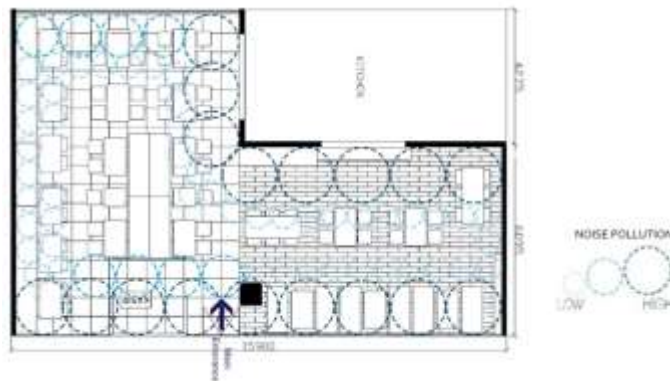


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**Figure 4** Diagrammatic Index of Natural Light.

163

164 The next aspect observed was the noise intensity of the restaurant. This was  
165 signified by a range of circles, having three different diameters (figure 5).



166

167

**Figure 5** Diagrammatic Index of Noise.

168 Noisier areas were signified by circles with larger diameters whereas quieter  
 169 areas were signified by smaller diameters of circles. It was found that the area  
 170 on the north-west was the noisiest area because it was close to the kitchen.  
 171 Areas close to the main entrance was also noisy because of the activities outside  
 172 the restaurant. Hence, the direction of noise came mostly from the kitchen and  
 173 from the mall visitors outside the restaurant.

174 The next aspect analysed was ventilation. This restaurant only used artificial  
 175 ventilation through a central air conditioner. Hence, the index of the ventilation  
 176 was the mapping of the location of the air diffusers with a blue square shape.  
 177 The air diffusers were equally distributed in all the areas of the restaurant.

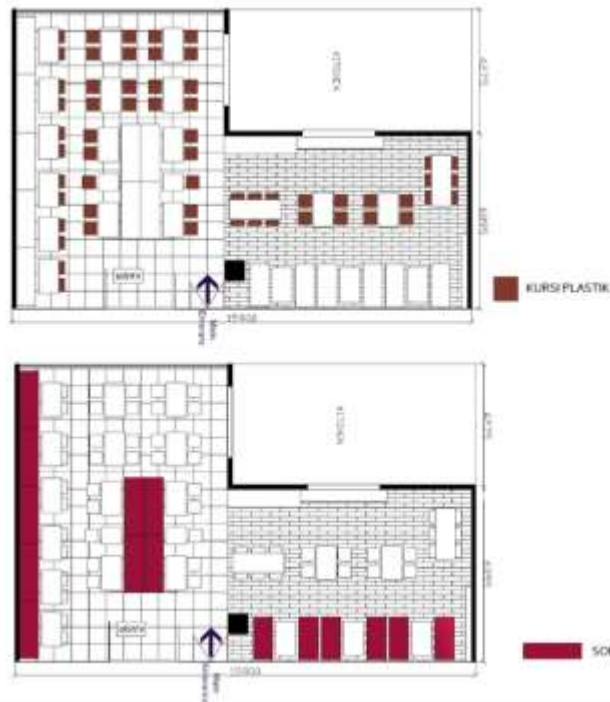


178  
 179 **Figure 6** Diagrammatic Index of AC diffuser location.

180 The last aspect analysed was the seating facility. This was important in  
 181 determining which form of seating facility was preferred by the visitors. There  
 182 were two types of seating that were used in the restaurant. The first type of  
 183 seating facility was a plastic chair, that was the dominant seating facility in the  
 184 restaurant, placed around every rectangular table. This was signified by a brown  
 185 square. The second type of seating facility was a rectangular sofa placed right in  
 186 front of the west wall, the middle area and on the south east along the glasswall  
 187 of the entrance area. This was signified by a red rectangle (figure 7).



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**Figure 7** Diagrammatic Index of Seating Facility

190 With the completion of variables to be analyzed, students then overlapped the  
191 indexes into a single diagram and observed the data by drawing relations  
192 between the variables observed (figure 8). From the indexical observations,  
193 several conclusions could be drawn. First visitors favored the areas that were  
194 brighter and closer to natural light. This could be seen from the diagram that  
195 shows that the lighter areas on the west appear to have more dots that signified  
196 more occupancy. Second, visitors also preferred sofa seats compared to the  
197 plastic chairs. This is evident from the diagram that there were twenty dots on  
198 the red rectangles (sofa) and only eight dots on the brown squares (plastic  
199 chairs). Noisier areas close to the kitchen on the north-east tend to be avoided  
200 by the visitors. Meanwhile, the design of artificial ventilation did not have any  
201 significant effect on the occupancy. Hence, based on analysis of the

202 diagrammatic indexes, the areas close to the kitchen were areas that needed  
 203 design solutions as they were areas that were least favored by the visitors.

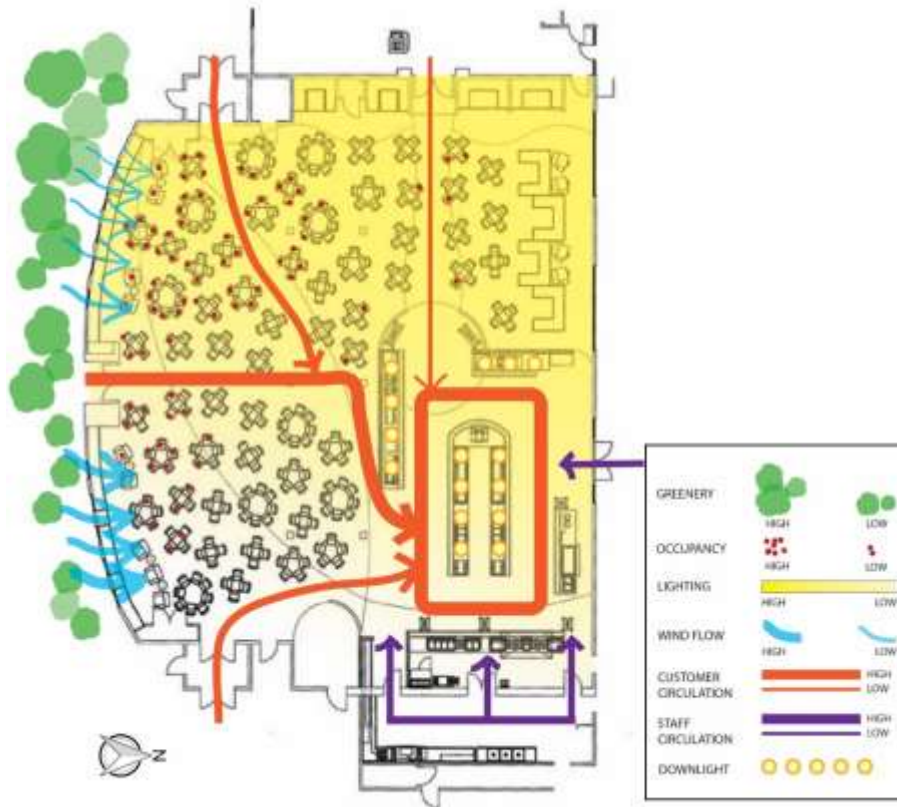


204  
 205 **Figure 8** Overlapped Diagrammatic Index of Field Data

206 Another indexical observation project conducted was a school canteen of a  
 207 private university. Students were required to analyze the visitor behavior in  
 208 relation to the interior design elements of the canteen. The canteen has a buffet  
 209 mode of service in which visitors first pay their lunch with their smart cards  
 210 before entering the building and proceed directly to the buffet table on the  
 211 north-east to collect their food before eating them on the table. With the same  
 212 diagrammatical indexing method, students analyzed various aspects they could  
 213 determine such as the occupancy, circulation, lighting, wind flow, views and  
 214 greeneries. Based on the overlapped diagrammatical indexes produced (figure  
 215 9), the students have observed that visitors of this canteen preferred the tables  
 216 that were far from the high flow of circulation from the entrance to the buffet  
 217 counters. They also preferred the areas on the south-west because of the mild  
 218 wind from the southern windows, views to greeneries outside and the brightness  
 219 of the space. Meanwhile, the areas on the north-west were less favored because  
 220 of the darkness and the high wind flow from the large windows. Hence, based

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221 on the observation, the areas on the northwest would need some design solution  
222 in the ideation phase.



223

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**Figure 9** Overlapped Field Data Diagrammatic Index of a School Canteen

## 225 **5 Conclusion**

226 Through this research, an artistic and technological approach of interior design  
227 field observation and documentation has been developed. By adopting graphic  
228 thinking from the early stages of an interior design process, interior design  
229 students benefit from a more quantified and visual understanding of the  
230 problems they need to solve. The use of the floor plan as the template or  
231 boundary for indexing and the focus on patterns or intensities of the research

232 variables also assist in representing material conditions on site and target the  
 233 exploration more concretely. This addresses the problems frequently  
 234 encountered in interior design studio projects in which the design solutions  
 235 offered by students are often focused on the inside space while the atmosphere  
 236 rendered are disconnected from the material quality of the site [11]. Students  
 237 become more aware of the potentials of the site that should be maximized  
 238 through their designs, thus enabling a more environmentally-conscious mind-set  
 239 in the design process.

240 Moreover, with the use of vectored computer software not just in the ideation  
 241 and prototype phases but from the very beginning of the design process, interior  
 242 designers as art students become more accustomed to quantified and  
 243 dimensional thinking rather than purely abstract thinking. Hence, the role of  
 244 computer technology in art education becomes more as a partner for design  
 245 thinking rather than merely a medium for presentation [10].

## 246 **6 References**

- 247 [1] Cunningham, E., *Navigating the Past: What Does History Offer the*  
 248 *Discipline of Interior Design?* *Journal of Interior Design*, 39(3), pp. 5-12,  
 249 2018.
- 250 [2] Brand, J. L., *Physical Space and Social Interaction*, Haworth, 2014.
- 251 [3] Laseau, P., *Graphic Thinking for Architects and Designers*, ed. 3, John  
 252 Wiley & Sons, 2000.
- 253 [4] Mitton, M., *Interior Design Visual Presentation: A Guide to Graphics,*  
 254 *Models, and Presentation Techniques*, ed. 2, John Wiley & Sons, 2004.
- 255 [5] Elsheshtawy, Y., *Creativity, Science and Architecture: The Role of*  
 256 *Research in the Design Studio*, *Design Studio Pedagogy: Horizons for the*  
 257 *Future*, Salama, A. M. and Wilkinson, N., eds, The Urban International  
 258 Press, pp. 75-90, 2007
- 259 [6] Mougnot, C., Bouchard, C., and Aoussat, A., *Creativity in Design- How*  
 260 *Designers Gather Information in the Preparation Phase.*, International  
 261 Association of Societies of Design Research., pp. 1-16, 2007.
- 262 [7] Rico, E., Ramírez, A., Castro, E., *Projective Readings: Indexes and*  
 263 *Diagrams in Landscape Urbanism*, *Representing Landscapes: A Visual*

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Technological Approach in Contemporary Interior Design Process

- 264 Collection of Landscape Architectural Drawings, Amoroso, N., ed,  
265 Taylor and Francis, pp. 22-34, 2012
- 266 [8] Dobson, T. and Dobson, S. C., *Tip of the Icon: Examining Socially*  
267 *Symbolic Indexical Signage*, *Dialectic*, 1(1), pp. 61-90, 2016.
- 268 [9] Gavrilidisa, A. A., Ciocăneaa, C. M., Nițaa, M., R., Onosea, D. A., and  
269 Năstasea, I. I., *Urban Landscape Quality Index – planning tool for*  
270 *evaluating urban landscapes and improving the quality of life*, *Procedia*  
271 *Environmental Sciences*, (32), pp. 155-167, 2016.
- 272 [10] Reffat, R., *The Realm of IT in Architectural Education: A Partnership*  
273 *Approach*, *Design Studio Pedagogy: Horizons for the Future*, Salama, A.  
274 M. and Wilkinson, N., eds, The Urban International Press, pp. 313-324,  
275 2007
- 276 [11] Smith, C. D., *Inside-Out: Speculating on the Interior*, *IDEA journal*, (5),  
277 pp. 93-102, 2004.

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