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Predictive Perspective for Assessing Visual Perception of Existing Libraries Architectural Forms by Generative Redesign

Hossam El-Din Sabry Hegazy1, Mohamed Al-Sayed Al-Ebrashy2

1 Architecture Department, Faculty of Fine Arts, Minya University, Egypt

2 Architecture Department, Faculty of Engineering, Zagazig University, Zagazig 44519, Egypt

Abstract:

The preferences of both architects and users over time, and on occasion, major upkeep and repairs are required. There is no assurance that a building's original compositions will always be appreciated, nor that it will preserve its excellent standing. Once a structure has been constructed, there is no assurance that it will continue to be in good standing once it has been completed. Despite this, a building's reputation can be maintained despite the state in which it is currently located. The building will undergo certain extensions as a direct result of the necessary alterations. It is occasionally necessary to alter the structure's present shape or composition—some extensions being done to create additional space. The professionals assigned a relative weight to the essential components of the visual perception appreciation process, those components underwent reprioritization after their ranks were determined, and the experiment on regeneration adhered to the priorities that the specialists had specified. By using delphi techniques, in which experts were asked to evaluate the quality of the regenerated design, it was possible to validate and narrow down the options for the numerous forms generated from data and reduce the number of alternatives.

Because of this, the options built by artificial intelligence software to regenerate the forms using the priorities from

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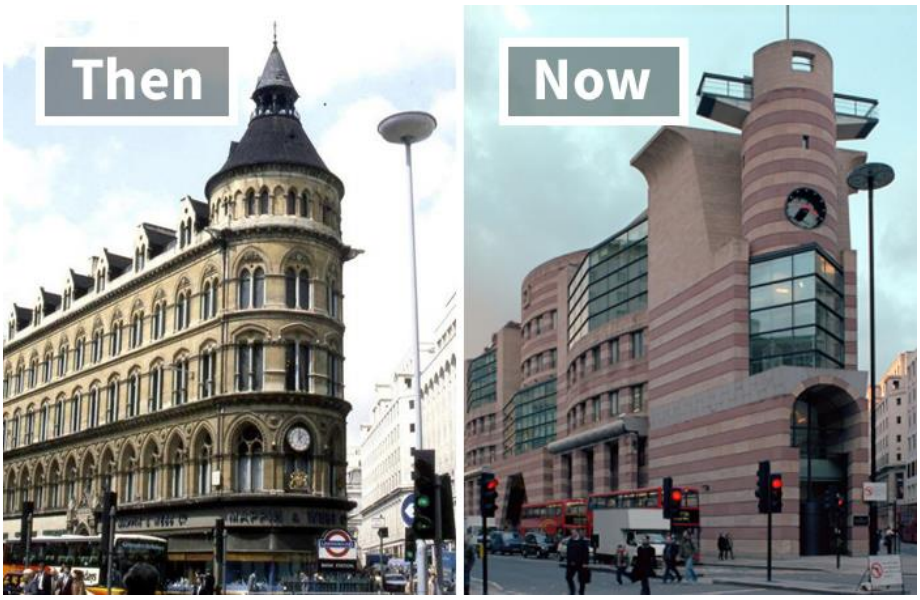
experts' evaluation, which highlighted the order of interventions.

Key Words:
Architectural forms, regenerative design, libraries form, perception, visual design, form validation.

Introduction

Numerous studies have cataloged the wide range of visual features that either convey the architect's aesthetic vision or affect the aesthetic sacrifices made in the project. Some redesigns make inappropriate alterations to older buildings that cause not only specialists to reject the design but also locals to move out of the area because they have lost the mental image of the building. In other cases, trials fail because the new design isn't good enough due to disrespect for the visual factors of good architectural design and this is the research problem, as concluded in previous research. Please see the figures from 1:8



Figures 1 and 2 show a building that had been unsuitably redesigned

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Figures 3 and 8 sets of buildings unsuitably redesigned concerning shape, colors and materials

One way to think of aesthetics as the art of beautiful thinking, another as the art of sensory cognition, and yet another as a lower theory of cognitive processing. As a result of the widespread documentation of the fact that all visual properties have the potential to be aesthetically experienced or to affect aesthetic visual preferences.

2. Architectural Visual preferences

the twenty-first century is concerned with bespoke architectural creations, which are primarily linked with individual design experts, rather than with mass-produced building types, as were their predecessors. This shift in emphasis can be attributed to the fact that the twenty-first century has seen a widespread increase in the number of people interested in documenting that all visual properties have the potential. As a result of this culture's preference for experimenting, which has led to a preponderance of form over content in architectural design, there have been many changes in how we view the beauty of buildings.

This has led to a predominance of form over substance in architectural design. The following is a list of the visual aspects that can be appreciated for their aesthetic value:

- Visual Complexity, Because of the size discrepancy between the building's numerous parts and its overall condition.
- Colour, It's established knowledge that colour is the fastest-recognized visual signal and has a major impact on people's taste judgements.
- Symmetry is typically preferred over asymmetry, even in complex abstract forms, because the human eye more easily recognizes it.
- Familiarity, Because of your consistent visits, you will develop a stronger attachment to the building and its architectural form.
- Knowledge and experience: The architect's aesthetic judgements may be influenced by their training and experience in design and construction.
- The shape describes the building's aesthetic, the arrangement of the building's architectural elements that give rise to its complex forms.
- Materials, The materials used in constructing a building or object give it a certain look and feel and hint at its age and style.
- Functional character is the interior's expected functional quality (depending on the category of the building or the building to be selected for the survey).

3. Research materials and methods

The chosen research methodology consists of preliminarily listing some outstanding criteria deducted from the previous study highlighted on international and national libraries cases of study to measure the quality of redesigning libraries' existing buildings; in addition, to perform regenerative design experiments to introduce proper architectural solutions for buildings redesigns applicated on one building, an action plan resulting from this research to applied in Egyptian libraries building tested on a case of study as a pilot experiment, and validated by specialists by an online questionnaire adopted to collect the required data of evaluating the quality of form regeneration based on using the prioritized factors which ranked by experts and named as responsible of the visual perception.

4. What is a regenerative design development

To ensure that all crucial design parts are subject to singular, irreversible variables, creating a geometric model capable of outlining a succession of shaping possibilities is necessary. The algorithm's capacity to independently govern each feature of the design while searching for optimal combinations for the repeated design possibilities relies on the uniqueness of each shape metric .

All values must be continuous since the algorithm should optimize the settings based on anticipated future results based on the past patterns of the current structure.

The search algorithm in a generative design technique needs to be able to read all performance measures for the hypothetical design system as a numerical code, which can be limiting .

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Since the architect's intended performance parameters for the algorithm are the visual perception factors, it is crucial that all outcomes of the design solutions can be reliably estimated and analyzed using these factors.

Once a generative model is complete, an algorithmic investigation can be carried out to develop high-performing designs. Optimization techniques often involve searching for the ideal settings for the input values of a requirement to maximize the value of one or more preferred outputs.

Regenerative design typically starts with a collection of foundational designs that are selected randomly or in some proportion. Either random parameter swapping (called "cross-breeding") between two successful designs yields a third (or "generation") that outperforms its predecessors, or direct optimization of design performances based on the previous generation's results yields "generations" that outperform their predecessors (elitism).

The basic input values of each new design can be subtly altered through a mutation process before being introduced to the population. This process is continued for an extended period, up to the maximum number of generations or until no further performance improvements can be achieved .

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5. Using Generative Design in existing buildings enhancements

The broad strokes of the regeneration plan are sketched out, with the comprehensive restoration of the structure as its bedrock. All the requirements for integrating the building with nature, especially those about the need to apply sustainability, have been met because the removal of certain components and the installation of others ones resulted in the new form of the existing building. The requirement to use sustainable practices is to credit for this. Improvements in comfort and efficiency in using nonrenewable energy sources and scarce materials are the results of a recent renovation that was carried out whether or not the building was created sustainably in mind: precipitation collection, improved natural light and air exposure, and other advantages .

Instead of calling for a change in approach, regenerative design and development focus on adopting a different frame of mind.

To put focus on this regenerative worldview, the company Regenesis has developed a regenerative methodology that provides a collection of guiding ideas and concepts. The three stages of implementing this technique are finding the right link to the environment, planning for harmony and co-evolution, and finally, putting it together. By highlighting the relevance of having a sense of community and belonging through an appreciation of location, harmonious design is offered, and co-evolution ensures the continuing integration of human and natural systems in a mutually beneficial way.

6. Cases of study analysis based on the visual factors

Eight international library buildings were chosen in addition to eight Egyptian public libraries highlighting the visual factors analyzed by the authors under the criteria of being a standalone building with clear masses composition to give relative weights after reviewing the understanding of those factors in relation to architectural forms, the given weight done by delphi technique as detailed after the cases analysis.

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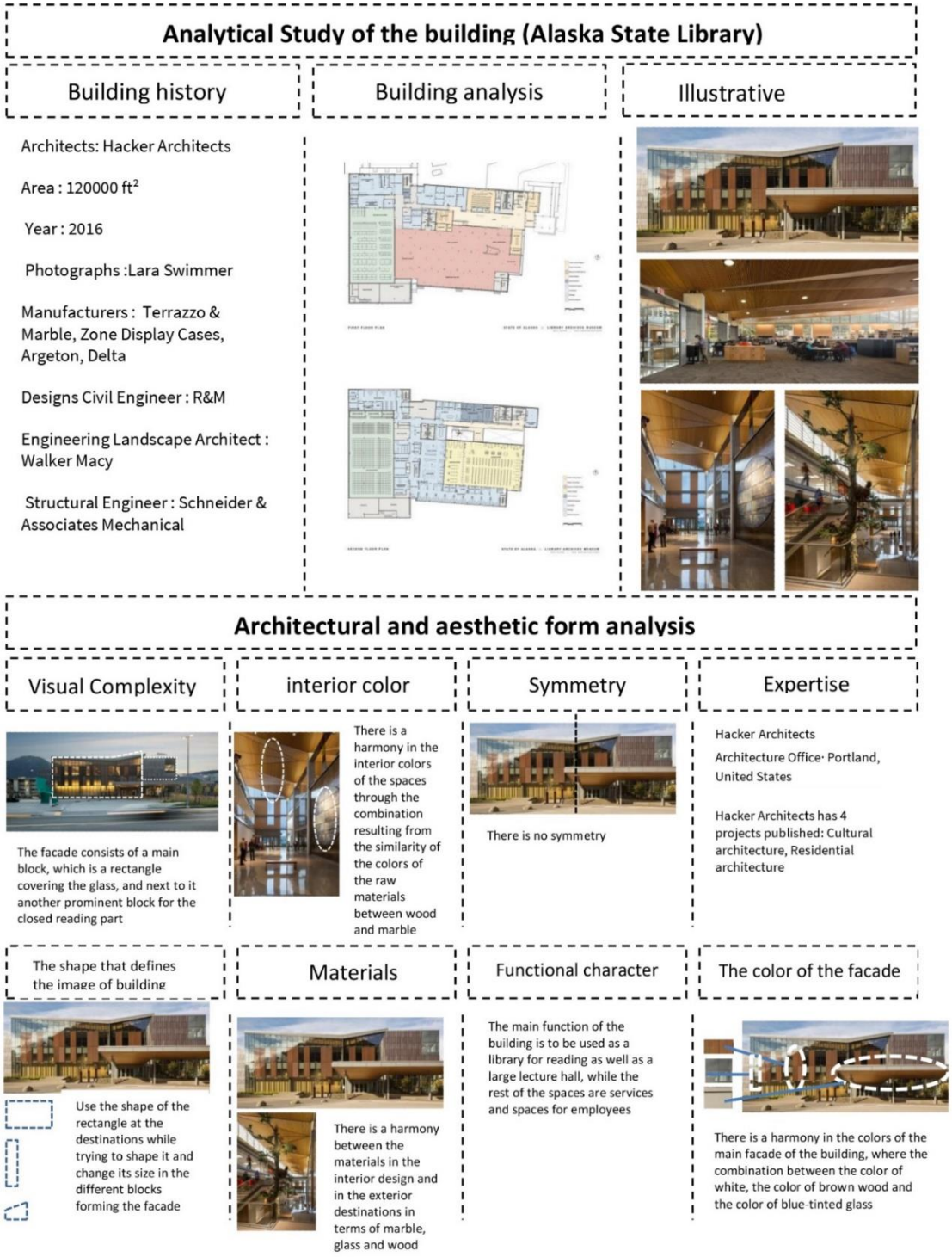

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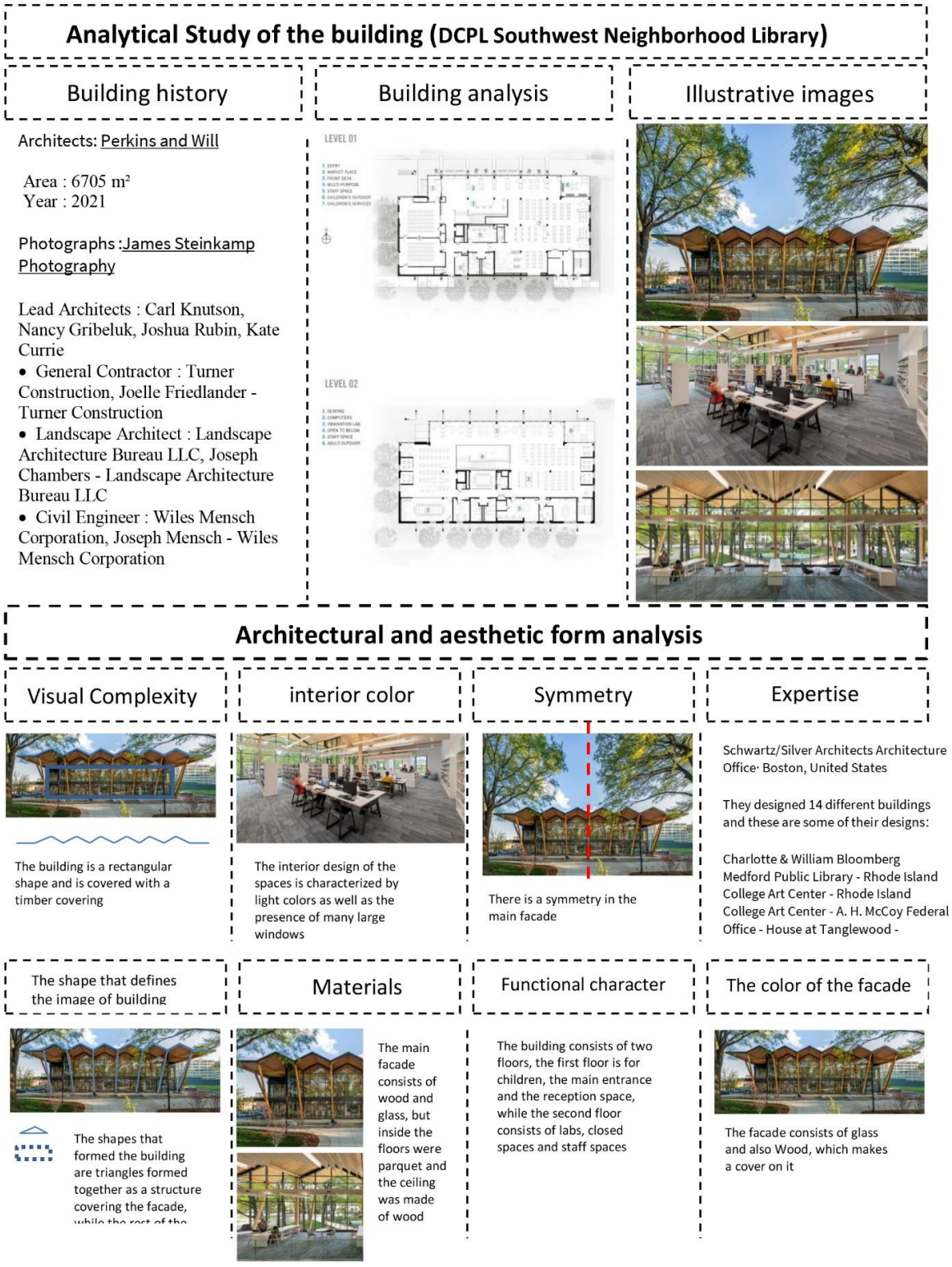

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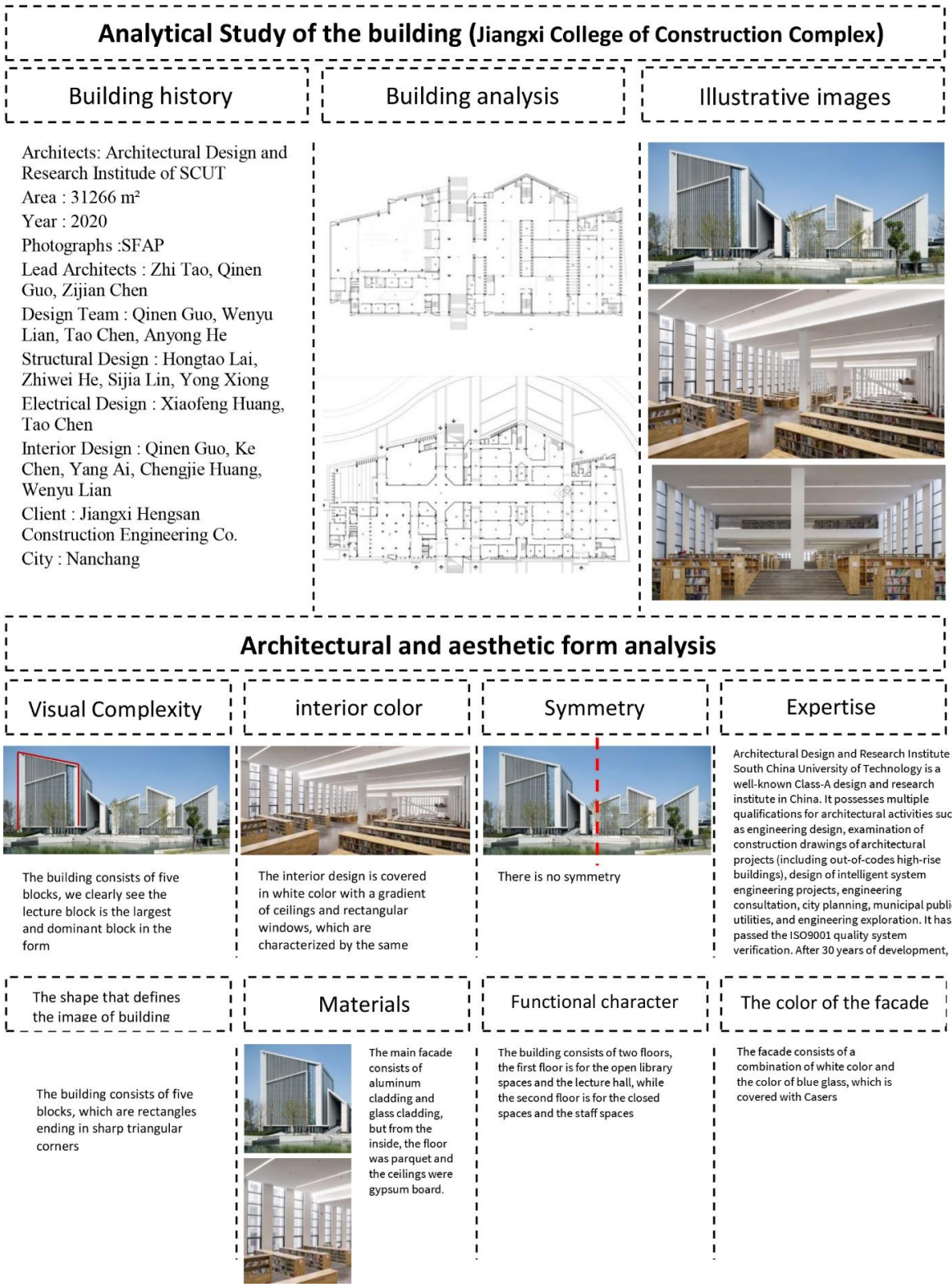

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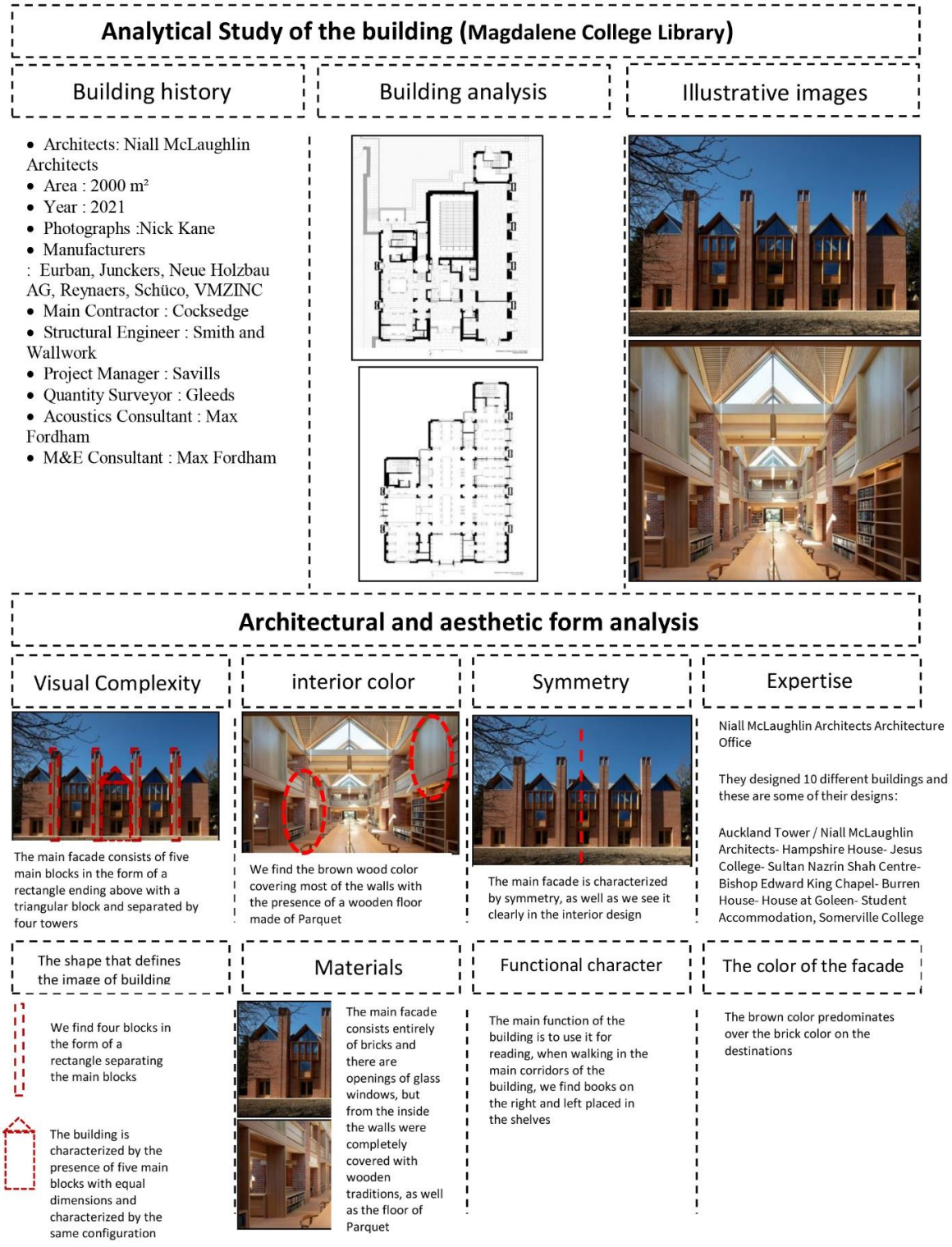

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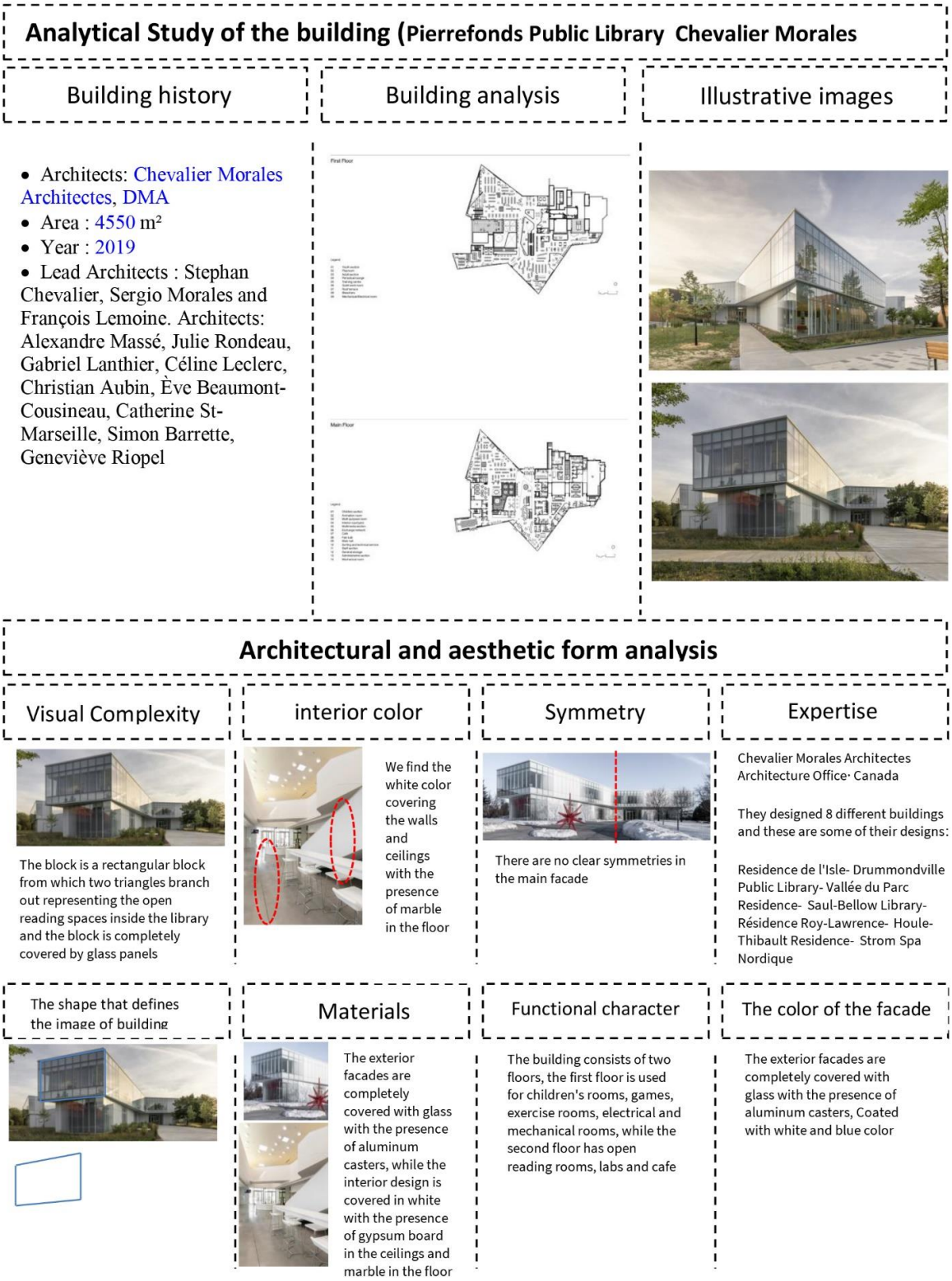

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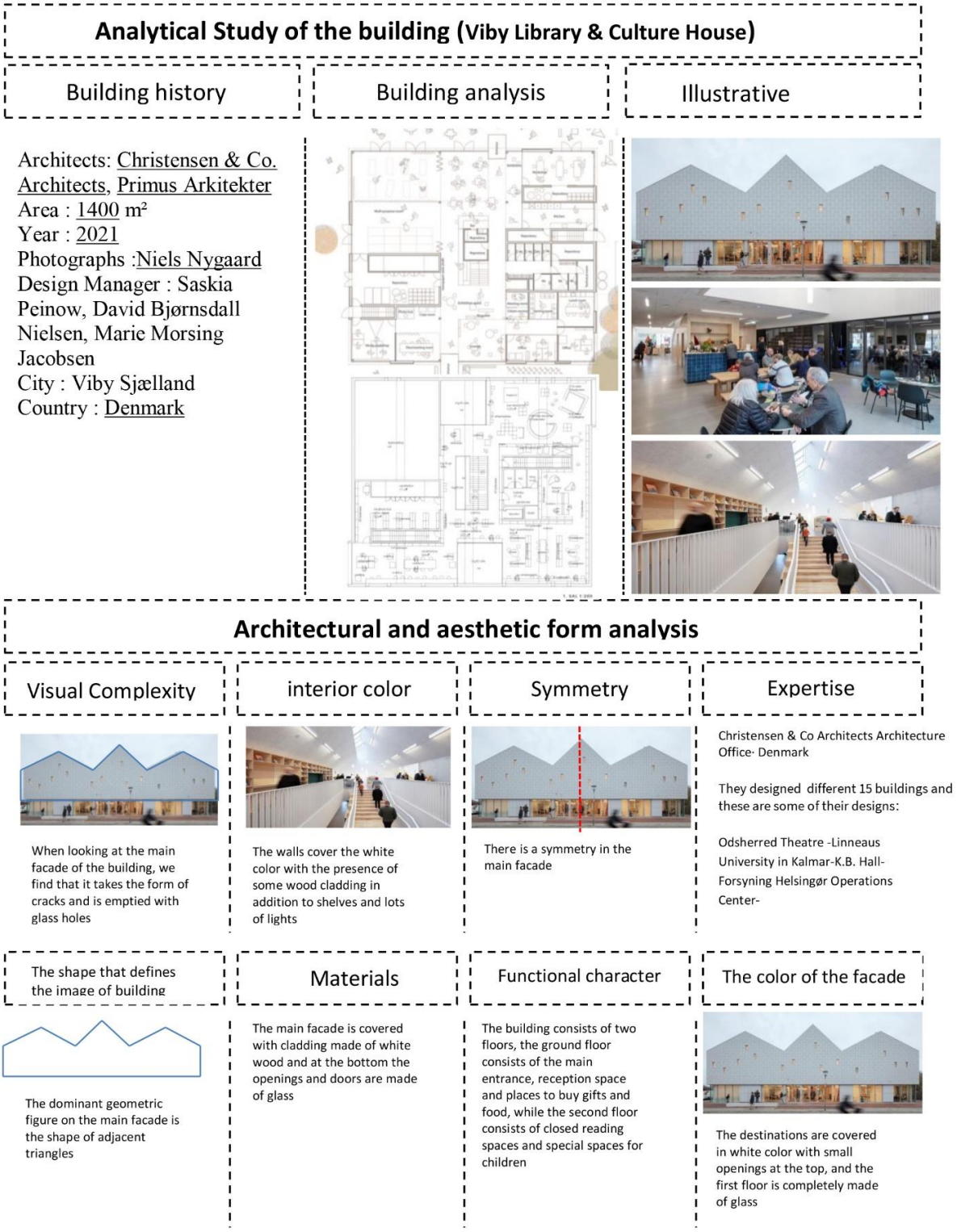

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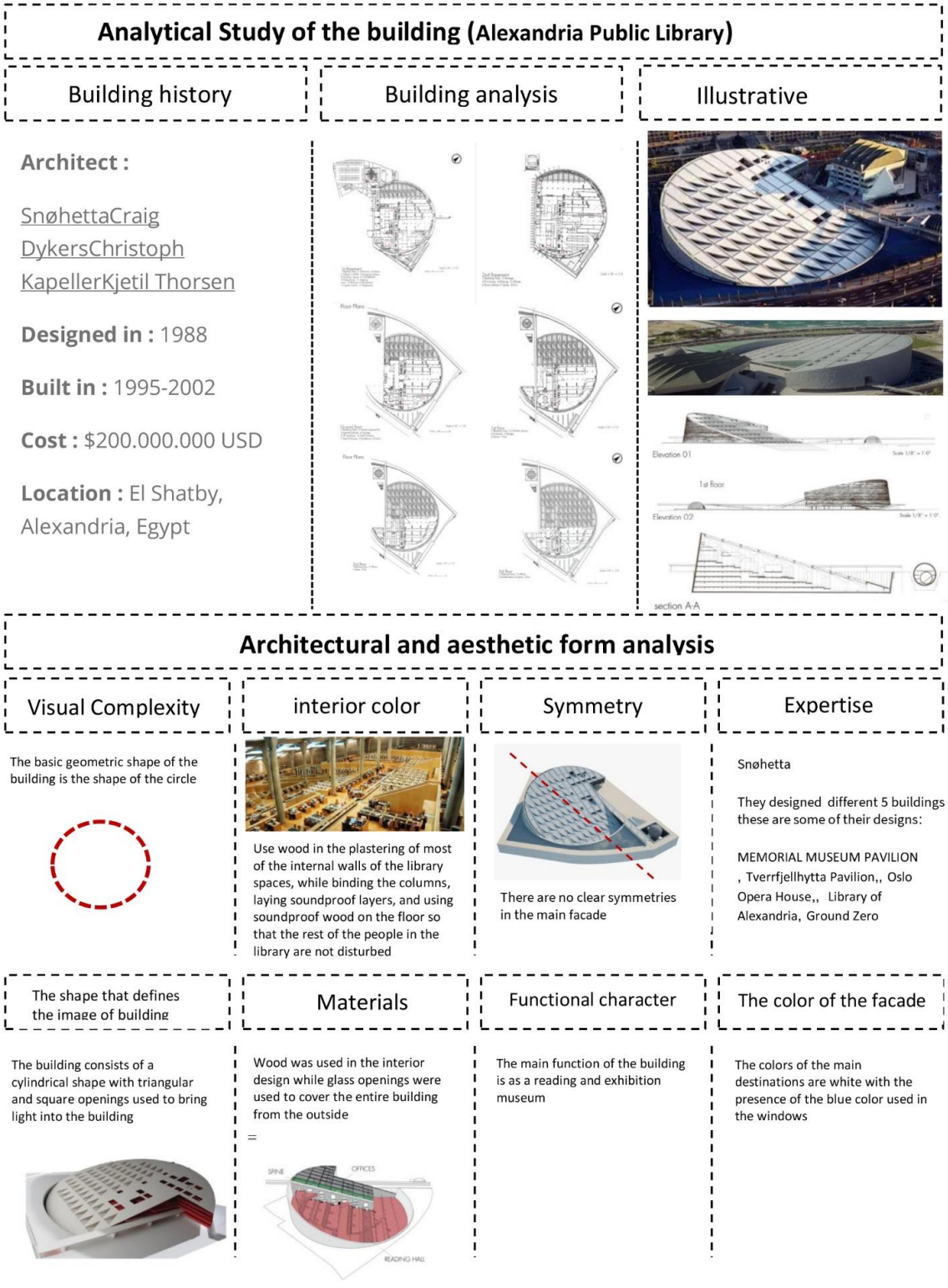

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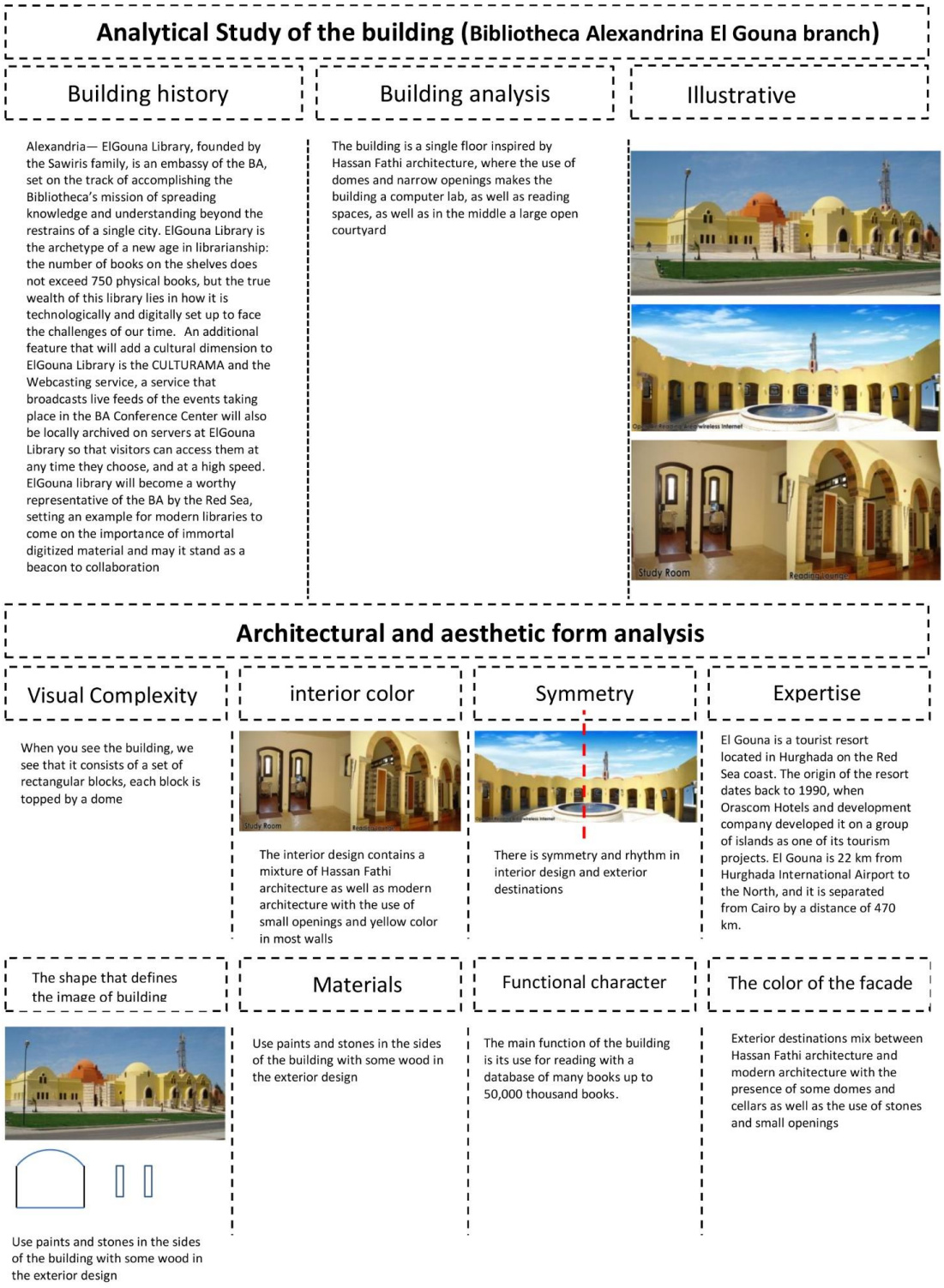

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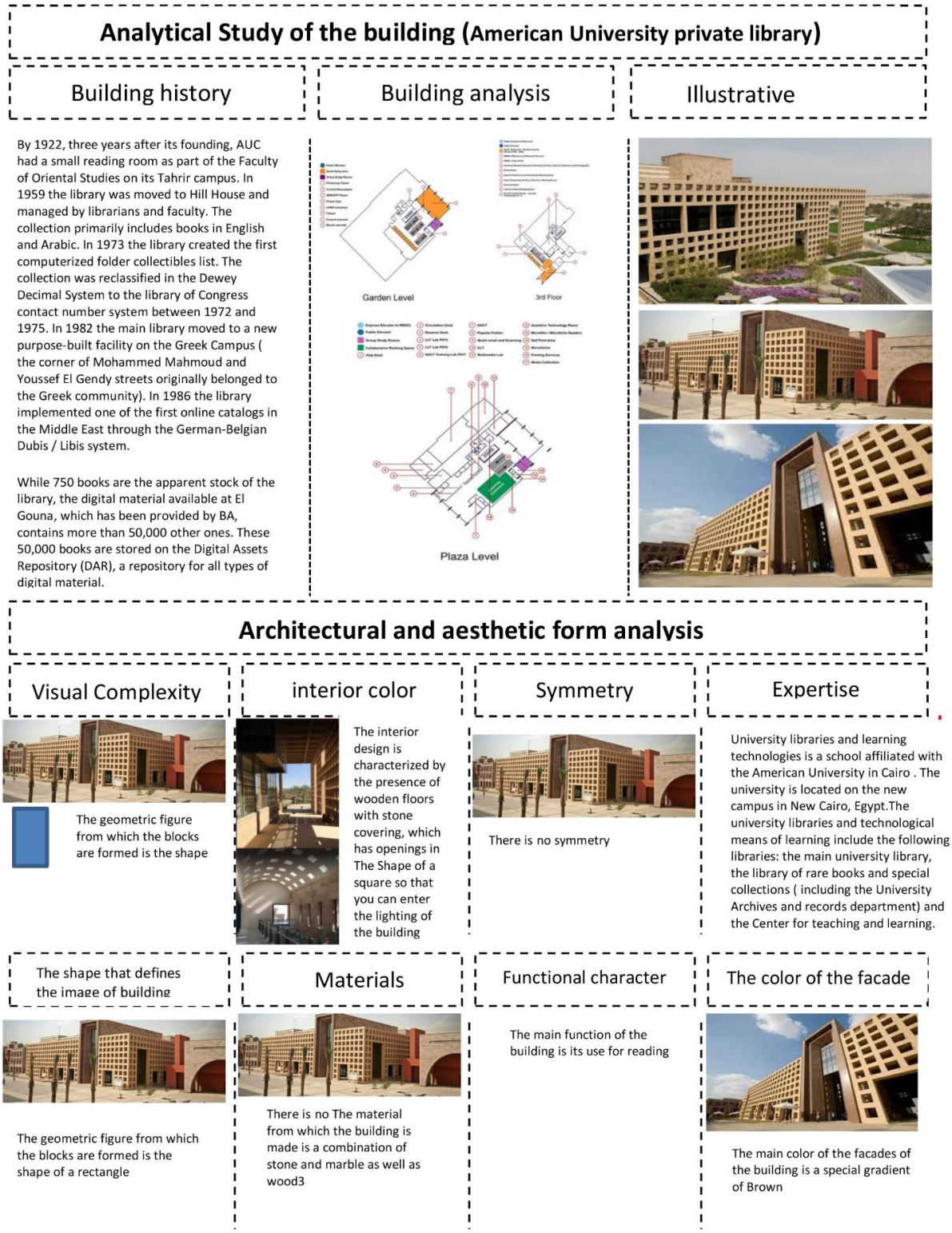

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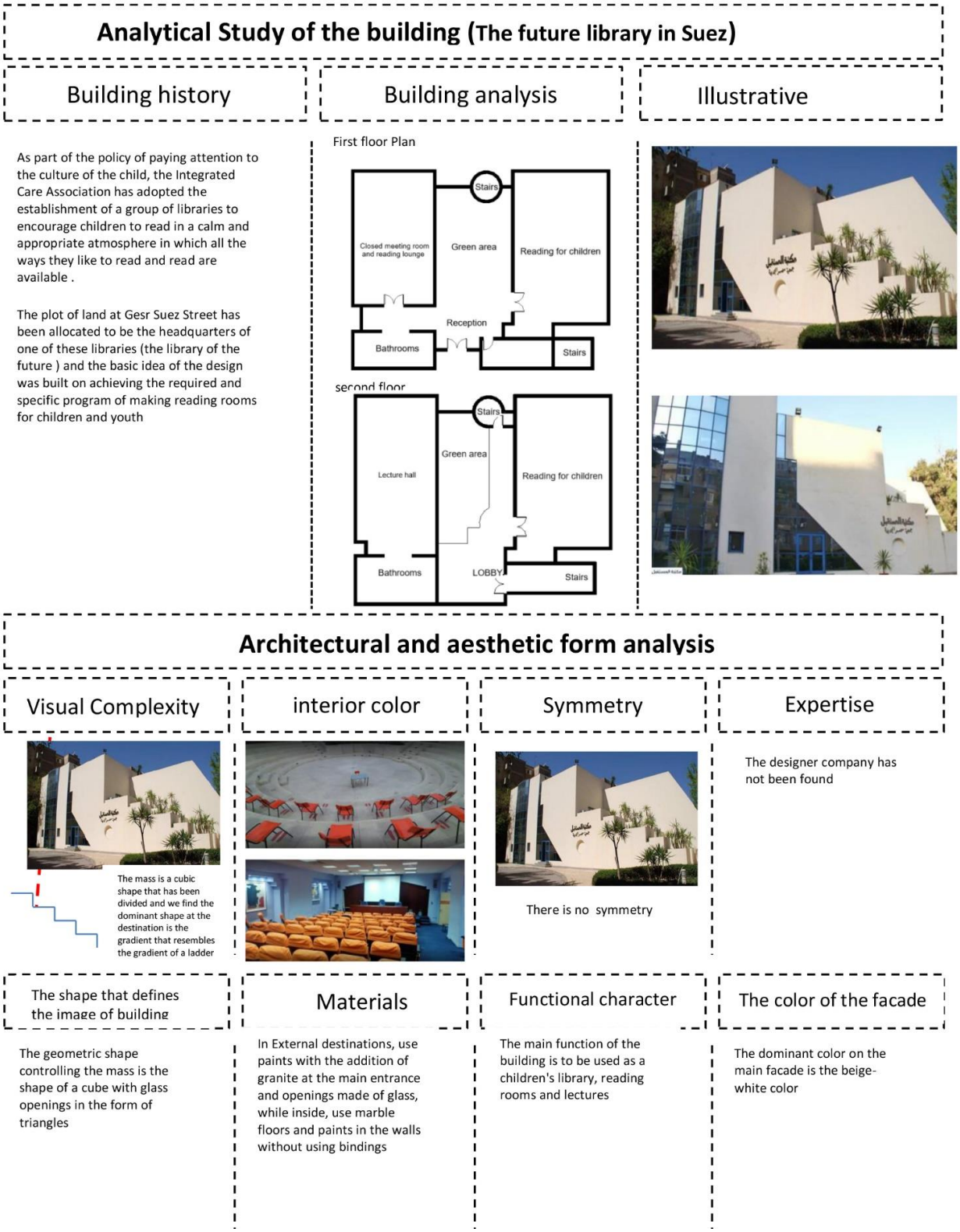

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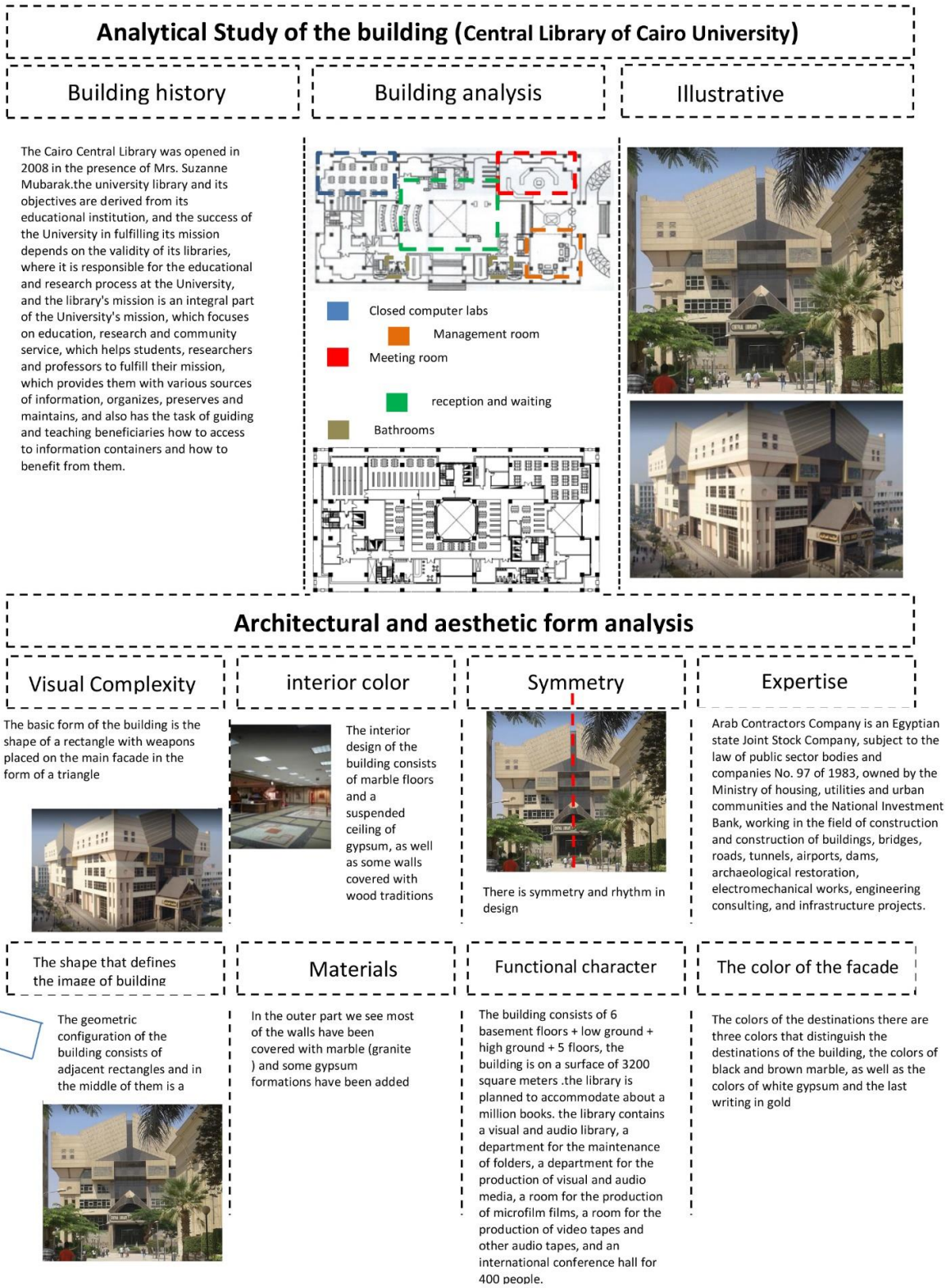

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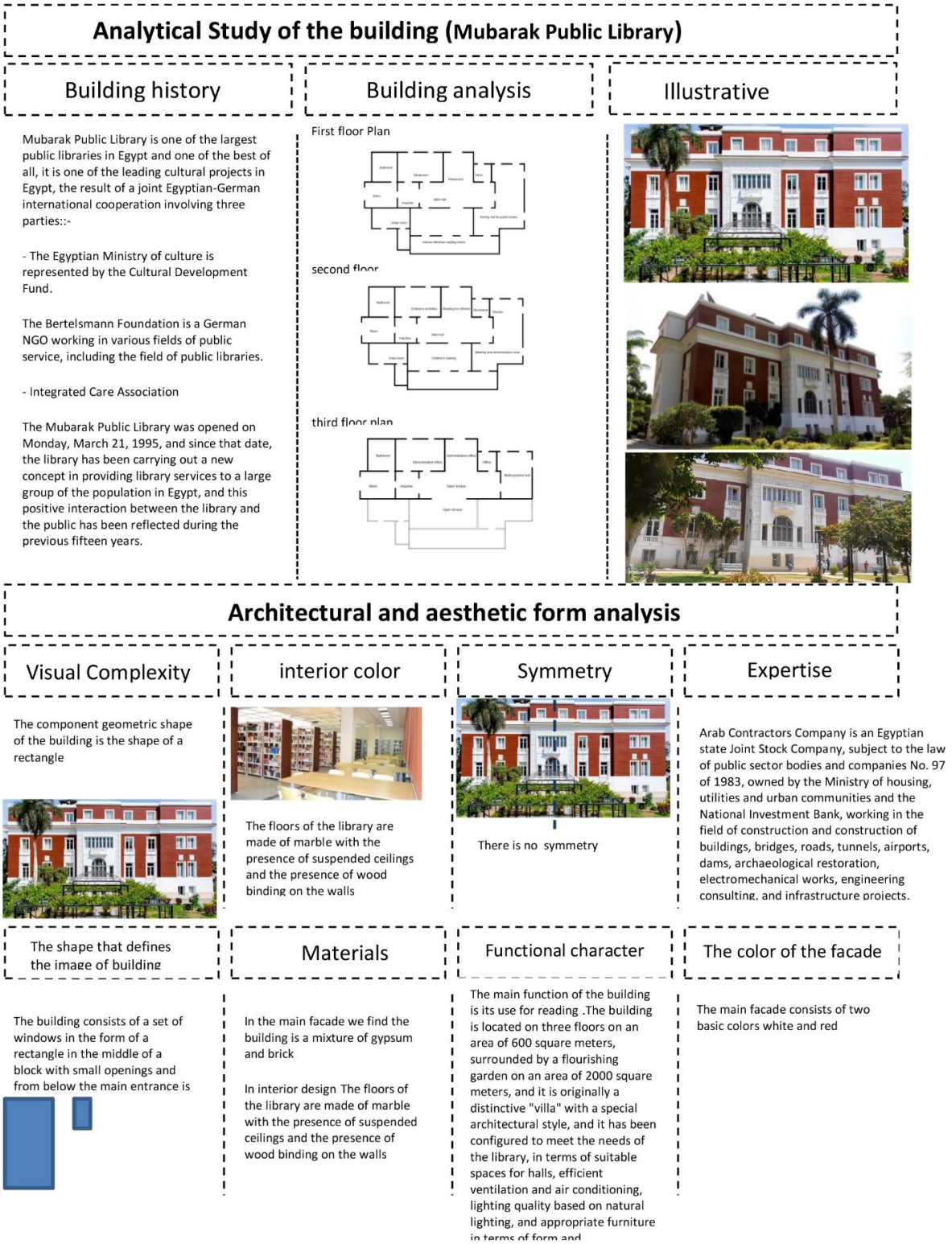

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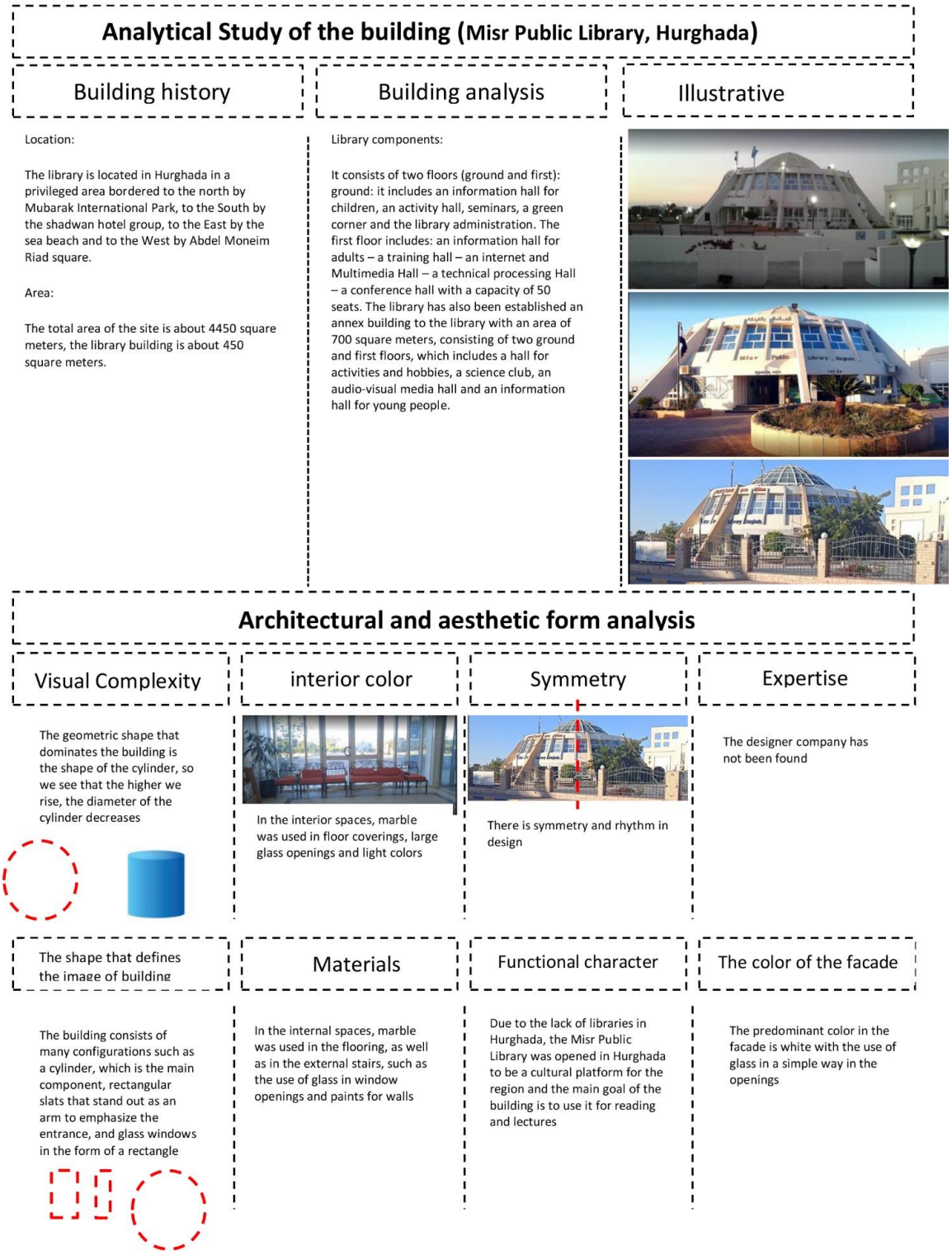

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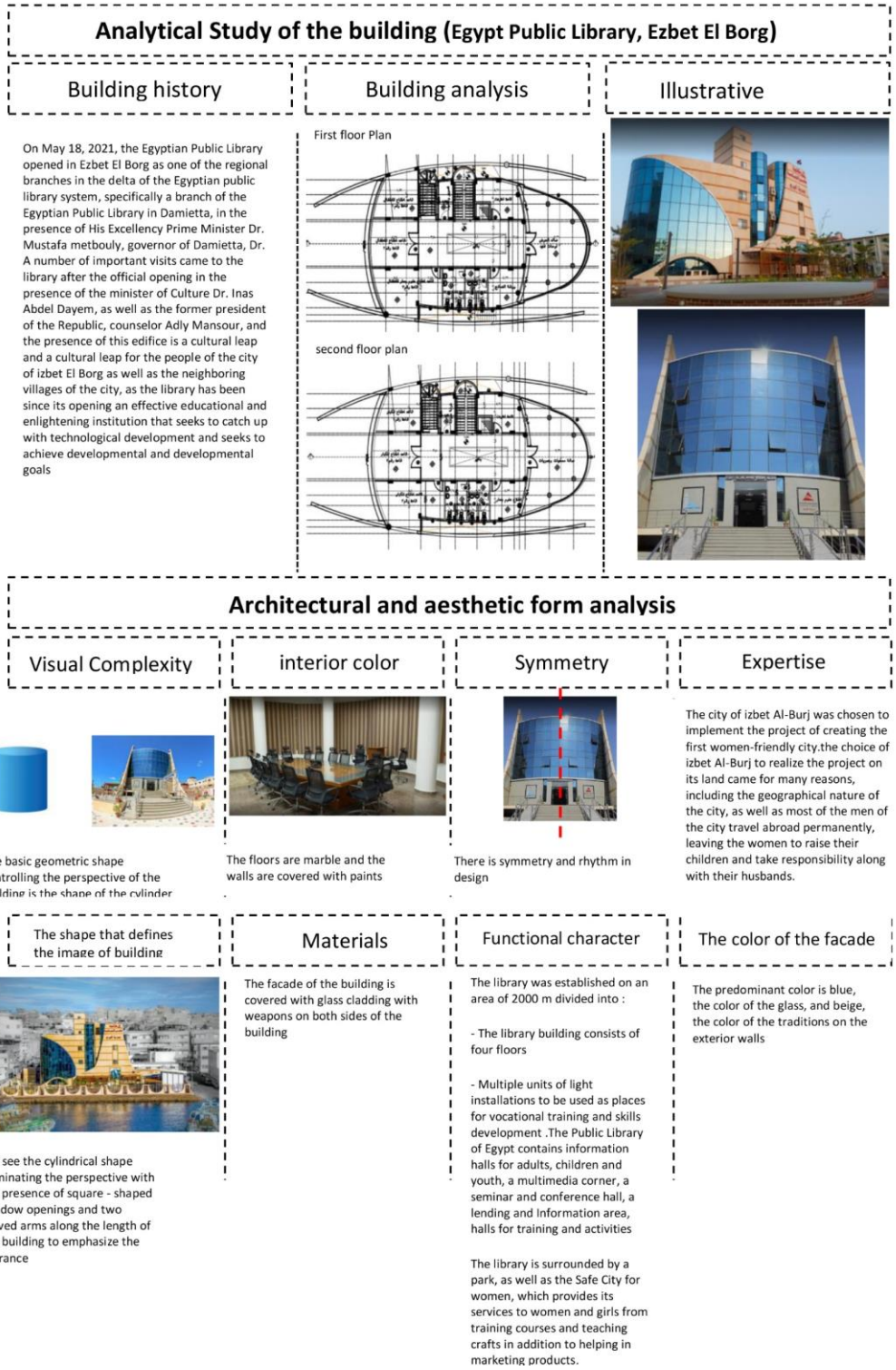

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Experts results of Delphi technique

In the Delphi technique, a group of knowledgeable individuals are polled using a set of questions, and then they are given the opportunity to comment further on their responses. When new information is evaluated by the panel, the experts' opinions are subject to change with each new round of analysis.

Ten experts reviewed the performed analysis of the visual perception factors of architectural forms to give relative weights to those factors which are Visual Complexity, Colour, Symmetry, Familiarity, Knowledge and experience, shape, Materials in addition to Functional character, and the cases which can assess their ability to give weights clearly on presented analysis, the cases chosen under criteria of the top buildings on the architectural website of Archdaily , while the Egyptian cases chosen from the governmental official website which highlight the main educational facilities in Egypt, the result from the performed four rounds summarized at tables no. 1, 2 and 3, as follows;

Table 1. Given weights per each expert to each criterion of visual factors.

Weightage	Given weights per each expert to each criterion								Sum per expert
100% total	Visual Complexity	Colour	Symmetry	Familiarity	Knowledge and experience	shape	Materials	Functional character	
Expert 1	20	10	5	10	15	15	5	20	100%
Expert 2	20	15	10	5	10	15	15	10	100%
Expert 3	10	5	10	15	15	15	10	20	100%
Expert 4	15	10	10	10	20	10	10	15	100%
Expert 5	20	5	15	5	20	5	10	20	100%
Expert 6	20	10	10	20	10	5	10	15	100%
Expert 7	15	15	15	15	10	10	10	10	100%

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Expert 8	15	10	10	20	15	15	5	10	100%
Expert 9	25	15	5	10	10	10	10	15	100%
Expert 10	25	5	10	5	20	10	15	10	100%
Mean of weights	20%	10%	10%	10%	15%	10%	10%	15%	100%
	0.2	0.1	0.1	0.1	0.15	0.1	0.1	0.15	1

Table 2. Given rank per each expert to each international library building according to the previously assigned relative weights from 1:5, where 5 is the maximum level of expressing the factor and 1 is the lowest level.

Weightage 100% total	Given weights per each expert to each criterion								
	20%	10%	10%	10%	15%	10%	10%	15%	Total Score
	Visual Complexity	Colour	Symmetry	Familiarity	Knowledge and experience	shape	Materials	Functional character	
Alaska state library	3	5	3	4	4	5	5	5	4
Chulalongkorn library	1	2	5	4	3	3	2	4	3
DCPL library	4	4	4	3	3	5	4	5	4
Jiangxi library	5	5	1	2	2	5	5	3	4
Magdalene Library	4	2	4	3	3	3	3	3	3
Pieerefonds library	3	4	3	4	4	4	3	3	4
River center library	4	4	4	3	3	4	3	4	4
Viby library	4	3	4	2	2	2	3	3	3
	4	4	4	3	3	4	4	4	

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Table 3. Given rank per each expert to each national library building according to the previously assigned relative weights from 1:5, where 5 is the maximum level of expressing the factor and 1 is the lowest level.

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20%	10%	10%	10%	15%	10%	10%	15%	
	Visual Complexity	Colour	Symmetry	Familiarity	Knowledge and experience	shape	Materials	Functional character	
Bibliotheca Alexandrina - Alex	5	4	4	3	4	5	4	5	4
Bibliotheca Alexandrina - Gouna	4	3	4	2	2	2	2	2	3
AUC library	5	5	5	5	5	4	4	4	5
Future library	3	3	3	2	2	2	3	2	3
Central library	4	4	4	2	2	3	2	3	3
Misr- Giza	3	1	4	2	2	3	3	4	3
Misr- Hurgada	2	3	4	1	1	1	2	2	2
Misr- Ezbet El-Burg	2	1	3	1	1	1	1	1	1
	4	3	4	2	2	3	3	3	

After a group of experts has been polled with a series of questions, their aggregated and anonymous responses are discussed. A "collective reaction" from the experts will allow them to tailor their reactions to the extent to which they understand the information at hand by being applied on the chosen 16 buildings. After several rounds of questioning, the group's collective opinion is relayed to the panel. Reaching a consensus which is crucial to the Delphi method.

The high ranked libraries buildings from the Egyptian cases of study, get chosen for the second stage of the experiment by regenerating their form according to the priorities of visual factor means assigned by experts and defined as high impact on visual perception in the analysis, so every building from the chosen four entered to the regenerative Rhino which inscribed the plugin of Grasshopper software of in order of the arrangement of the seven elements which is different between every building and the other.

Artificial intelligence form-generation software is used as the backbone upon which a wide variety of add-ons, from environmental analysis to robotic control, are built. It's the same a lot of new features were added in for prior the missing elements which received a low rank.

Primarily, the software is utilized in the development of generative algorithms, such as those utilized in the creation of generative art. As it has many parts that can be used to generate 3D shapes. Aside from logical algorithms, programs can also include a variety of additional algorithms, such as arithmetic, textual, audiovisual, and tactile ones, Supporting the decision-making process in the early stages of design, those kinds of software offers a wide range of 2D and 3D interactive graphics that are accessible to designers. It streamlines analysis, automates and speeds up calculations, and gives clear graphical representations in the software 3D modeling interface .

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7. Results and Discussion

After modelling the chosen libraries buildings in Egypt by Autodesk Revit, the images of the every building model were extracted, one image that is integrated and another image without openings and shaping to show the stages of building formation. Then a step of an attempt done to develop the building from the analysis elements (Familiarity-shape-Functional character) and a set of alternatives for each of the three elements regenerated through the artificial intelligence program (Ai-midjourney) where the input models entered and prompt script feed the software to regenerate, this helped in developing the cases so that the simulation process take place.

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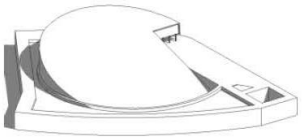
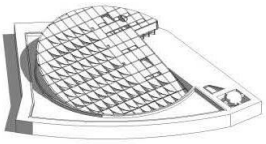
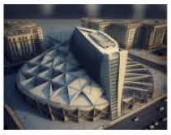
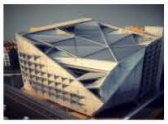
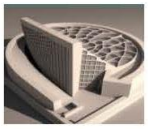
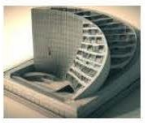
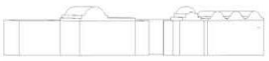
3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
Bibliotheca Alexandrina - Alex	5	4	4	3	4	5	4	5	4

We introduced modeling to the midjourney program and these results were extracted

alex familiarity	alex shape	Functional character
   	   	   

3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
Bibliotheca Alexandrina - Gouna	4	3	4	2	2	2	2	2	3

Gouna familiarity	Gouna shape	Gouna character
   	   	   

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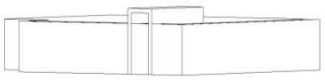
3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
AUC library	5	5	5	5	5	4	4	4	5

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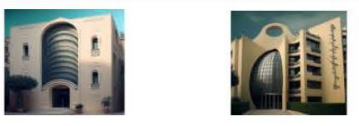
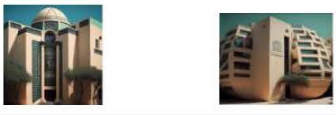
alex familiarity	alex shape	Functional character
		
		

3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
Future library	3	3	3	2	2	2	3	2	3

Gouna familiarity	Gouna shape	Gouna character
		
		

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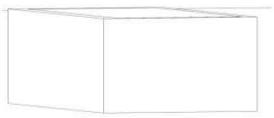
3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
Central library	4	4	4	2	2	3	2	3	3

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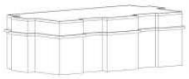
alex familiarity		alex shape		Functional character	
					
					

3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
Misr- Giza	3	1	4	2	2	3	3	4	3

Gouna familiarity		Gouna shape		Gouna character	
					
					

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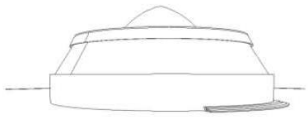
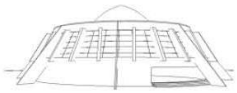
3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
Misr-Hurgada	2	3	4	1	1	1	2	2	2

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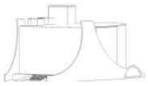
alex familiarity	alex shape	Functional character
 	 	 
		

3d without shaping(by revit)	3d shaping and openings(by Revit)	The current form of the building
		

Weightage 100% total	Given weights per each expert to each criterion								Total Score
	20% Visual Complexity	10% Colour	10% Symmetry	10% Familiarity	15% Knowledge and experience	10% shape	10% Materials	15% Functional character	
Misr- Ezbet El-Burg	2	1	3	1	1	1	1	1	1

Gouna familiarity	Gouna shape	Gouna character
 	 	 
 	 	 

8. Conclusion

As a result of the offered strategy to develop design alternatives utilising artificial intelligence and form creation software, a wide variety of designs may be evaluated while modifications are being made to existing buildings. This enables a greater number of options to be considered. The fact that the methodology was devised in the first place makes this at least theoretically viable. The Delphi approach, which was implemented in this research's form generation experiment, serves as the foundation for the methodology that is being proposed here. In light of the fact that library buildings are considered to be public structures, the purpose of this methodology is to conduct an investigation into the aspects of each building that call for an enhancement to the visual appearance of the structures.

References

1. Kopatich, Ryan & Steciuch, Christian & Feller, Daniel & Millis, Keith & Siegesmund, Richard. (2021). Development and validation of the Aesthetic Processing Preference Scale (APPS). Psychology of Aesthetics, Creativity, and the Arts. 10.1037/aca0000449.
2. K. Aysha Jennath, P.J. Nidhish, Aesthetic Judgement and Visual Impact of Architectural Forms: A Study of Library Buildings, Procedia Technology, Volume 24, 2016, Pages 1808-1818, ISSN 2212-0173, https://doi.org/10.1016/j.protcy.2016.05.226.

3. Demarco, F., Bertacchini, F., Scuro, C. et al. The development and application of an optimization tool in industrial design. Int J Interact Des Manuf 14, 955–970 (2020). https://doi.org/10.1007/s12008-020-00679-4
4. Banihashemi, Saeed & Tabadkani, Amir & Hosseini, M. Reza. (2017). Modular Coordination-based Generative Algorithm to Optimize Construction Waste. Procedia Engineering. 180. 10.1016/j.proeng.2017.04.222.
5. Ayeni, Dorcas & Omeiza, Victory. (2021). Investigating Design Strategies for Regenerative Development. 10.24018/ejers.2021.6.1.1987.
6. Stamenković, Marija & Stojčić, Lj & Glišović, S. (2018). Regenerative design as an approach for building practice improvement.
7. D. Hes, C. du Plessis, Designing for hope: pathways to regenerative sustainability, Routledge, New York, 2015.
8. https://www.archdaily.com/956171/alaska-state-library-archives-museum-hacker-architects
9. https://www.archdaily.com/930888/architecture-library-chulalongkorn-university-department-of-architecture
10. https://www.archdaily.com/975792/dcpl-southwest-neighborhood-library-perkins-and-will

11. https://www.archdaily.com/985513/jiangxi-college-of-construction-complex-architectural-design-and-research-institude-of-scut
12. https://www.magd.cam.ac.uk/college-life/library
13. https://www.archdaily.com/977609/pierrefonds-public-library-chevalier-morales-architectes-plus-dma
14. https://www.archdaily.com/987380/river-center-branch-library-schwartz-silver-architects-plus-whlc-architecture
15. https://www.archdaily.com/976626/viby-library-and-culture-house-christensen-and-co-architects-plus-primus-arkitekter
16. https://snohetta.com/project/5-bibliotheca-alexandrina
17. https://www.elgouna.com/education/
18. https://pfeifferpartners.com/projects/american-university-in-cairo-library/
19. https://misrelgededa.org/future library
20. https://www.frup.info/library/central-library-of-cu/
21. https://www.sis.gov.eg/section/574/2399?lang=ar
22. http://mpl.org.eg/ar/pages/regional.html
23. http://www.mpl.org.eg/helloinboorg/
24. Crawford, Megan & Wright, George. (2016). Delphi Method. 10.1002/9781118445112.stat07879.

25. https://www.archdaily.com/search/projects/categories/library
26. Barrett D, Heale R, What are Delphi studies?, Evidence-Based Nursing 2020;23:68-69.
27. https://www.rhino3d.com/6/new/grasshopper/
28. Sadeghipour Roudsari, Mostapha & Pak, M.. (2013). Ladybug: A parametric environmental plugin for grasshopper to help designers create an environmentally-conscious design. Proceedings of BS 2013: 13th Conference of the International Building Performance Simulation Association. 3128-3135.