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The Evolution of the Architectural Façade since 1950: A Contemporary Categorization

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Abstract: The architectural façade has been a site of intensive experimentation and innovation throughout the 20th century, something that continues to this day, resulting in a vast range of architectural imagery, often incohesive in the post-modern reality. This research explores contemporary façade types and classifies the character of exterior building surfaces. In this paper, we aim to explore how the façade has been designed and has affected its surroundings. How and why has the façade evolved in the ways that it has? Is it the material innovation, structural novelty, the new design techniques or new aesthetics? We adopt a method of analytical induction to extract the most prevalent façade themes from relevant contemporary literature, characterize their meanings and categorize them in order to better explain the many sides of the façade. We set out to define the principles of façade design to then develop a general categorization, which can be applied to most building façades in recent history.

Keywords: façade design; contemporary buildings; iconic Canadian buildings; façade design evolution

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1. Introduction

> "As architecture rethinks the distinctions between structure and ornament, function and décor, form and façade, the surface no longer has the status of decorative element but becomes an entity in itself". [1]

The architectural façade has been a site of intensive experimentation and innovation throughout the 20th century, a phenomenon that still continues to this day; this has resulted in a vast range of architectural imagery, often incohesive in the post-modern reality. This research explores contemporary façade types and classifies the character of exterior building surfaces. The goal is neither to collect design examples nor to compile regulation-conforming typologies but rather to develop an improved understanding of façades and to categorize them across various building types.

A façade is often a visual expression of a building's design concept, use, program, structure, services or construction process [2]. A building's face can demonstrate its quality of design and possibly its overall structure [3]. Equally, the façade can impact the design or experience of the interior [4]. Furthermore, the setting and the overall architectural concept can also play a key role in demonstrating the design quality [4].

With all of these potential effects, it follows that façades are crucial to establishing a building's identity [5]. They serve as a connection between the inner and outer spaces [6] and can potentially reveal the utility of the interior to passersby. Moreover, they are not limited to the actual space they occupy as part of a given structure; they can also influence the area in and around the building [4]. A building's façade configuration may also play a role in creating a relationship with the urban environment, and it can often be a factor in determining peoples' sense of scale of the space surrounding a building [7]. Broadly speaking, urban space is characterized by building façades, streetscapes and open public areas, which underlines the importance façades possess vis à vis the urban experience [3].

Thus, building façades, through their visual elements, enable various experiences for viewers [8], providing them with visual ideas of the city [5] and allowing them to surmise a building's purpose through its external appearance [9]. Building façades, with their architectural and cultural identities, can even arouse emotional reactions among people [10]. In fact, the ideas people have about buildings stem from how they perceive façades [11]. Kevin Lynch, in his seminal book, *The Image of the City*, observes that given the numerous functions of façades, it is no surprise that most civic experiences are mediated through them [12]. These mediations, he maintains, constitute a larger part of memorable urban experiences. Therefore, by impressing an indelible image of buildings upon people's minds, façades have a considerable impact on a city's perceived image [7].

In addition, façades can present symbolic elements derived from culture, history, etc. Symbolism is often presented in façade design through the use of metaphoric, referential or analogical devices [13]. In many respects, the built environment within a given society reflects the culture and identity of that society, and the building façade is the most telling aspect of this reflection. People need to inhabit a meaningful built environment, and this necessity can be expressed through symbols—elements that, in the words of Geertz (1973), represent something other than what they appear to be. The result is that much of the world's architecture carries a symbolic weight. Cultural and societal identities are often reflected in the built environment within a society, independent of the architect's original intentions [14].

Façades may also have practical purposes. For instance, exterior walls provide a safe interior environment based on the needs of the building's users. Architectural design involves not only the concept and composition of space, but it also requires structural realization [4]. The façade provides physical protection to those who frequent or inhabit a building [15], fulfilling a basic human need for shelter from adverse weather and general violations of privacy and property. A façade, therefore, should adequately protect both the inhabitants and the internal structure against environmental and climatic effects, including rain, snow, wind, heat, cold, moisture, noise [15] and artificially induced damages.

With all these functions, it is no wonder that façades are a rich and significant field of study, both from a historical and a contemporary perspective. Consequently, designers are increasingly asked to pay more attention to their design and character [16]. Developing a building façade is a process of communication and decision making, which focuses on how the building will be shaped and seen [4]. With this in mind, this paper contributes to the characterization of façades, shedding light on the potential for improving the relationship between buildings and the human experience in the process. This work also aims to provide a theoretical description of the façade and its ever-evolving design.

We set out to define the principles of façade design to then develop a general categorization, which can be applied to most building façades. Most importantly, we will attempt to determine how we can categorize the role of the façade in recent history and examine whether its iconicity still has currency in today's architecture of computerized design, materials and building technologies.

This work is separated into four sections. First, we elaborate on the methodological process. Second, we lay out the various definitions of the façade, as well as its different denominations. In the third section, we summarize the evolution of façade design since 1950, and we develop a preliminary categorization for them. In the fourth section, we present a summary table with examples of specific contemporary architectural trends and their corresponding façades. This section brings façade design approaches into focus and further develops the categories we conceived for the analysis. We also create a table for classifying various façade designs, focusing on iconic Canadian buildings. In the discussion and conclusion, we elaborate on how the façade has developed over the last 30 years in Canada and provide a summary of our findings, as well as suggestions for future research.

2. Methodology for Categorizing the Architectural Façade

The aim of this paper is to better categorize post-1950s façades. In order to achieve this, the methodology is broken up into three phases: (1) a survey of the theory of façades, which will enable the development of a preliminary analytical lens; (2) the development of the analytical grid used to study the façade design; and (3) a qualitative analysis of a selection of buildings using the developed grid. More specifically, in the first phase, we survey the evolution of façade design throughout history, as well as the contemporary principles of designing the façade. In the second part, we will develop analytical tools (i.e., analytical induction) in order to categorize the façades. In the third phase, we fine-tune the analysis grid by exploring a selection of contemporary buildings in Canada (i.e., constructed in the past four decades).

The primary methodological approach is *analytical induction*, invented by a philosopher and sociologist, Florian Znaniecki, in the 1930s. It describes a particular process of scientific inquiry. Alfred Lindesmith, Donald Cressey, Howard S. Becker and others all went on to develop and apply this concept, and its interpretation has varied considerably since then. According to Hammersley [17], this was the primary method used during the first half of the 20th century, mainly in qualitative research in sociology. Analytical induction was in opposition to the prevalent practice of statistical methods; it was centralized on analyzing descriptive theories with research on individual cases [17]. To a large extent, the development of quantitative studies and the popularity of grounded theory overshadowed this development, even though the latter has gained significant traction in the last few decades.

The analytical induction method is crucial for the present work because it allows for the analysis of the varying definitions and characteristics of façades. In order to accomplish the three main phases of this research approach, after having conducted the literature review on façade design, we developed a preliminary analytical approach to help us analyse the selected contemporary buildings. We alternated between the study of their façades and the fine-tuning of our analytical grid. The grid was finalized once all of our cases were investigated. The catalogs used for choosing our texts were in the field of architecture, building design, façade design and urban design.

This method is suitable for the present research, limitations notwithstanding. Its most important advantage is that it compares qualitative data with quantitative data and provides proof for the final results by analysis [17]. Using data from a limited number of well-defined and carefully selected cases, it tests a limited number of hypotheses [17]. Another benefit of analytical induction is that it can address a wide range of phenomena without a specific analytical scale [18]. It is frequently mentioned that the problem with AI is that it only specifies necessary but not sufficient conditions [18]. Another limitation is that AI implies ideal conditions for data gathering, which are rarely met, and the researcher should constantly modify the data search as the analysis continues [17]. There is a limitation in the grid tool used in this study, namely evaluating and expressing the qualitative criteria for each building for comparison purposes. The colour coding is used for measuring each case study's proximity to each category.

Based on the aforementioned literature review and in order to finalize the analysis structure, a map was drawn to illustrate the process (Figure 1). Our initial premise was that the façade could have a structural, cultural, environmental, symbolic and/or functional value. Based on this premise, the analysis structure was refined by studying the façades of a selection of iconic Canadian buildings constructed in the last four decades. In our analysis, we consider the architectural details, the design teams, the form of the buildings and the relationship of the building with each category of façade design to ensure our analytical lens is continually focusing. The selection of architectural projects was made with the primary intention of highlighting the wide variety of façades that have been constructed in the last four decades.

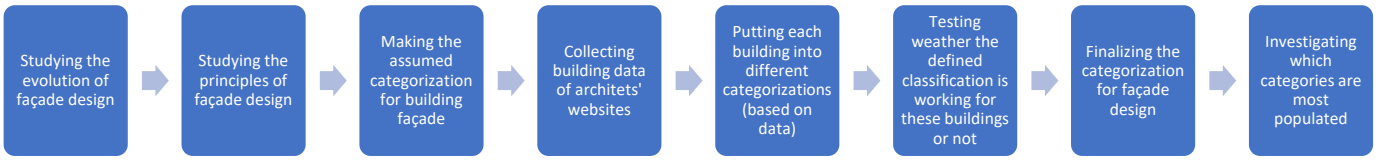

Figure 1. Methodology and work process. © Image by Authors.

Of particular interest are public buildings, as they are meant to engage directly with the public realm. Furthermore, in Canada, public buildings are the only ones that go through the competition process; hence, they more accurately reflect the country's collective architectural tendencies. We preferentially selected museums and other cultural institutions and aimed to represent various regions across Canada.

3. Definition of Façades and Their Different Nomenclatures

The definition of the word "façade" has primary importance in our research of its evolution. "Façade" is originally a Vulgar Latin word, whose root comes from "*facies*" or "*facia*", meaning "front" and "face", respectively, and it corresponds to the word "appearance" in English [19]. Therefore, when discussing the "face" of a building, we mean, above all, the side facing the street. However, as a mediator between a building's inner structure and the outer world, the façade is also a separation; it delineates the public from the private realm. These two realms consequently correspond to two distinct moods, that of public responsibility and that of private self-representation [11].

As Rob Krier [11] explains:

> The façade never really fulfills the "natural requirements" determined by the organisation of the rooms behind. It also talks about the cultural situation of the time when the building was built; it reveals criteria of order and ordering and gives an account of the possibilities and ingenuity of ornamentation and decoration. A façade also tells us about the inhabitants of a building, gives them a collective identity as a community, and ultimately is the representation of the latter in public. [11]

Krier defines the façade as "an architectural element capable of communicating the function and significance of a building" [11]. In addition to enclosing the inhabitants' living space, the façade is a vital part of the urban fabric that shapes the urban experience [15]. A façade, in this regard, is expected to be visually "impressive, inviting or deterring, informative, etc." [20]. On the other hand, other scholars, such as Knaack, Chung-Klatte and Hasselbach [4], explain that building façades mainly serve to:

- Define a building's architectural appearance;
- Provide a view of the inside and outside;
- Resist forces from wind loads;
- Support their own weight as well as that of other building components;
- Control the amount of sunlight penetrating a building;
- Resist rainwater penetration and help cope with and attenuate humidity both indoors and on their exterior surface;
- Provide insulation against heat, cold and noise and potentially facilitate energy generation.

Therefore, the primary focus in recent history has been on structural, passive and robust performance aspects [4]. Nowadays, however, it is becoming increasingly obvious that the more versatile the façade, the better, with the keywords becoming "adaptive", "responsive" or "dynamic" [21]. Mike Davies first suggested in 1981 a building "skin" concept with variable characteristics. He presented the idea of an integrated skin that could act as a nanometric absorber, a radiator, a reflector, a filter and a transfer device [22] while placing considerable emphasis on the importance of the building's appearance (1981). Davies asserted that for decades, building scientists and architects have imagined that future buildings would have envelopes that could respond to changing environmental

conditions in a manner similar to that of our skin. These "adaptive envelopes", with their high efficiency, would eventually satisfy the construction market while meeting the users' expectations for optimal performance [23].

Given the diversity of perspectives of the significance of the façade and the emerging building technologies, there is a growing need for a renewed categorization of façade design. In the next section, we identify the most used nominations for the façade: envelope, curtain wall, skin and surface. These terms are often erroneously used interchangeably, so we outline their differences below. We also outline and justify the nominations that we chose to focus on.

3.1. Envelope

Alejandro Zaera-Polo notes that the envelope is quite possibly the oldest architectural concept that succeeded in separating the inside from the outside—the natural from the artificial—and in demarcating private property and land ownership. He further states that when the envelope becomes a façade, it "operates also as a representational device, in addition to its crucial environmental and territorial roles" ([24], p. 193).

The fundamental utilitarian function of the envelope has been to contain, protect and separate the interior from the exterior (Figure 2). It is one of the most important exterior elements for the functionality of a building, as it has a critical role in energy performance, which is complemented by the façade's unique architectural visuals [25].

However, this role extends beyond mere functionality. A building's envelope is the interface between the outer world and its inner space; "it demarcates ownership and limits, and determines form and image" ([26], p. 21).

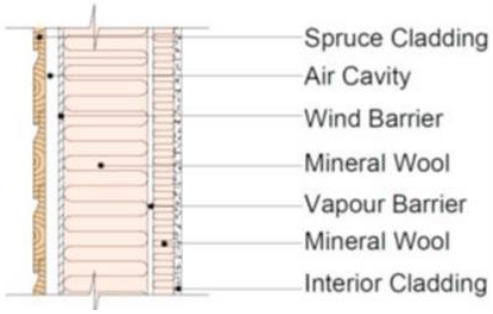

Figure 2. Photo of a sample envelope section with labeled layers. relabeled from Ref. ([27], p. 395).

3.2. Curtain Wall

The great Bauhaus architect, Walter Gropius (1883–1969), may have been the first ever to design a curtain wall [28]. In structural terms, systems in which the façade hangs from the front of the roof are precursors to curtain walls [4]. The development of curtain walls can be divided into three generations [29]. The first started in the early 1970s and was a simple design using aluminum profiles and a thick partition system. The characteristic feature of the second generation (1980–1990) was a protective system based on the recommendations of the manufacturer, wherein installation was mostly performed on the building itself [30]. Curtain walls created after 1990 constitute the third generation and include built-in or specially designed systems for specific purposes, constructed from aluminum sections or stainless steel and prefabricated units installed on the building as seen in Figure 3 [30].

Curtain walls are essentially independently framed assemblies with components that do not brace the building structure. According to Eberhard Oesterle's definition, the curtain wall is separated from the building's bearing system and suspended between the floors, which is where its elements can be prefabricated [31]. Most of the definitions do not specify the type of material used for infill [32]. In commercial and similar types of buildings, the curtain wall serves two essential functions, acting as both a weather barrier against environmental factors (e.g., air and water infiltration) and as an avenue for

light transmission (i.e., into the interior space) [25]. When the curtain wall is inadequately designed (or if it sustains damage), the façade's skin integrity can be compromised, allowing wind, rain, ice and flying debris to penetrate the building [30].

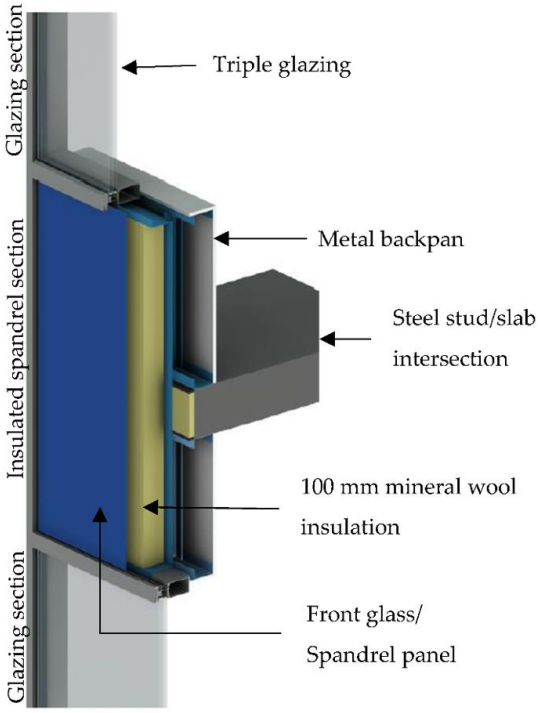

Figure 3. Example of a high-performance curtain wall. relabeled from Ref. [33].

3.3. Skin

Another term that has been widely used in architecture in the last century is "skin" a term initially coined to distinguish between the cladding and the structural "bones" of a building (as seen in Figure 4). More recently, it has become associated with the conceptualization of the envelope as an intelligent environmental system [16]. The distinction between skin and façade is that the architectural façade is the public face of architecture, which communicates a specific message, whereas the "skin" is more of an all-enclosing system, an integral part of a building or a space [34]. On the other hand, the main difference between the skin and the curtain wall is that while the latter is always made of glass, the former can be made with other materials and is not necessarily hung. Therefore, the term "skin" includes the curtain wall but extends to other materials and installations as well.

Lupton states that the skin has been evolving into a multilayered member of the building, which functions in response to the environment (like the skin of our body), changing based on differing conditions. These changes could be from thin to thick, tight to loose, lubricated to dry. The skin is an organ that senses temperature, pleasure and pain, and there are no definitive boundaries connecting exposed body surfaces to internal cavities [35].

Goldsmith remarks that a building's skin can act as a filter from the environment, a boundary for personal property and an element of transition between the interior and exterior. In a pure skin envelope, the roof and exterior walls are seamless—similar to how the human skin enwraps the body. Since skins have been removed from the structural support of the building, they are not required to express it (as classic modernists intended it). The structure acts like the bones of our body under pressure, and the skin is simply the tensile element that holds everything together [36].

Figure 4. Example of "skin", Campus de Jussieu, Paris, France, 2006, by Peripheriques Architectes. Image source: https://www10.aeccafe.com/blogs/arch-showcase/2016/07/13/atrium-jussieu-university-in-paris-france-by-peripheriques-architectes/ (accessed on 6 December 2022). ©Luc Boegly.

Skin is often associated with the term "free façade", which, based on what Leatherbarrow and Mostafavi [37] note, implies a distinction between the structural and non-structural features of a building (i.e., between timber framing and façade cladding). One can extend the human body analogy to comparing the "free façade" to a dress worn on the body.

3.4. Surface

Another related term that is present in the current architectural discourse on façades is "surface". In 21st century architectural discussions, its definition has broadened to include skin, threshold, edge and boundary [38].

The architectural shell encompasses and relates both to the structure and surface of the building (as in Figure 5). Whether building exteriors are made of concrete, metal, glass, etc., their surfaces have an impact on the surrounding urban environment and create spatial effects through which the architecture materiality communicates. Thus, buildings can declare their autonomy and their engagement with the environment through their surfaces [37].

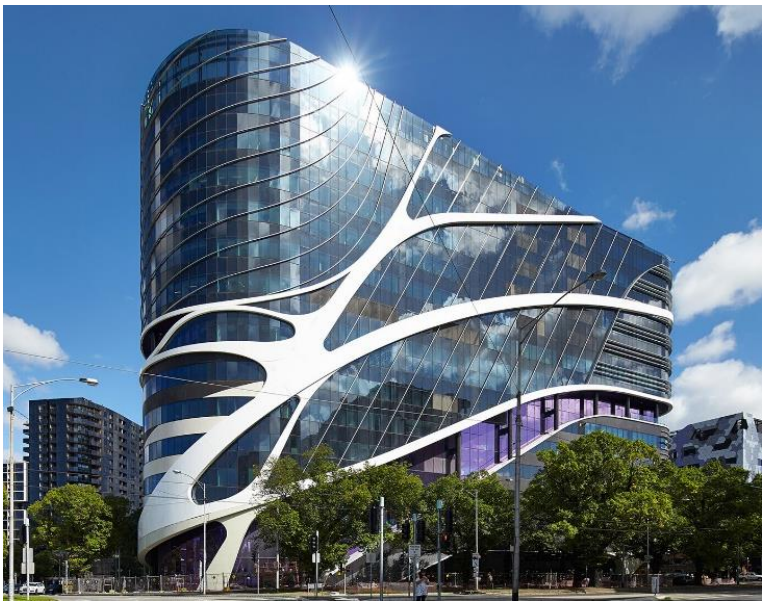

Figure 5. Example of the surface façade. Image source: https://www.surfacedesign.com.au/projects/façade/vccc/ (accessed on 6 May 2022). ©Bennetts.

Giuliana Bruno, in her book, *Surface: Matters of Aesthetics, Materiality, and Media*, sees contemporary façades as surfaces that are light and tensile, not unlike those of movie screens (i.e., capable of displaying moving images and becoming a canvas for a variety of art forms); "The surface, like the screen, is an architecture of relations" [1].

To summarize this short section on the nomenclature of the façade, a building's envelope and wall remain important exterior elements for the functionality of the building (Figure 6). In contrast, the aesthetic aspects of the façade are manifested chiefly through the building's outermost layers, namely the surface and skin.

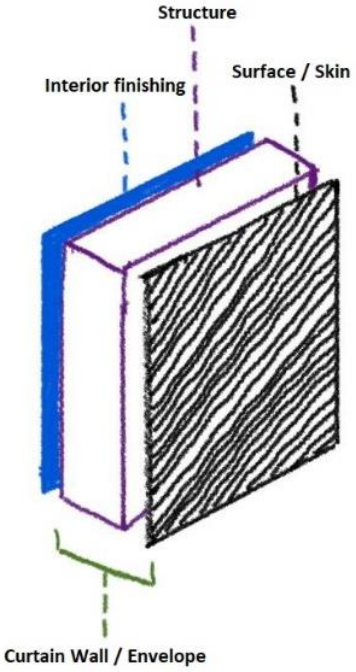

Figure 6. Curtain wall, envelope, surface and skin. © Image by Authors.

4. Understanding the Various Characteristics of Façades

This section investigates the evolution of the façade design. We also characterize the different approaches, which enables the categorization of a series of iconic buildings across Canada. This classification is intended to be applicable worldwide.

4.1. Evolution of the Façade

The architectural façade has always been a communicative tool demonstrating the underlying structure or identity of a building [39]. For most of history, both structure and identity were indiscriminately expressed in a building's exterior. Even when appearance was paramount (e.g., in the case of monumental architecture), the form, function and "face" were extremely interdependent [40]. It was not until early modernity—when the practice of architectural drawing became standard—that the idea of the pictorial composition of buildings was introduced. Since then, the idea of a façade has had varying meanings regarding its essential architectural expression—from the symmetric building façades of the Renaissance to the understated façades of modernism, and then, to post-modernist declarations, like Robert Venturi's statement that "the façade is the place where architecture takes place" [41].

The impetus for the idea of the "facciata", the face of the building, was the standardization of the architectural drawing as a design tool among Renaissance architects [42]. They were focusing on the creation of buildings as images, which did not necessarily reflect the interior space [43]. The façades of Renaissance buildings were often symmetrical along their vertical axis, as was the case with church façades, which were mainly covered by a pediment and arranged around a system of pilasters, arches and entablatures. At

times, through the columns and windows, one could discern a centralized arrangement, a paradigm being the Palladian villas of the 1550s [44]. The intellectual developments of the Renaissance marked a break with the anonymous master builder of the Middle Ages and ushered in the author centricity of the Modern Era [45]. After the Renaissance period, especially during the Baroque and Rococo movements, building façades became more decorative. The trend was less prominent in the era of Neoclassical architecture, which featured a return to the more austere classical orders.

The industrial revolution of the 19th century brought significant shifts in architecture and design. Load-bearing masonry gradually gave way to a framed structural system, which initially used steel and then concrete [30]. In the second half of the 19th century, two important developments had provided the foundation for what would come in the first decade of the 20th century. The first was the use of techniques that allowed for thinner walls with less masonry, and the second was the realization that the ornamental elements applied to architecture no longer had the same capacity to communicate as they had in the century prior [7]. The transformation from load-bearing façade to a lightweight one with the advent of the skeletal construction system led to fully glazed façade surfaces becoming more common. This, in turn, paved the way for the curtain wall of the 20th century [30]. As a result of industrialization and the faster production speeds and new materials (e.g., stainless steel) that it brought along with it, building decorations lost their importance [46].

At the beginning of the 20th century, a series of developments radically altered the way façades were designed. One such development was the possibility of increasing the size and number of openings on façades [47]. Another was the growing independence of the façade from the support of the building, as articulated in Le Corbusier's Dom-Ino scheme (1914). The free façade, one of his architectural design principles, called for the replacement of traditional windows with freely arranged openings in the non-supporting walls [48]. Today, the façade continues to exist as a design theme, thus preserving the legacy inherited from earlier concerns about façade proportions [49].

Façades changed again when windows were enlarged in order to bring in more light and provide better views of the outside [7]. The increasing complexity of curtain wall constructions led to a transformation from the craftsman-built structures of the 1950s to today's sophisticated systems that incorporate both manual and industrial constructive processes [50]. In the 1960s and 1970s, there was even a trend in commercial buildings for larger and larger windows as a sales pitch to passersby [7]. Consequently, glass, which was already used for fenestration, became the façade's predominant material. During that time, designers gave more consideration to aesthetics and views than to performative aspects, such as energy efficiency. However, since the oil shortages of the 1970s, architects have been growing increasingly concerned with global energy resources, climate change and the importance of designing energy-efficient buildings, and façades in particular [51]. Therefore, modern façade design involves a significant amount of glazing in order to increase the amount of natural light. The design and configuration of glazed panels, the use of energy-efficient materials and other considerations of energy sustainability are what "ornamentation" now consists of [2].

In recent years, the design of the building façade has become much more complicated as a result of new construction methods, requirements for highly controlled interior environments, attention to energy efficiency and new materials and production methods, all of which need to be part of the present-day architect's design palette [48]. Meanwhile, the harmonization of these novel requirements with existing buildings has created a phenomenon, whereby the preservation of the exterior is preferred to that of the interior, a particularly common occurrence in historic and heritage buildings.

This practice, called "façadism", essentially consists of conserving the exterior walls of an old building while rebuilding the interior [52]. It is a response to urban developments that are often at odds with historic preservation mandates [53]. Since the turn of the century, façadism has actually become the most widely applied method by architectural heritage bodies, a compromise between historic preservation and economics. Jonathan

Richards identifies three interconnected reasons for façadism's prevalence: the preservation of streetscapes, the obsolescence of a building's former uses and a desire to revitalize derelict city centres [54].

However, as the appearance that results from façadism often does not correspond with function, the practice can be characterized as a decorative or structural exercise of post-modernism, according to Evangelia Kyriazi, who summarizes it as the preservation of historical façades through facsimile ones in front of modern buildings [53]. Façadism has also been criticized for disconnecting the buildings' interiors from their exteriors and for creating little more than "stage sets" in townscapes. As such, according to Richards, architectural purists consider it distasteful or even immoral. Another view is that of John Earl, who stated that façade preservation is not preservation but instead the "continuity in the townscape" [54].

4.2. Developing the Analytical Grid: A Preliminary Categorization of Façade Design

In this section, we elaborate on façade design in order to develop a grid for our analysis. First, we discuss contemporary trends that are used in façade design and, in using those, categorize different façades and specify their key features.

4.2.1. Contemporary Trends in Façade Design

In addition to the traditional roles that façades have taken on, new trends have enhanced their scope to an even broader set of functions. A building must be stable and mechanically strong. It must also ensure the health and safety of its occupants through its materials (e.g., protecting against pollutant emissions and providing fire resistance), contribute to a comfortable acoustic, visual and thermal environment, and maintain heat (radiation, conduction) and mass transfer (vapor, air) [21]. Today, technology has brought these functions to the fore as key factors in façade design.

The design and development of building envelopes has traditionally been dominated by structural, passive and performance-related aspects [4]. Currently, it is widely recognized that a desirable building is one that has more versatility, and the keywords in façade design are changing to *responsive*, *adaptive* or *dynamic* to indicate a preference for optimal workability, efficiency and sustainability [22]. Designing a building envelope, therefore, requires prior knowledge of a building's components, properties and parameters in order to understand the physical processes of heat, air, moisture and light through the envelope of a building [55].

One new way of seeing façades is based on Kumar and Raheja's categorization, which concerns suitable combinations of site and climate. The following façade types can be distinguished [55]:

- Single skin façade building envelope,
- Double or multiple skin façade building envelope.

The single skin façade is a basic requirement for building enclosures. It simply consists of walls (which can be brick, stone or prefabricated block) with openings for fenestration, a roof and skylights if needed. An extra skin for a single layer envelope can consistently improve the thermal insulation [55], and this benefit leads to the idea of a double skin. The double skin façade, for its part, is a design element used to enhance a building's performance to satisfy several demands. Double skin facilitates sustainable designs that aim at energy conservation, thermal and visual comfort, and enhanced indoor air quality [56].

There are several methods for describing and developing the different types of double skin façades, but the most common one was developed by Eberhard Oesterle and is shown in (Figure 7). Variations can be achieved with this kind of system through different combinations of air cavity sections, such as box-window façades, corridor façades, shaft-window façades and multi-story double skin façades [31].

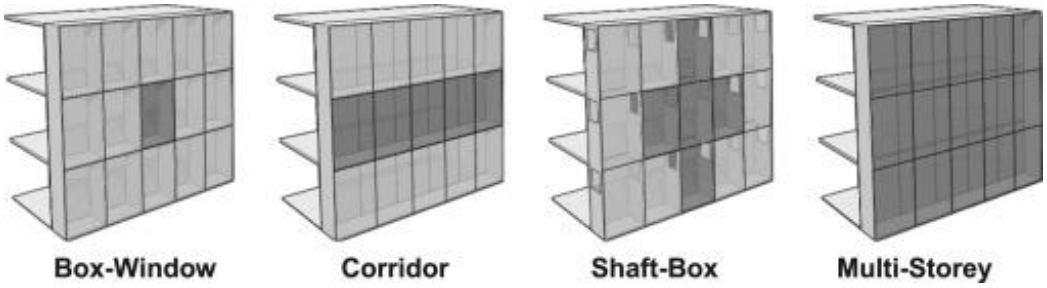

Figure 7. Different combinations of air cavities in a double skin façade system. relabeled from Ref. [57].

Additionally, the current generation of façades hosts multifunctional and highly adaptive systems, which should improve building performance in the long term. In these systems, the barrier between the interior and exterior environments can change its functions, features or behavior, in time to respond to the changing environmental requirements. These adaptive façades can serve as thermal mass and insulation, which can be controlled through ventilation, daylighting, solar shading and energy harvesting features [21].

4.2.2. Categorization of the Façade

Based on the literature review conducted for this paper, we categorized façade types and indicated the unique features of each of them separately. Without disregarding the multiple purposes of any given façade, the current categorization identifies the most crucial feature of each one and classifies it accordingly. We divided façade types into three categories, as described below.

A. Utilitarian Façade:

The primary purpose of the utilitarian type of façade is to respond to the building's structure, its environment and its function (see categorization schema in Figure 8). Therefore, these three subcategories will further differentiate these façades. Although most façades have some utilitarian component, the ones categorized here are particularly centred on these three characteristics.

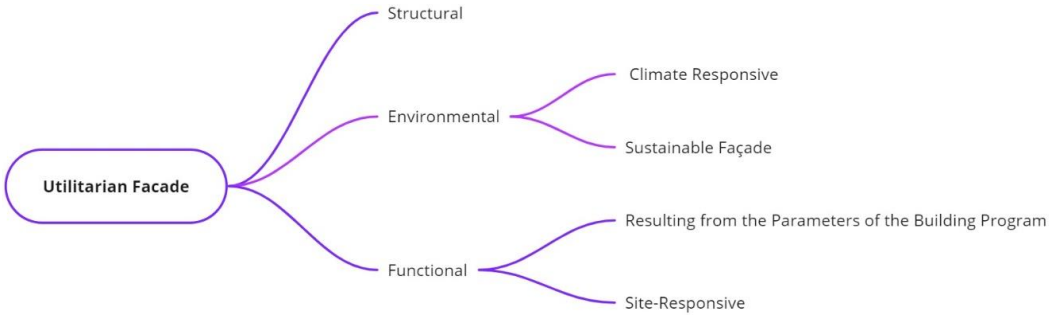

Figure 8. Categorizing utilitarian façades. © Image by Authors.

A.1. Structural Façade:

In this subcategory, the façade is a direct result and expression of a building's structural requirements. It is mainly found in architectural styles such as Brutalism and High-Tech, wherein the façades reveal the structural system of the building. Structural façades are responsible for containing the architectural functions and for responding to the structural system [58]. One of the most distinguishing characteristics of this type is that the structure is usually exposed on the main façade, so as to demonstrate the structural components of the building, e.g., the Shanghai Bank in Hong Kong [59]. Some architects are aware of how this technique can enrich a building's exterior, so they take a more proactive stance and devote a good deal of care to accommodate the synergy between the façade and the structure [59].

A.2. Environmental Façade:

This façade contributes to environmental efficiency by adapting to different environmental conditions and responding to changes outside and inside the building [60]. As urban development is now heavily impacted by climatic factors, architects have equally accounted for the environmental changes in their designs; even ornaments added to the façades of such buildings are adapted for this consideration [61]. The contemporary façade, which mediates between the building and its urban context, has become an integral part that responds to climate change to improve the performance of the building [58]. These façades function as ecologically adaptive devices that respond to environmental issues [58], and double skin façades are representative of this category. Environmental façades can be further divided into two subcategories: *climate-responsive* (i.e., adaptive) façades and *sustainable* façades.

A.2.1. Climate Responsive (adaptive):

The façades in this section respond directly and dynamically to climate issues, hence the term climate responsive (adaptive). A climate-adaptive building shell (CABS) is an excellent example of this type, as it can improve the overall building performance [62]. It accomplishes this by repeatedly and reversibly changing some of its functions to respond to climate requirements and variable boundary conditions [63]. Like other types of façades, the primary function of CABS is to protect residents, but it differs in that it uses a minimal amount of energy all the while being sensitive (responsive) to its surroundings [62]. To account for these compromises, a dynamic envelope is required; it can work at various angles through its moving components or through techniques that involve varying airflows, the chemical alteration of materials, etc. [64].

A.2.2. Sustainable:

Façades in this category use a combination of efficiency and moderation of materials, energy, space and the ecosystem at large, and they seek to minimize the buildings' negative environmental impacts [65]. The most important goal of sustainable architecture is the energy efficiency attained during a building's life span. In fact, many passive and active techniques are used by architects to that end. For example, a design feature such as solar panels or green walls could increase residents' abilities to save on energy [66]. Furthermore, by conducting a site analysis, we can increase the harnessing of local environmental resources, such as daylight and wind, for heating and ventilation [65]. The sustainable façade category also comprises façades that use durable materials and building practices that result in a low environmental footprint.

A.3. Functional Façade:

This category applies to any façade, which is a direct result of the function of its building, without having any distinct purpose in and of itself. Most office and residential buildings would fit into this category. Here, the architects' designs are based on the functionality of the relevant building [67]. The other important design criteria in this category are performance, durability and optimization of service life [68]. This type does not aim to be symbolic, sustainable or have any formal quality; instead, it clearly displays a building's internal function to the public. We further divide this category into two subcategories: façades resulting from the parameters of the building program and site-responsive façades.

A.3.1. Resulting from the Parameters of the Building Program:

This type of façade usually results directly from the design of the rest of the building, and especially from its program. In other words, the façade design obeys the parameters set forth by the building's interior spaces or adjusts to them appropriately [69]. Most existing buildings are in this category because common architectural design practice prioritizes the building program.

A.3.2. Site-Responsive:

In the case of site-responsive façades, it is the environment around the building that informs the façade. For example, if a building is designed to account for some geographical limitation, the form of the building will be affected, and the façade will naturally follow. The design framework in this category is based on the observation and assessment of the site [69]. As façade designs in this category create a relationship between the building and

the site, they subsequently become responsible for the environment around and near the building [70]. An excellent example of this is the *Pierrefonds Library Extension* in Montreal by Chevalier Morales Architects (Figure 9).

Figure 9. Pierrefonds Library Extension in Montreal, by Chevalier Morales Architects. Image source: https://www.archdaily.com/444736/pierrefonds-library-chevalier-morales-architectes (accessed on 15 September 2022). © Courtesy of Chevalier Morales Architectes.

B. Formal Façade:

This category consists of façades that define the shape of the building and that are expressive of its very form. They are usually continuous surfaces surrounding a building, often acting as both the façade and the roof. As a result of the attention to the form, the design of formal façades coincides in concept with that of the overall building architecture [71]. This design approach emphasizes form without considering technology, social issues or any such category [72], while a formalism framework offers a broad range of possible insights into the nature and potential of architectural forms [73]. An example of this type is the Guggenheim Museum Bilbao by Frank Gehry (Figure 10), for which it is impossible to distinguish the edge of the façade from the roof. Today, these buildings challenge the traditional concepts of walls and ceilings; they are composed of continuous surfaces that serve as both the façade and the form of the building, expressing the building not in two-dimensional images but rather in a three-dimensional volume.

Figure 10. Example of the formal façade: Guggenheim Museum Bilbao by Frank Gehry. Image source: https://www.flickr.com/photos/dalbera/3432848128 (accessed on 11 August 2022). © Jean-Pier Dalbera.

We further divide this category into three subcategories: façades emphasizing a combination of structure, form and materiality; façades resulting from the exterior design; and façades resulting from a tectonic approach (Figure 11).

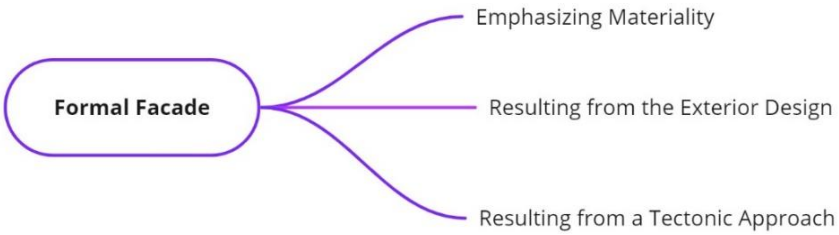

Figure 11. Categorizing formal façades. © Image by Authors.

B.1. Emphasizing Materiality:

In this category, the emphasis is on façade materials, and, in fact, the material shapes the form of the façade and expresses the purpose of the overall design. Therefore, the form of the façade is concordant with the material that is being used to construct it. The Nottingham Contemporary, designed by Caruso St. John Architects (Figure 12) is as an excellent example from this category. The structures here are symbolized by their type and form and by the material used. The materials, in addition to serving as an element of beauty and structure, provide meaning and a sense of aesthetics [74] while also expressing the design's purpose. Most designer-related considerations are based on the physical nature or qualities of the materials employed [75].

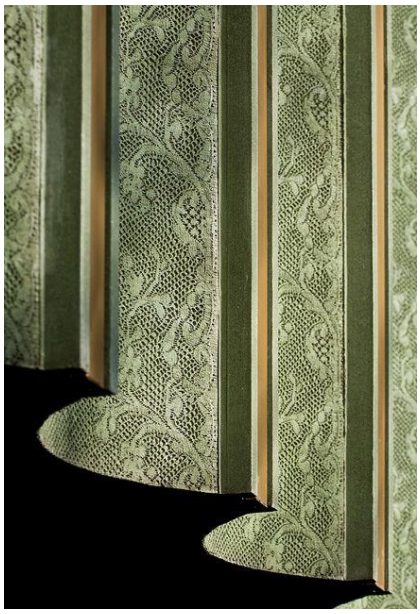

Figure 12. The Nottingham Contemporary, designed by Caruso St. John Architects. Image source: https://www.flickr.com/photos/47337713@N08/5335737763/ (accessed on 12 August 2022) ©by plainsailing.

B.2. Resulting From the Exterior Design:

This type of façade is designed independently of the interior; therefore, the elements of the façade do not significantly affect the interior. In this façade category, which often occurs in parametric design, there may even be a lack of coherence between its interior and exterior [76]. The Faculty of Engineering and Information Technology by Denton Corker Marshall (Figure 13) in Sydney, Australia, where the form of the building is strictly a result of its skin's design, serves as a textbook example [77].

Figure 13. "Faculty of Engineering and Information Technology" by Denton Corker Marshall. Image source: https://www.archdaily.com/529229/faculty-of-engineering-information-technology-denton-corker-marshall/53cacae3c07a805e080002ae-faculty-of-engineering-information-technology-denton-corker-marshall-photo?next_project=no (accessed on 12 August 2022). ©Richard Glover.

B.3. Resulting From a Tectonic Approach:

The tectonic façade derives from the formal façade because of the intent to combine materiality with craft, techniques and culture in order to generate a particular form. The term tectonic describes an artisan who works with any and all hard materials other than metal [78]. The result is then an expression that is neither symbolic, nor referential, nor metaphorical; it can only be considered formal. Buildings' tectonics, which are conceived as the interactions between structural and artistic forms, have substantially influenced serrated façades [79].

The tectonic approach in architectural façades can be divided into two types: classical and digital. The classical type focuses on culture, material and technique (Figure 14), whereas the digital type centres on tools, articulation and assemblies [80]. According to Kenneth Frampton and others, there are seven main factors for classical tectonics: junction, detail, material, object, structure, construction and interaction [81]. In digital tectonics, the design software combines with traditional construction methods [82], where the design is affected by climate and topography as well.

Figure 14. "Castelvecchio Museum" by Carlo Scarpa is an example of the classical type of tectonic approach. Image source: https://www.e-architect.com/italy/castelvecchio (accessed on 12 August 2022). Photo © David Lawson.

C. Image Façade:

Façades belonging to this category are those with a clearly expressed purpose; they act as images that communicate messages to their viewers. In other words, by functioning as communicative "images", these façades actively connect the building to the public realm (Figure 15).

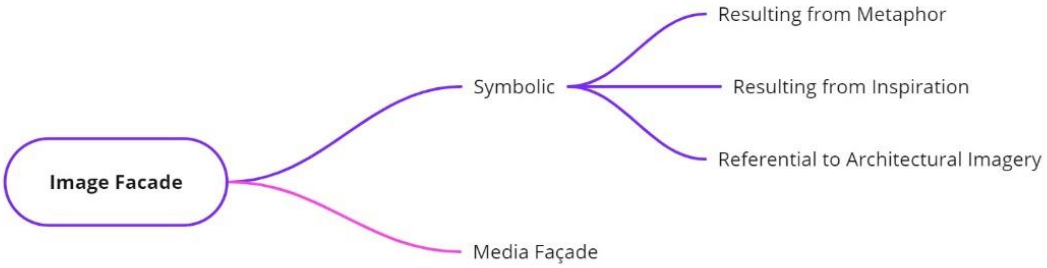

Figure 15. Categorizing image façade. © Image by Authors.

C.1. Symbolic Façade (can also be called socio-cultural):

These façades—explicitly designed to symbolically represent a site's culture or rituals—remind the visitors of specific references through their use of ornaments. These ornaments are usually associated with the cultural, social and historical factors of the surroundings, and they express this in symbolic ways [58]. Accordingly, façades of this type serve as a reflection of relationships between the history of a nation and its arts, cultures, traditions, society or theology [58]. Faced with cultural or symbolic imagery, people take "mental photos" of what they see, and they come up with a meaning for it [83]. In essence, symbols are used to express objects and relationships [71]. Here, the term "symbol" includes visual features (e.g., morphological, geometric, spatial and topological relations), as well as diagrammatic languages that represent objects and relations [71]. We further divide this category into three subcategories: façades resulting from metaphor, façades resulting from inspiration and façades referential to architecture. It would be beneficial to note, in passing, that "symbolism" in an architectural context can either refer to the ideas of architects or to the perception of the public. Here, our focus is on the former.

C.1.1. Resulting from Metaphor:

A metaphorical façade makes explicit references to the elements with the same characteristics through its design elements or ornaments to convey a message. These references are usually easy enough to identify (as in Figure 16). By definition, it means referring to something that is considered to have similar characteristics to the thing it is being compared to [84]. Metaphor in architecture consists of a process of transforming abstract ideas into concrete or visible images that have a strong connection to the local context and knowledge [85]. Architects have the capacity to make mental shifts between verbal and visual metaphors, and therefore, they can transmit multilayered and sophisticated meanings effectively [86].

Figure 16. "The Long Island Duckling" from God's Own Junkyard. Source: https://www.archdaily.com/961951/when-novelty-follows-function-the-kitschy-designs-of-duck-architecture (accessed on 5 August 2022). © Image via Wikimedia.

C.1.2. Resulting from Inspiration:

While an architect may indeed draw inspiration from cultural or religious ideas, the resulting façades do not necessarily manifest these ideas as identifiable elements. For this category, a visitor can understand the source of the inspiration by looking at a façade with the help of these indicators, but the reference in this category is not so obvious when observed compared to the metaphor. Innovative design is often the result of an inspiration from a variety of sources, where nature is often the source [87], and understanding this origin is important even if it is not often recognizable in the final design. A design that is the result of an inspiration goes through many cognitive transformations. For instance, a diamond-shaped façade would belong to the metaphor category, as it copies the form of a diamond; however, an art nouveau building is inherently inspired by nature. The first is easily recognizable, but the second is more about the gesture. The façade would not be the only thing that results from the inspiration but possibly the interior as well. Gottfried Semper said that façades have their origins in weaving, stemming from fences made of woven sticks. With time, functional elements were added to the façade (i.e., the structure) [88]. Aptly, the Beijing National Stadium was built with the idea of weaving materials and is a fine example of this category (Figure 17).

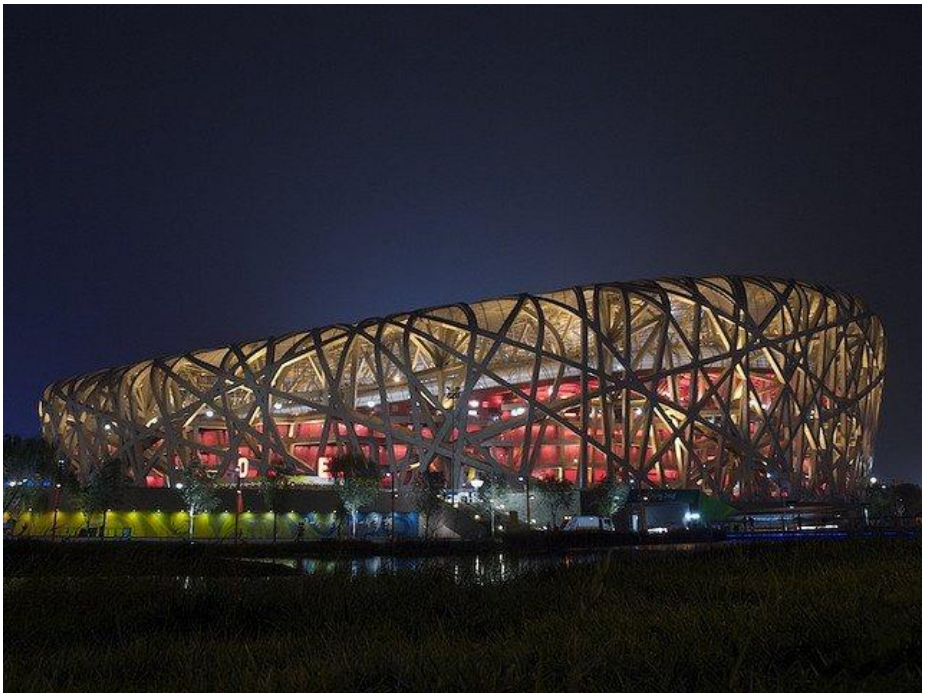

Figure 17. "Beijing National Stadium". Image source: https://en.wikipedia.org/wiki/Beijing_National_Stadium#/media/File:Birds_Nest_at_Night.jpg (accessed on 5 August 2022). © CC BY-SA 2.0.

C.1.3. Referential to Architectural Imagery:

In addition to referencing abstract ideas or forms found in nature, architecture in and of itself can also serve as a significant source of imagery. For example, a façade can use classical pillars to reference classical façades without being part of a classical building. Referential architecture encapsulates the design qualities of other architectural styles and is based on well-established knowledge that has been developed over time [89]. This category can be readily seen in most post-modern buildings. On the topic of referential symbols in architecture, Robert Venturi et al. mention that "[they are] an architecture of communication over space; communication dominates space as an element in the architecture and in the landscape" [87], as shown in Figure 18.

Figure 18. "Children's Museum of Houston" by Venturi. Image source: https://en.wikipedia.org/wiki/Children%27s_Museum_of_Houston#/media/File:HoustonChildrenMuseum.JPG (accessed on 5 August 2022). © Public Domain.

C.2. Media Façade:

This type of façade projects information to the community through its use of parametric design. This becomes an increasingly viable option, for instance, when the skin of the building needs to establish a dialog with its surroundings [90]. Thus, this kind of surface could respond to changing contexts, such as environmental and socio-cultural ones [91], and it could present information in different visual forms all the while remaining decipherable to observers. The Allianz Arena stadium serves as a perfect example [92].

Façades mediating between physical and digital spaces are early manifestations of architecture adapting to an information-rich society; the programed media usually allow users to interact with the façade in prescribed ways [93]. This interaction between the façade and people impacts the building's societal and cultural roles and how it is perceived in the context of its surroundings [94]. A façade that displays the silhouettes of passersby would be categorized as a type of media façade. In Hank Haeusler's words, a media façade is "a façade into which dynamic communication elements are embedded" [95].

Furthermore, media façades may anticipate and respond to environmental changes or serve as an urban scale dynamic information interface [93]. In the media façade, technology, movement, colour and light are used to transform it into a public display that encourages community interaction. This results in a new relationship between the media and architecture, wherein digital media become a contemporary architecture interface [96].

These façades can also convey information, communicating to passersby climate and temperature conditions, interior events and resource consumption or any other real-time data. In this case, the façade can be a screen for projection of information and an active site of exchange between the subject and object [1]. Information can be shown through the use of informative lighting and may affect the form of the architecture and its façade. The media façade may incorporate images and sound simultaneously.

5. Selection of Buildings and Their Analysis

For this section, we chose ten iconic buildings in Canada (where iconic public buildings are defined as those readily recognizable to the broader public), which were built in the last four decades. We analysed the façade design classification of these buildings specifically, as they can impact their surroundings more than other non-descript buildings, using the categorization schema as depicted in Figure 19. Indeed, the intention behind the design of these façades is typically to showcase how the governing bodies want to brand their city. All the information about these buildings was collected from their architects' websites and their reflections on the media.

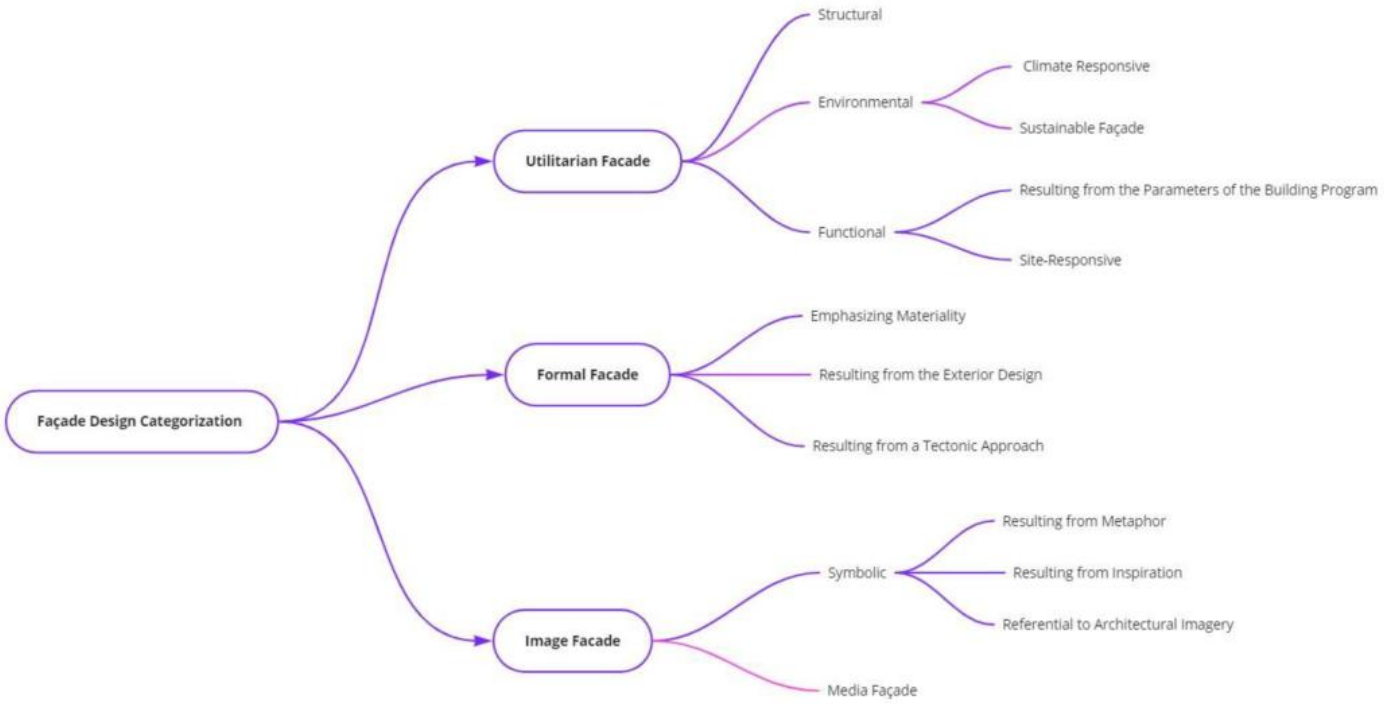

Figure 19. Categorization of the façade design. © Image by Authors.

5.1. Migration du Biodôme de Montréal

The Biodôme was initially designed in 1976 as the velodrome for the Olympic Games by Roger Taillibert. This building underwent two main renovations (Figure 20). The first was in 1992, when it was made to accommodate the four natural ecosystems of the Biodôme. The second, completed in 2020, ensured the preservation of the original skylights from the original building form [97].

Figure 20. Biodôme de Montréal. Image source: https://www.azuremagazine.com/article/montreals-new-biodome-immerses-visitors-in-nature/ (accessed on 9 October 2021). © Photos by Marc Cramer and James Brittain.

The biophilic layout in the building's façade design was used to increase the occupants' connection to the natural environment by using nature directly [98]. Furthermore, the skin is stretched and curved around a bowed aluminum frame with tension, cantilevers and triangular beams attached to a primary steel frame [99]. This building façade has a sensitive architecture, which mediates between structural techniques and nature, linking urban and natural ecosystems [100].

Based on the aforementioned information, the category that most accommodates this building is that of the **formal façade**, of the subtype that emphasizes **materiality**. More specifically, the form of this building was shaped following the form of the façade, and the façade even continued to the roof in order to provide natural light and emphasize the form. This façade could also belong, secondarily, to the **climate-responsive** category, a subcategory of the **utilitarian façade**, as the building is clad with an extraordinary roof featuring a massive skylight, reconnecting people with the environment and allowing more natural light to penetrate the building. Thirdly, this building's façade could also belong to the **metaphor image** design category because of the form of the opening on the roof, which alludes to the cat-eye shape.

5.2. ROM's New Terrace and Plaza

The ROM project was started with the primary goal of developing Michael Lee-Chin Crystal's entrance to the city plaza (Figure 21). The intention was to create a lively environment for enjoying outdoor performance programs and to entice people to explore the adjoining indoor galleries [101]. Crucially, this project resulted in the separation of the historic building from the new form of the terrace, all the while providing a view to the historic façade [102].

Figure 21. ROM's New Terrace. Image source: https://www.archdaily.com/923916/hariri-pontarini-reveal-the-roms-new-terrace-and-plaza (accessed on 9 October 2021). © Photos by Archdaily.

This building has what is most readily construed as a **formal façade resulting from the exterior design**. This categorization is due to its deconstructive form, which emphatically contrasts the symmetry of the original building. The focus of the façade design is on its form, which serves as a cladding on the older façade. The second most prominent façade-type classification for this example would be the **image façade resulting from inspiration**; the shape of the metal-clad volumes is reminiscent of crystals, inspired by the crystalline forms present in the ROM's mineralogy galleries.

5.3. The Livery Shop

The Livery Shop (Figure 22)was built in Calgary's oldest neighbourhood, which was established in 1875. The building has long been a prominent destination and has revitalized the Inglewood neighbourhood, Calgary's historic centre [103]. The building is described as having ghost-like skeletal frames, which form the building's massing and perform two main functions; they cover up the drive aisle for the parking and loading area in the rear, and by using an innovative tent-like structure, they can be transformed into covered outdoor spaces.

Figure 22. The Livery Shop. Image source: https://www.archdaily.com/search/all?q=The%20Livery%20Shop&ad_source=jv-header (accessed on 9 October 2021). © Photos by Robert Lemermeyer.

The approach for designing the façade of this building was to create a taxonomy of possible formal strategies from an inventory of local industrial typologies, the material palette of which transitioned from standing seam metal to brick [104].

The primary category appropriate for this building is that of the **formal façade with a tectonic approach** because of the diversity of the materials used. The second most important categorical placement is that of the **façade referential to architectural imagery** because the form of the roof affects the shape of the façade and makes a reference to the industrial history of this neighbourhood.

5.4. Complexe Sportif de Saint-Laurent

The Complexe Sportif de Saint-Laurent (Figure 23) project sought to establish a relationship between the existing horizontal and neutral-toned buildings in the area and a nearby park and planned greenbelt. According to the design firm, the structure consists of two large buildings: one white and diaphanous with prismatic form, the other darker and in a horizontal format. Owing to the glazing details, these volumes appear as if they are breaking out of the ground at an unusual angle. The light-coloured portion of the building is reminiscent of a massive chunk of ice, and the dark structure resembles a protruding volcano. From the boulevard, both buildings welcome users and serve as signs that direct pedestrians to the adjacent park [105].

This building is most related to the category of the **image façade resulting from inspiration** because the two volumes evoke elements and features of nature. Furthermore, the design of both buildings is inspired by the tectonic forces of the site itself [106]. The second most relevant category is the **formal façade resulting from the exterior design** because the external forms of the two volumes take precedence over interior factors. The third most relevant category is the **utilitarian façade of the climate-responsive** subtype because of the materials used.

Figure 23. Complexe Sportif de Saint-Laurent. Image source: https://www.archdaily.com/881193/saint-laurent-sports-complex-saucier-plus-perrotte-architectes-plus-hcma/59dad1ecb22e38053400017e-saint-laurent-sports-complex-saucier-plus-perrotte-architectes-plus-hcma-photo (accessed on 12 October 2021). © Photos by Olivier Blouin.

5.5. Halifax Central Library

The architecture of the Halifax Central Library (Figure 24) is modern and innovative, and, according to the architects, combines the best qualities of a traditional library with the finest traits of a modern one [107]. The building has a welcoming design, and it reflects the diverse population of the city and its heritage. As architect Chris Hardie explains:

> By designing an adaptable library, we embrace multiple functions to ensure that the library will meet the needs of the Halifax community into the future. People should see this building not only as a library but as a free public space in the heart of the city. [107]

Figure 24. Halifax Central Library. Image source: https://www.archdaily.com/577039/new-halifax-central-library-schmidt-hammer-lassen/548a4a4de58ece0c9000007f-portada_halifax-central-library_schmidt-hammer-lassen-architects_024-jpg (accessed on 12 October 2021). © Photos by Adam Mørk.

The library has a cubic form, consisting of four significant "volumes" stacked above one another with a tilted and twisted façade arrangement. A large amount of glazing on each rectangular block allows visual connections between the interior and the surrounding streets, and the large skylight provides natural light for various levels of the building [108].

This building is most related to the **formal façade**, where **materiality** is emphasized through form. The library's exterior consists of four rectangular shapes stacked horizontally and rotated to represent the two diagonal axes that dominate the otherwise orthogonal

grid of the city [108]. The second most relevant category here is **the functional, utilitarian façade** because the form is designed based on the functionality of the space, and it is a result of the conditions of the building program.

5.6. Fogo Island Inn

The Fogo Island Inn was designed by Todd Saunders (Figure 25), a Newfoundland-born architect, and the traditional method of temporary construction from 400 years ago has been used in its case, despite its structure being permanent. By connecting with the natural landscape, by using natural materials (e.g., wood) throughout and, most importantly, by enabling a pragmatic and collaborative design and construction process, the inn is highly associated with Fogo Island and the architectural traditions of outports in Newfoundland [109].

Figure 25. Fogo Island Inn. Image source: https://www.bloomberg.com/features/2016-fogo-island-inn/ (accessed on 12 October 2021). © Photos by Richard Barnes.

The primary category to which this building belongs is that of the **functional, site-responsive, utilitarian façade**, as it was built according to the particularities of the site and the surrounding environment. The building hits the land directly without impacting the adjacent rocks, lichens and berries. The second most important category here is the **climate-responsive (i.e., adaptive) utilitarian façade** because the exterior cladding is locally sourced from milled black spruce.

5.7. Manitoba Hydro Place

Manitoba Hydro Place (Figure 26) represents the first of a new generation of sustainable buildings that combine the latest technology with time-tested environmental principles to create "living buildings" that can adapt to the local climate [110]. In response to the locals' vision, its architectural design is implemented in a manner that does not compromise design quality or comfort [110]. One of the important features of its façade is the use of a double skin, which contains a double-glazed outer wall and a single-glazed inner wall to insulate the building against heat and cold.

This building belongs to the **sustainable**, **environmental façade** of the utilitarian category because the architectural design relies on passive free energy without compromising design quality and, most crucially, comfort. A double façade curtain-wall system is used to make the building thermally efficient with the implementation of double-glazed walls on the exterior and single-glazed walls on the interior. The radiant slabs act as a medium for heat exchange between the geothermal field and automated louvre shades that control the glare and heat gain [110].

The next most appropriate category would be the **climate-responsive (i.e., adaptive) utilitarian façade** because the building responds to the climate and adapts accordingly. For instance, recovered heat from exhaust air and passive solar radiant energy is used to warm the fresh air in colder temperatures.

Figure 26. Manitoba Hydro Place. Image source: https://www.archdaily.com/44596/manitoba-hydro-kpmb-architects/5012184f28ba0d55810005f8-manitoba-hydro-kpmb-architects-photo?next_project=no (accessed on 12 December 2022). © Photos by Gerry Kopelow.

5.8. Canadian Museum for Human Rights

Antoine Predock, the architect of Canadian Museum for Human Rights (Figure 27), found inspiration in the natural scenery and open spaces of Canada, and he designed it to be an iconic symbol [111]. The appearance of this building is a visualization of ice, clouds and stone, and it serves as a symbol of the climatic changes in the environment. The building also gives the impression that these elements are located in a field of sweet grass [112]. The museum's architecture is a creative structure of curving lines and bold geometry with many irregular surfaces and unusual angles [112].

This building would primarily belong to the category of **formal façade resulting from the exterior design** because of the innovative structure of curving lines and bold geometry inherent in many of the irregular surfaces. The second category to note is that of the **symbolic façade resulting from inspiration** because, as mentioned, the museum's façade resembles ice, clouds and stone that appear as though they are set in a field of sweet grass [112].

Figure 27. Canadian Museum for Human Rights. Image source: https://www.archdaily.com/565612/the-canadian-museum-for-human-rights-failed-memorial-and-white-elephant (accessed on 15 October 2021). © Photos by Aaron Cohen/CMHR-MCDP.

5.9. Canadian War Museum of History

According to its architects [113], the architectural design for the Canadian War Museum of History (Figure 28) was inspired by both a photography collection depicting ordinary Canadians who were fighting in foreign landscapes and by nature. The building, immersed in the surrounding Ottawa River landscape, seems to manifest regeneration. This museum's green roof acts as a pedestrian walkway, which hints at its many layers of interpretation [113].

Figure 28. Canadian War Museum of History. Image source: https://www.canadianarchitect.com/new-canadian-war-museum/1000222965-1000312835/ (accessed on 16 October 2021). © Photos credit Canadian Architect.

This building's primary category is that of the **formal façade**, owing to its emphasis on **materiality**. The façade's materials (e.g., raw concrete), its rough joints and its harsh exterior form all aid in determining this classification. The second most relevant category is the **formal façade resulting from the exterior design**, which expresses the concept of regeneration and renewal, as the building seems to be springing from the earth.

5.10. Vancouver Public Library (Central Library)

The Vancouver Public Library (also known as Library Square), designed by Moshe Safdie, Richard Archambault and Barry Downs (Figure 29), houses a library, a federal office tower, and integrated retail and service facilities. According to Velazquez [114], the external form of Library Square resembles the Colosseum in Rome because of the free-standing elliptical wall that surrounds the main building, which provides skylit light for the open space between walls. Large windows from floor to ceilings offer natural light and a 360-degree view of the building's surroundings.

Figure 29. Vancouver Public Library. Image source: https://www.procore.com/jobsite/canadian-buildings-18-iconic-examples/ (accessed on 16 October 2021). © Photos by Wikimedia Commons.

Library Square would primarily be classified as possessing a façade that is **referential to architectural imagery** because the library is reminiscent of the Colosseum. The second most important category here is the **formal façade resulting from the exterior design**, as the curved exterior wall is detached from the inner spaces of the building, emphasizing an elliptical form. The main building is a rectangular box, and it is surrounded by a free-standing, elliptical, colonnaded wall. Furthermore, the library's internal glass façade overlooks an enclosed concourse formed by a second elliptical wall.

5.11. Canadian Museum of History

The architectural design of the Canadian Museum of History (Figure 30) is far removed from the traditional architecture of rectangular grids and straight-line axes. The monumental sculpture of Canada's Pacific Coast Native Peoples is found on one side of the museum in order to highlight the building's tribute to Canada's native heritage. The use of the circular ritual space illustrates that there is no single specific point of view to emphasize; rather, a variety of views are accessible due to the many arched openings in the form [115].

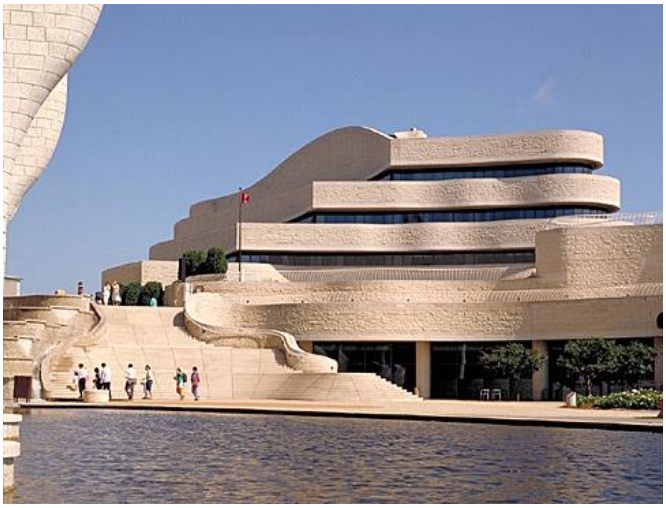

Figure 30. Canadian Museum of History. Image source: https://www.historymuseum.ca/cmc/exhibitions/cmc/architecture/images/tour150b.jpg (accessed on 12 December 2022). © Photos by Canadian Museum of Civilization.

This building primarily belongs to the category of **inspirational image façade** because it is inspired by the topographical history of the site since the First Peoples' arrival on the land. The second most relevant category is that of the **formal façade resulting from the exterior design**, as the architecture of the building is closely integrated with the architecture of the landscape.

6. Analysis of Result

In creating the categorization of façade designs, we used the building information of important buildings across Canada from 1950 to today (selecting about ten buildings from each decade). From these buildings, we chose 11 iconic buildings in order to finalize and evaluate the classification. An analysis of the categorization of façade design on these buildings can be seen in the figure below (Figure 31). The columns on the left contain important information about these buildings, such as the architect's name, the location and the year of completion. The three columns on the right stand for the three broad façade categories we identified and, by colour coding from light to dark blue, we demonstrate the degree to which the façade in question can be identified within that category.

Dark Blue: The most appropriate category
Blue: The second-most appropriate category
Light Blue: The third-most appropriate category

NO.	YEAR	City	Architect	Building Name	Building Image	UTILITARIAN FAÇADE: A.Structural Façade B.Environmental Façade: 1)Climate Responsive 2) Sustainable Façade C.Functional Façade 1)Resulting from the Parameters of the Building Program 2)Site Responsive	FORMAL FAÇADE: A) Emphasizing Materiality B) Resulting from the exterior design C) Resulting from a Tectonic approach	IMAGE FAÇADE: A)Symbolic Façade: 1)Resulting from Metaphor 2)Resulting from Inspiration 3)Referential to Architectural Imagery B)Media Façade
1	2020	Montreal	KANVA	Migration du Biodôme de Montréal				
2	2019	Toronto	Hariri Pontarini Architects (HPA)	ROM's New Terrace and Plaza				
3	2019	Calgary	Modern Office of Design + Architecture	The Livery Shop				
4	2017	Montreal	HCMA Architecture + Design, Saucier + Perrotte architectes	Complexe Sportif de Saint-Laurent				
5	2014	Halifax, Nova Scotia	Fowler Bauld & Mitchell, Schmidt Hammer Lassen Architects	Halifax Central Library				
6	2013	Newfoundland	Saunders Architecture	Fogo Island Inn				
7	2009	Winnipeg	KPMB Architects	Manitoba Hydro Place				
8	2008	Winnipeg	Antoine Predock	Canadian Museum for Human Rights`				
9	2005	Otawa	Moriyama & Teshima Architects & Griffiths Rankin Cook Architects	Canadian War Museum of History				
10	1995	Vancouver	Moshe Safdie	Vancouver Public Library (Central Library)				
11	1989	Gatineau	Douglas Cardinal, Michel Languedoc	Canadian Museum of History				

Figure 31. Analysis of the categorization of façade design on 11 iconic buildings. © Image by Authors.

Based on the above analysis, as well as the process of developing the classification (as seen in Figure 31), this study inferred the hypothesis that most of the façade designs belong to more than one category. This multifaceted nature of the façades examined in this study is illustrated in the graph below (Figure 32). More specifically, the graph shows that the most common occurrence is among buildings that have façades that are both formal and image based, suggesting that the majority of the case study buildings belong to these two categories, the most probable reason for this being their iconic nature.

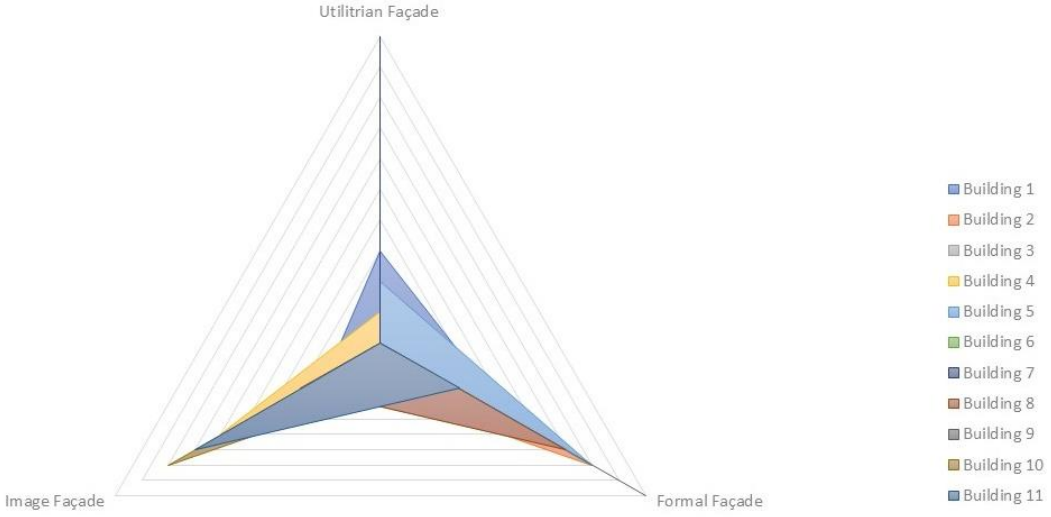

Figure 32. Graph on the frequency of each category. © Image by Authors.

7. Conclusions and Discussion

Considering the importance of the façade throughout architectural history as the face but also as the boundary, surface, skin, envelope and other more recent manifestations, the present study, by analytic induction, undertakes a total reconsideration of what the façade means in today's architectural context. The categorization elaborated aims at bringing to light and organizing a broad range of established and also emerging ideas about the building façade, thus taking into account the latest design practices.

Despite the expected and inevitable challenges in defining clearly distinct categories among façades, which, by nature, are multifaceted and often open to subjective interpretations—as to the extent that they are a result of practical or aesthetic considerations—the present study offers a preliminary yet extended glimpse across much of the contemporary façade landscape and identifies major façade qualities that correspond to common contemporary design approaches.

The findings point toward a prevalence in the aesthetic aspects of building surfaces today—an iconicity—which, in the present study, fall under what is designated as formal and image categories. The examples selected make evident that much of this trend is contingent on the proliferation of advanced image-making design tools, an image-centred culture, as well as a growing need for meaning and sense of place in today's fast-paced and transient societies.

The grid presented in the current study, with its small number of Canadian examples, is neither meant to reflect a representative picture of façades in Canada today nor can it lead to solid conclusions about their evolution but rather serves as a prototype that can be further refined and populated. Nevertheless, this device, through the eleven iconic buildings selected, achieves to reveal the tendency during the first two decades of the 21st century toward a certain formalism in façade design. This phenomenon may be an indication of the increasing dominance of new technologies in architecture that enable new experimentations with the built form and its "faces". As these new technologies, building techniques, but also environmental imperatives establish themselves in the near future into more predictable and standardized patterns, the proposed categorization, with appropriate

adjustments, could evolve further and provide a sound basis for a contemporary redefinition of the façade, which can contribute to both architectural design and the relevant theoretical discourse.

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