



ORIGINAL ARTICLE

The impact of local environment aspects on Coptic architecture in Egypt

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Abstract To understand the forces that formed the architecture in Coptic Egypt, a whole set of environmental, economical, cultural, and political forces are examined in order to differentiate these forces from those that brought the religious buildings in the Western World to where they are. These forces continued to form the style of the Coptic buildings away from the simultaneous development of the coincident styles. This research is an attempt to monitor how the different elements of Egyptian environment had forced the Coptic architects into certain directions in forms, structural systems, building materials, etc.

The study approach is formulated a process in which these buildings are interacting with and between people, place and epoch. Its main idea is to address the question about the way Coptic architects tried to deal with both natural and artificial environment to utilize their obtainable resources as far as possible.

The study will be accomplished within analytical framework with some forms of quantitative data to validate the qualitative analysis.

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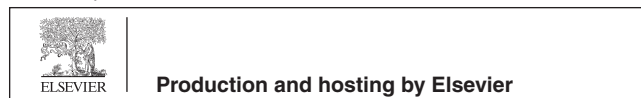
1. Introduction

For Hamilton Egyptian churches could be categorized as a distinct entity away from the rest of Early Christian and Byzantine Architecture. He affirms that its character was dictated by its ecclesiastical traditions, and its structure bears the mark of its national feelings [1].

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This research introduced a trial to monitor this entity and how the different aspects of Egyptian environment had contributed into this distinction, considering these aspects as a key of many characteristics that drew up the peculiar image of this architecture. It relates the architectural form to a web of factors rather than just making a physical descriptions of it. In view of that, the ideas of climate, natural constraints, influence of people, economics and culture as the generators of form are examined. The factors that have shaped the built environment, including beliefs, customs and socio-cultural forces are particularly considered.

This paper primary aims to develop a wider understanding of 'character–environment relationship' as a concept in Coptic architecture and clarifying its wide range treatments and its relationship with people and place.

The hypothesis is that 'the interplay between the Coptic architecture and the elements of the local Egyptian environment had led the development of the latter into certain direction with peculiar characteristics', It assumes, thereby, that Coptic architecture is not just a result of physical forces or matter of taste, but is the consequence of a whole range of socio-cultural factors in their broadest terms.

To achieve the above mentioned objective the program of the study will go in two basic lines that deal with both natural and artificial aspects of environment. It will be based on a qualitative method that depends on practical case studies and will be accomplished within analytical framework to seek empirical support for research hypotheses. This qualitative analysis will be validated by quantitative data and statistics from 142 examples in different regions and from different eras to typify different characteristics and contextual locations.

In order to bring in the influences that have contributed to the formation of this style, a critical and analytical scheme, similar to that of Sir Banister Fletcher in his eminent book of History of Architecture, had been employed¹. It is organized into two main parts; aspects of natural environment, and aspects of artificial environment. These in turn are divided into six elements, using the same elements that Fletcher used in his study, but replacing 'religion'-as all the buildings under study belonged to the same religion- with 'economy', which was one of the seven elements that Amos Rapoport has used in his book House Form and Culture, as impacting factors in generating form.

2. Aspects of natural environment

The influence of the natural environment on Coptic buildings had occurred in many forms including selection of sites, building materials, climatic treatments, etc. The evidences of this influence had a varying character that cope with the natural conditions of the different regions as in the following:

2.1. Geological aspects

Butler ascribed the choice of the site of Babelion keep, to build all these churches in, to the availability of stone and the brick from the keep. The ground was also easy digging for a well, and naturally fortified [2]. This means that sites for building churches or monasteries were not selected randomly, but rather according to certain criteria, the most important of which are:

- Having a well or a water source near the site.
- The accessibility to the site and the availability of motion and transportation around it.
- Not being so far from the cultivated land.
- Having caves for hiding.
- Having natural resources both to afford income and to build convents.
- A special significance was granted to the sites by which the holy family had passed.

The impact of natural environment did not concern only the selection of sites but appeared also in other features as in the following:

¹ Remarkable enough is it here, that this book is completely empty of any reference to this style under study.

2.1.1. Building materials

Building materials for churches were the same as these, used for domestic buildings until the 4th century. Walls were of crude brick and roofs of palm trees covered with a layer of mud [3]. When Christianity became the official religion in Egypt, churches were built of stone with marble columns and wooden roofs such as those that we see now in Cairo.

From the 6th century onwards, not only in Egypt but also in the whole Byzantine Empire, all building works were on a much smaller scale – a change that had occurred when long straight pieces of timber had become scarce as a result of clearances of forested areas, and many earlier sources of marble were no longer accessible, or the quarries were no longer worked.

The structural system also changed from trabeated to arched systems and from wooden roofs to domes and vaults. Fire risk was another motivation for wood avoidance in this era [4].

Building materials had varied in Coptic churches from one region to another and from one time to another. The treatment of these materials had also taken various shapes according to environmental and geological factors as reviewed in the following:

2.1.1.1. Stone. Christians could not make use of the quarries until the government tolerated the faith. In addition, stone needs a lot of expenses and efforts to be prepared for use. Thus, there are only few remains of churches built of stone [5]. But, the shells of the churches of Natrun Valley are generally built of limestone from the desert hills [6].

The sandstone of Nubia is perhaps one of the worst building materials in the world, being coarse in grain, soft, and yet full of hard veins and imbedded pebbles. Christian builders in Nubia more frequently employed monolithic columns of sandstone or gneiss rocks that came from the quarries near the island of *Argo*. In the southern part of the Nubian valley, so steep are the banks that even the alluvium is scarce, fragments of stone from the adjoining hills are the materials most readily available [7].

2.1.1.2. Brick. It is almost superfluous to say that the material for bricks was everywhere at hand. Only in the above mentioned area in southern Nubia, brickwork was a rarity.

Until Sudan, fuel was scarce; so it is not often that the bricks were burnt, and it is rare to find burnt bricks except for structural elements and at the lowest courses of the wall [8]. The use of burnt brick for the lower courses had two reasons. First, in Upper Egypt White Ant is very active; it could penetrate crude brickwork easily, but cannot eat its way through well-burnt brick. Stone, being bad as well as scarce, could not be used for such treatment. Second, crude brick and mortar, being chiefly of Nile mud, the salts in these materials eat considerably into the crude brick, consuming the lower courses of the walls and turning them into powder. Indeed it was not unusual to see stone, and even granite, quite disintegrated by such saline action [9].

2.1.1.3. Wood. Woodwork was found in Ancient Egypt from very early epochs, but the works that came to us from the Coptic era is much more. After the Arab conquest, scarcity of wood controlled the methods of employing it and penetrated most of the details of construction. Arches and vaults – for

example – were formed without a centering, and the largest buildings were erected without scaffolds of wood [10].

Rarity of wood was one reason for employing brick for the screens of the churches in Upper Egypt instead of wood, as greater importance was given to the churches in Cairo, where also the industrial techniques had changed in order to utilize the smallest part of wood. When local wood was used, woodwork was rather flat, and deep carving was avoided (Fig. 2.1A). When screens were made of imported hard wood, the industrial method of “Assemblage” or “Collective Panels” (Fig. 2.1B), was used. Lack of wood, especially during the crusades, forced the workmen to try using each small piece of wood [11].

2.1.1.4. Glass. From Roman to mediaeval times, glass works existed almost continuously at Netria in the eastern desert. Glass was very common in Coptic buildings, both for decoration and functional uses, as the basic materials of its industry were at hand all over the country [12]. Colored glass was used for openings with screens of wood or stucco.

2.1.1.5. Marble. As marble was a very expensive material, it was mainly used in small pieces for decorating iconostasis or ambons. They were merely used in structural elements or large masses. Most of the marbles used in the churches were brought from *El Arish* in Sinai or from old Roman temples. Marble columns were later replaced by heavy piers of masonry due to the high expense of marble and the lack of old temples’ remains after the 10th century. Furthermore, it was found that marble is easily damaged by fire more than stone [13].

Granite was also merely used due to its rarity and the difficulty to shape it and transport it from the quarries in Aswan [14].

2.1.2. Water resources

When the convent is away from direct water sources, the monks had to dig wells or make rock-tanks in which rain is collected. In the convents of Natrun Valley, the water was

close to the ground surface and it was available to dig wells there [15]. But in other cases, like in Anba Antonyous convent, where the water was very far from the surface and it was not possible to dig wells, they made earthenware pipes under ground from the nearest spring to the water tanks in the keep to use it in the times of attacks [16].

Moneret de Villard discovered another treatment in Anba Hedra convent; he found water tanks in which water brought from the Nile was stored. He estimated the amount of water that could be stored in these tanks by 30 m³. This amount was not enough for a long time, especially during sieges. Digging a well in this land, it is impossible to reach the water level. Therefore, the convent was abandoned in the 12th century [17].

2.2. Climatic aspects

Egyptian warm weather played an important rule in saving Coptic antiques for long time, although they were not built of enduring materials. Had it not been for this climate, hardly a relic would be left standing. This warm climate necessitated some climatic treatments to cope with it, the most important of which were:

2.2.1. Domes

In addition to the fire hazard, high temperature was another reason for replacing wooden roofs in Upper Egypt by domes and vaults. Being also built of brick, they had considerable effect. The openings in the upper surface of the dome also allowed the circulation of hot and cold air inside rooms [18].

2.2.2. Duxars

The Duxar is a closed area before the entrance in convents and desert churches to protect the entrance from wind and sandstorms. The keep of El Fakhoury convent has two Duxars (Fig. 2.2A); one is called the summer room and the other is called winter room [19].

2.2.3. Openings

The shining sun forced Coptic architects to avoid large openings. Small upper openings or small openings in the base of the dome were used instead. Clerestory was the ideal solution at early basilicas and it was quite enough to supply moderate, indirect, lighting for the nave [20]. Vaults on aisles were meant to be low to allow light entering the church from the openings of the domes over the nave (Fig. 2.2B) [21].

One of the best treatments in this regard is the upper openings in the cells at “*Kasr El Robaya’at*”, (Fig. 2.2C). [22]. In Anba Hedra convent, there is another technique with opening in the cells connected to pipes hidden in the walls and ending in certain position facing the wind to bring the mild breeze into the rooms. Further treatments included also:

2.2.4. Bent entrances

Most of the independent churches (not belonging to convents) in Upper Egypt had bent entrances with a porch as sort of a protected waiting area for the worshipers until the service starts (Fig. 2.2D) [23].

2.2.5. Rainwater spouts

They were provided in major churches such as The White Monastery in Suhag [24].

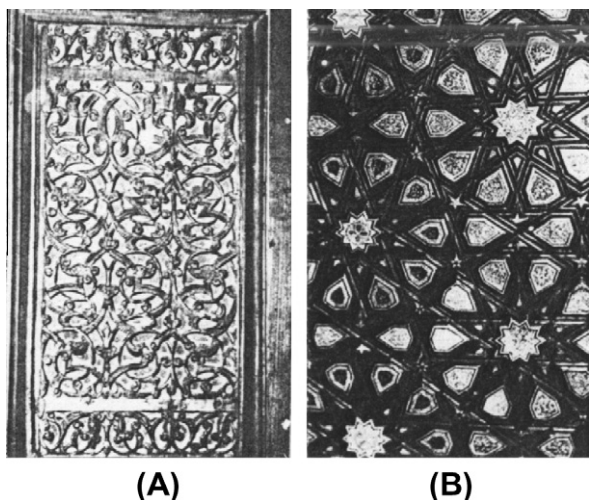


Figure 2.1 Woodwork: (A) El Moalakah church – 10th cent.: Ornamentation by carving. (B) The Virgin church, Harat Zwaitah – 11–12th cent.: “Collective Panels” [Shyha 1988, Plate: 25, 28].

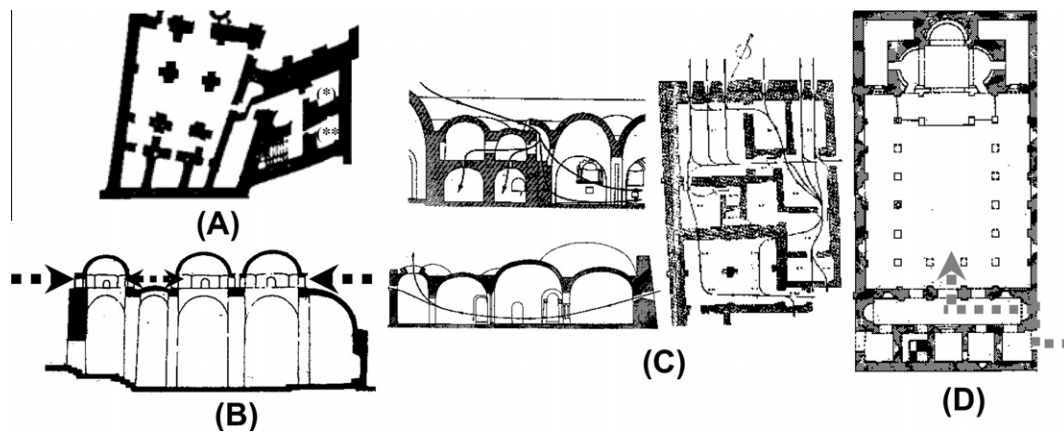


Figure 2.2 Climatic treatments: (A) *Duxars*: El Fakhoury convent – Esna (12th cent.) (*) Summer room: airy weather resulted in by the opening in the vault facing the wind and thick walls (1.2m). (**) Winter room: faces the sun most of the time [Shyha 1988, p. 243]. (B) *Openings*: The Virgin church – Fayoum (19th cent). Vaults on aisles were meant to be low to allow light entering from the openings of the dome [Grossman 1990, p:11]. (C) *Lighting and Ventilation*: Cells in *Kasr El Robaya'at* – Natrun valley (5–8th cent.) Openings in the four northern rooms were carefully distributed and placed at the top, opposite to each other, to balance the distribution of air between rooms. [Kadous, 2002, p. 65, 66, 67]. (D) *Bent entrance*: Dandarah Basilica – Quena (6th cent.) Two narthexs and a bent entrance with three turnings to reach the church entrance [Gabrah 1996, p. 114].

2.2.6. Treatments for fences

There are many examples of such treatments, the most common of which is that the side of the fence that faces the strong wind of the desert had to be stronger than the other sides to stand the wind [25]. Most of these fences in the desert were built of crude brick, although stones must have been more available. But crude brick had proved more efficient against weather changes, which turns stone into pieces, while crude brick gains more strength by heat [26]. In some other fences, like in Anba Antonyous and Anba Bola convents, there is a back corridor (originally meant for defensive purpose) provided with drainpipes. As the rain water collected in the corridor, the pipes directed it inside the fence for cultivation or inside the keep in siege times [27].

2.2.7. Building materials

Mud brick was often used for building in desert. Being a good isolator of heat with high water content, it was found more proper for such climate [28].

In Nubia churches, where the periodical rains and the incessant north-west wind might easily dispose much of the debris of crude brick, lower courses of the walls were built of stone [29].

2.2.8. Fresco

Real differences could be realized between the paintings in the churches at the Nile Valley and those in desert churches both in materials and techniques. In desert churches colors of metal origins were more preferable than those from organic origins, to be more resistant to heat, while in Nile valley organic colors were more enduring for humidity [30].

2.3. Topographic aspects

The topography of the site had sometimes dictated special arrangement to cope with the land as it goes. In desert monasteries, churches were located on the low level near the well,

while cells were located on a raised or rocky area or carved in the rocks. The monks did not usually try to flatten ground of the site. They were building their fences to be leveled as the ground changes. The location of Anba Hedra convent (Fig. 2.3A) gives an example of a site that had dictated a special location for the cells, being located around the keep on a lifted area higher than the rest of the buildings [31].

In Cairo, some changes had occurred in the churches due to the raise in the ground level of streets like Anba Shenudah church and the Virgin church in Harat Zwaitah (Fig. 2.3B). The crypt of Abu Sergah church is another example; by the 8th century the level of the ground about the little church had risen so high and the question of pulling it down could hardly have been considered due to its significance to the Christians. Easier and more reasonable was then to build above it and make it a shrine for a larger church [32].

3. Aspects of artificial environment

Early Coptic architects drew inspiration from a plethora of sources such as: ancient Egyptian, Classical, Byzantine, and Arab cultures. This fact appeared more clearly in Alexandria, Cairo and some parts of Upper Egypt, where the features of each of these civilizations emerged more obviously [33].

Other than the cultural inheritance of the Egyptian environment, economical, social and political aspects had also took part in forming the Coptic architecture as in the following:

3.1. Historical and social aspects

Tracing the development of Coptic churches, one finds two main thresholds; the Arab invasion, and Mohamed Ali up-swung to power. Before the Arab invasion, Coptic architecture was mainly affected by Ancient Egyptian and Byzantine culture. After the 8th century, in spite of the shaky relation between the Copts and the Moslem governors, features of Arab culture, especially Arabesque ornaments, had started to

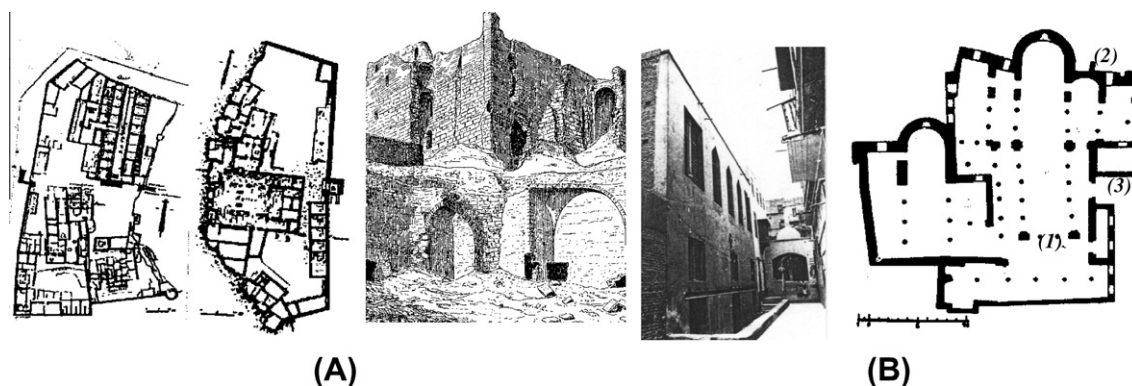


Figure 2.3 Topographical treatments: (A) *Natural Levels*: Anba Hedra convent – Aswan (11–12th cent.): The church is built against a terrace of rock, surmounted by a wall that the space within the enclosure was divided into an upper and a lower court [Clarke, 1912. P. 101]. (B) *The change of the ground level of Cairo streets*: (Left) Anba Shenuda church (8–10th cent.): the entrance door is reached by steps going down more than 2 m (Right) The Virgin church – Harat Zwaitah (11–12th cent.): the growth of the soil at the old western door choked it up with signs of another old entrance in the middle of the south aisle: (1 and 2) are the old entrances and (3) is the current entrances [El Suriyany 1995, p. 102, 107].

be seen in churches, while during the reign of Mohamed Ali's dynasty, the influence of the European Missions dominated the scene.

3.1.1. Early Christian era

At the 1st century, the community of Alexandria – the capital, was divided into three groups with three distinguishing cultures and life styles: Egyptians, Greeks and Jews. Christianity confined mainly among non-Egyptians until the 4th century, when it started to expand between native inhabitants [34].

3.1.1.1. *Before 5th century*. Even before the 4th century, the concept of originality in Coptic architecture, away from Byzantine influences, is easily recognized in many examples. Yet, a clear identity is not to be easily recognized for the following reasons:

1. The bundle between Christians and Jews at this epoch.
2. The domination of the Roman-Byzantine style on the other styles.
3. Taking refuge in turning ancient Egyptian temples into churches had participated to the obstruction of the architectural development [35].
4. The absence of clear uniformed liturgical rules for churches' design.

Starting from the 5th century the concept of worshipping had changed and a specific organization for churches' interiors had become a must. Churches were, still, not executed under a certain discipline; the bold locality in building appears very clearly in the construction methods and the stucco plaster that covers the walls to hide the bad masonry behind it [36].

3.1.1.2. *Between 5th and 8th centuries*. This period was the most prosperous period of Coptic architecture, in which most of the greatest Coptic edifices, like Suhag convents and Dandarah basilica, were erected. The reason behind this prosperity, which had also lasted for a short time after the Arab invasion, was the admittance of Christianity as the official religion of the Roman Empire.

After the 5th century, local Coptic art had become the dominant art in Egypt. It took this long time to spread over, as the native Egyptians were not very well educated, which made them ineffective in the development of early Christian art [37].

3.1.1.2.1. *Ancient Egyptian features*. The Copts took pride in their Pharaonic background. When they began to erect their own churches, it was normal that they copied their models, especially that they seemed to fulfill the requirement of the new faith [38].

Alfred Butler confirms that in spite of the similarity that may seem apparent between Coptic churches and the basilican style, "it is beyond all doubt that Coptic architecture had its own independent origin". He also says that Alexandria knew domes before Christianity, and it is more probable that "Byzantium borrowed them from Alexandria than the other way around." A curious example of the similarity between Coptic and Pharaonic relics is given by him in the comparison between the church at Gabal El Tair convent and the temple at the near town of Gergah, as he drives more than seven features of similarity between the two buildings [39].

The most important feature, in which the local spirit of Egyptian society appeared clearly, was art. This appears in the some features that were peculiar of early Coptic art and were not to be seen in any other part of the Byzantine Empire. One of the most important characteristics of Coptic art that denotes its locality was symbolism, which was widely used in funeral ceremonies such as the symbol of "Sokhis Ship". And although magic does not cope with Christian teachings, the Copts had employed some magical symbols from their predecessors like the drawing of "Alabsaderia" and "Aberzelia" (a devilish woman that refers to evil souls and the opposing magic against her evil) in St. Apollo's convent in Bawit [40].

On another hand, there is a common opinion that icons have been originated in Egypt and that the earliest known Christian icons were found in St. Catherine monastery in Sinai. It is said that they were derived from the idea of the portraits of the dead on mummy cases [41]. Ancient Egyptian subjects, like fishing and farming, had frequently occurred in early Coptic art [42]. It is also remarkable that dreadful paintings like the "Last Judgment" or "Heaven and Hell" were so common all over the world except for in Egypt, where pictures were treated

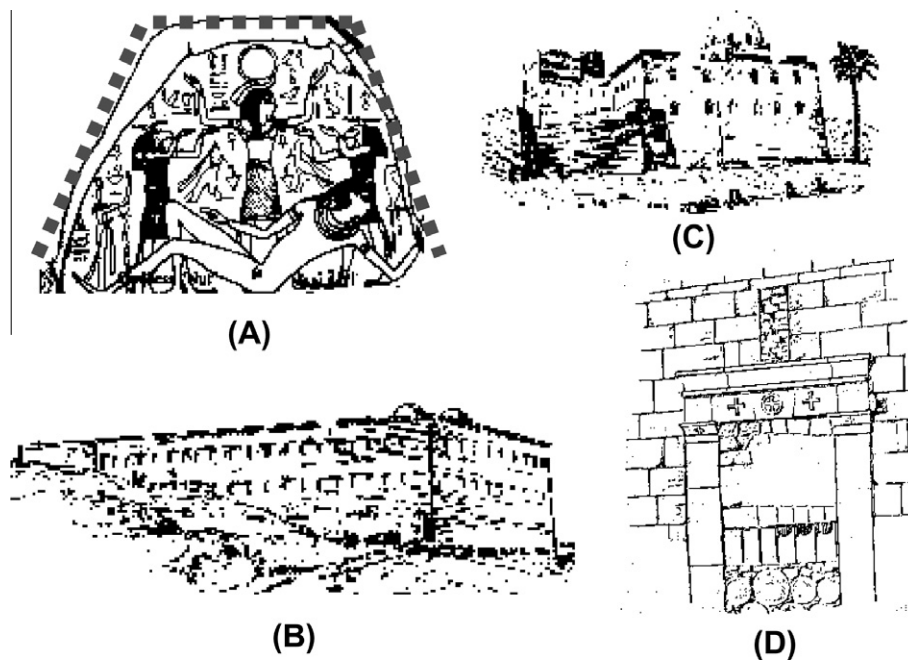


Figure 3.1 Ancient Egyptian features (A) The goddess “Nut” illustrated in the shape of a large dome. [El Surianny 1995, p. 3]. (B and C) *The White Monastery* (5th cent) and *The Red monasteries* (6th cent) in Suhag: the grandeur of old Egyptian temples with their cubical shape and the external face of the wall that slopes backward as it rises. (D) Ancient Egyptian *Gorge* in a lintel at the White Monastery [Clarke, 1912, p. 165, 149, 150].

with jesting manner similar to that of Ancient Egyptian art [43].

The ancient Egyptian cultural inheritance appears also in some features other than art, such as:

- *Domes*: Ancient Egyptian legend used to indicate the goddess “Nut” as *the dome of heaven* (Fig. 3.1A). The correlation between domes and religious buildings may have occurred due to such a background.
- *Functional distinction*: the main buildings in convents (churches and keeps) were built of stone or burnt brick, whereas the other buildings were built of crude brick. Churches, just like temples, were considered of higher value that they should last longer than any other buildings.
- *Fortress shape*: Just as Ancient Egyptian temples stood completely secluded within brick wall and were hardly to be seen above it, so was it with the Coptic churches and monasteries. Seen from a distance, they had this grim look and solid simplicity (Fig. 3.1B and C).
- *Sloping walls*: Sloping walls surmounted by a cornice of the type called “Gorge” – the mark of ancient Egyptian temples, were dominant in early churches of upper Egypt (Fig. 3.1D).
- *Pure rectangular plan*: The apse in Coptic churches is invariably internal. Standing outside, one sees a plain rectangular ending to the church, like that of Pharaonic temples, unbroken by any outward curvature as was common in basilican churches [16].
- *Spatial organization*: ever since the earliest Coptic churches, they retained a triple division like that in the ancient Egyptian temples with the same hierarchy and progression from an outer courtyard or narthex for the un-baptized Catechumens, to a nave reserved for baptized Christians, and finally a sanctuary hidden behind an iconostasis, where only the clergy were admitted. The gradual raises in the levels of

ancient Egyptian temples are also echoed in Coptic churches by the three steps between the choir and the nave and the step above the choir to the sanctuary [44].

- *Light and shadow*: Coptic architects inherited the practice of using the light for creating delightful atmosphere inside churches from their predecessors. Using domes had helped giving ambrosial impression to the building’s outlines with the sun movement along the day.

3.1.1.2.2. Roman and Byzantine features. The rarity of the examples in which these features appears proves the local spirit of Coptic churches. There are only two examples of Coptic churches,² where the typical colonnaded atrium of the 6th-century Byzantine churches appears, [45] while the Basilican Plan with wagon vaulting or wooden trusses was mainly found in the churches of Natrun Valley and Cairo, and so were the capitals with acanthus leaves, grapes, and baskets. Even the type of Fresco that was used in Coptic buildings, does not exactly follow the Byzantine technique, but it may be called Rural Fresco, being made of dough of straw and mud with a thin layer of lime of lime-sand or lime-stucco mix [46].

Yet, Coptic iconostasis was clearly following the Byzantine tradition of iconostasis with its “Royal Gate” and side entrances. Within the body of the church, icons were also distributed according to the tradition that was followed in Byzantine churches [47].

Minor details of Roman and Byzantine origins include also the so called Helena Style Apses,³ [48]; the Roman “Triraplion style”⁴ as those in the cemeteries of “El Bagawat” [49]; the

² The Basilica of St. Minas and Ashmoneen Basilica.

³ A deep apsidal apse, with recesses all round and columns against the wall, which was found in some Coptic churches between 4th and 6th century.

⁴ The building with four columns.

Broken Gabled Niches, the Shell Arches, and the classical treatment of “Diminution and Entasis”, which were all used in early churches [50]. In art, the Roman style of clothes, the details of surds, arrows and armors were also common in Coptic paintings [51].

3.1.1.2.3. North African and Syrian features. Egypt, lying at the middle of the transportation roads between North Africa and Syria, had certainly been affected by these cultures. Coptic monasteries hosted a lot of monks from these areas and they contributed transporting their styles into Coptic monasteries. One of the most important features of this interaction is the arrangements of the three altars, which was the common arrangement in the whole area between Syrian and North Africa [52], despite was so rare in western churches.

Similar characteristics included also apses or complete churches on *Triconch* and *Tetraconch* styles, which had come to Egypt from Syria, where it probably originated [53].

It is also believed that returned or western aisles was originated in northern African around the 4–5th centuries and reappeared in a wider scope in the 8th century in Egypt and Syria [54].

3.1.2. Arab domination era (middle era)

After the Arab conquest, the influence of Coptic art and architecture on Egyptian Islamic architecture and the incorporation of some Coptic features in Islamic building can be explained by the fact that the early Muslim rulers of Egypt recruited native Egyptians to undertake the building labor [55]. In later centuries, Coptic architecture also incorporated features inspired by Islamic styles. This is to be seen in the following characteristics:

3.1.2.1. Women’s area. Upper terraces or “Triforya” for the use of women congregation were included in most of the churches in Egypt. And despite this element was found in western churches, in Coptic churches it was designed in a different way, so that no glimpse to the church below, or vice versa, was allowed. The entrance to these galleries was in all cases from a separate entrance. Triforya were not common in desert churches where there are, of course, no women at all [56]. This separation had continued in later time, when provision was made in the body of the church for the presence of women. Women were ranged entirely behind (westward) the men and as the whole congregations faced the east, no interchange of glances was possible [57].

3.1.2.2. Guestroom “Mandarrah” or “Majles”. Most of old Cairo churches have outer guestroom or “Mandarrah”, where male worshipers used to meet after the service. This was certainly a social custom rather than religious ritual. Guestrooms were quite distinct from the church though adjoining it, but later renovations have sometimes removed the guestroom within the sacred building [58].

None of the desert monasteries is empty of a guestroom or a place for guests to stay overnight, as visitors are not allowed into the monks’ cells [59].

3.1.2.3. Arabesque. Under Islamic rule, and as Muslims forbade the representation of the human figure, even churches were ornamented with geometrical patterns. But even before the Arab invasion, statues were never used in Coptic churches [60]. The Over-decorated spaces and a strong tendency to-

wards filling each empty space with decorative drawings is another criterion that was in common in both Coptic and Islamic decoration and was found also in the Ancient Egyptian art [61].

Arabic, especially *Cufic*, calligraphy was frequently used side by side with Coptic calligraphy for decorating sanctuary screens with sacred inscriptions. *Mashrabya* screens and “*shorafat*” cresting in some churches in Cairo such as these in El Moalakah church (Fig. 3.2A) gives them the very same spirit as these in the neighboring mosques.

Stalactites were another type of ornamentation that was common in both churches and mosques, and although was more widely used in mosques, the first appearance of stalactites as structural treatment was actually in Abu Saifain church (Fig. 3.2B) [62]. Moreover, the arabesque pattern that Butler called “Star and Tongue” in some iconostasis in Cairo [63] is what is called in Islamic art “El Sab’aenya” pattern.

3.1.2.4. Domestic and public buildings. One of the most important Coptic domestic buildings is the house of the nuns near Mari Girgis church in *Kasr El Shame’a* (Fig. 3.2C). It is a three-storied house of Arab style, in which the first story, as usual in old Arab houses, projects some three feet beyond the ground story. *Mashrabya* screens before the entrance and all over the façade support this spirit [64].

The brides’ hall in Mari Girgis church (Fig. 3.2D) is another evidence of this influence. It consists of two side parts – “Iwan” and a middle part – “Dorka’a”, an arrangement that is positively Arab [65]. It has also rectangular niches and wooden bays for storage like those were common in Arab houses [66].

Further similarities include: wind-scoops like the one in the middle dome of Prince Taudrous church; pointed arches and Sarasinic capitals for some altar canopies in Cairo churches; and the multi domes in late Coptic churches, which is said to have been an ottoman influence [67].

3.1.3. Mohamed Ali’s Dynasty era (late era)

Starting from the Arab conquest, Coptic architecture had become almost isolated from western architecture. It was only in the reign of Mohamed Ali, when features of western architecture had come into vogue again. In this period, European missions came to Egypt in large numbers. The reflection of these missions had occurred in three different forms:

1. *Greek Plans with projecting apse:* such as in the old Morkosyah Cathedral (Fig. 3.3A).
2. *Accessories and Furniture:* such as marble altars of Greek style, polygonal pulpits on the western models, and spiral ambons that were not of rare occurrence in this era [68].
3. *Churches of the European Missions:* such churches (Fig. 3.3B) were built by European architects to serve European congregations.

3.2. Economical aspects

The economical status in Egypt through different eras had a clear influence on Coptic buildings. Coptic churches were rarely built to be huge. They were also always an aim for robberies and attacks, so that they were not so lavished with expensive ornaments, especially from outside.

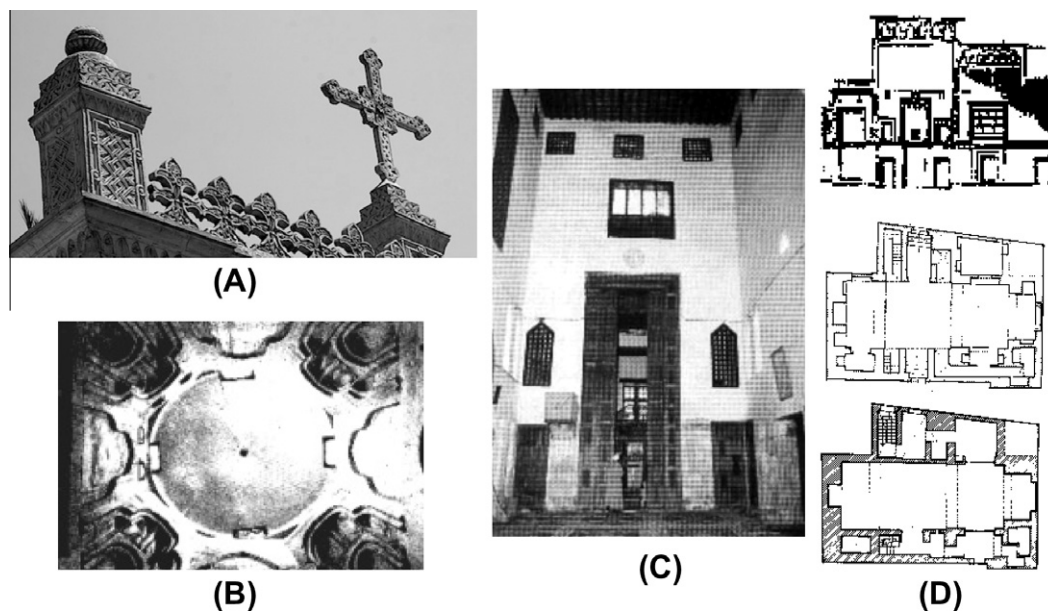


Figure 3.2 Features of Arab/Islamic culture in Coptic architecture: (A) *El Moalakah church – Cairo (10th cent): “Shorafat” cresting.* (B) *Abu Saifain church – Cairo (10th cent): The first appearance of stalactites in Egypt.* [Grossman 1989, taffel 56]. (C) *The house of the nuns – Cairo (14-15th cent.: “Mashrabeya” Screens.* (D) *The Brides’ Hall (Mari Girgis church) – Cairo (14th cent): Resembles the large halls in the Arab houses of Old Cairo with two side parts “Iwan”, and a middle part “Dorka’a”.* [El Suriy 1985 p. 94, 98].

The architecture of churches and convents were of course very much affected by the amount of money that the monks could possess in the different eras of peace or persecution. The cost of building fences and keeps in the desert monasteries – for example – should have been very high, which means that the monks could occasionally possess a lot of money [69]. On another hand, one of the reasons for not erecting campaniles, in addition to the political prohibition concerning the churches of Cairo, was that they were of very high expenses.

When the government had tolerated the Christian faith, many churches were erected by the Emperors. Churches after the 5th century used to get economical aids from the Roman emperors. The richness, which is seen in some of the churches that dates from the 5th to the 6th century, depended on this aid that lasted

only for a limited time [70]. The complex of St. Minas was financed by the Emperors Arcadius and Theodosius [71], the convent of St. Catherine was rebuilt by Justinian [72] and many convents were built by the Empress Helena such as Mari Boktor convent in Qamula, and St. John church in Antinoe [73].

The influence of economic factors had appeared in many forms, the most important of which are overviewed in the following points:

3.2.1. Architectural characteristics

The Copts had faced ages of persecution in which churches were destroyed for not paying the head-taxes. In ages of peace, these churches were rebuilt, employing the parts of the destroyed buildings in the new ones. This had sometimes resulted



Figure 3.3 Churches in Mohamed Ali's Dynasty era: (A) *Coptic churches on European styles (left) Old Morkosyah Cathedral –Cairo (19th cent.): Spiral western ambon instead of the traditional Coptic ambon. (right) El Botrosyah Church – Cairo (1911): A Coptic church built on the Greek style.* (B) *Missionary Churches in the 19–20th centuries (left) St Catherine church – Alexandria (1800) (left) Ivangilismos church – Alexandria (1869).*

in lack of uniformity and complicated the job of fixing the date to which the church belongs.

The size of the churches and their design were remarkably influenced by both economical issues and population number. When the number of the Christians was small there was a single altar in each church, regardless of its size. The two side rooms, when they existed, were empty of altars. Equipping the church with three altars probably occurred as the population numbers increased and more services were made⁵ [74].

After the 10th century, churches were getting smaller and smaller over the time. The architectural design of some churches was clearly the outcome of the rather poor material the artificers were compelled to make use of. In Nubia churches, so small the scale, the three altars were hardly placed, as the eastern end of each aisle is very small [75]. In some cases instead of building multiple churches dedicated to several saints, one church was built with multiple chapels, each one dedicated to a saint [76]. For example Anba Bakhomyous (or *El Shayeb*) convent in Luxor, which dates to 17–18th century, has five chapels and so does all the churches of Akhmym style of almost the same period.

3.2.2. Structural systems

Domes were economically used to cover large areas. Therefore, they were efficiently used in churches and large halls in convents [77].

As previously mentioned, changing the structural systems from trabeated to arched systems and from wooden roofs to domes and vaults had been related, in a way or another, to the lack of certain building materials that were so expensive and were needed for these systems.

3.2.3. Ornamentation

The churches were, although very ornamented from the inside, very poor from the outside to avoid robbery in the times of persecution and unsteadiness. The same rule seems to have been followed inside churches, but this time due to economical reasons. At the time when Butler visited the church of At Abu Saifain, he found that the choir screen is very ornamented choirwards and completely plain from inside. This contrast is usual and not exceptional and had occurred in order to save the money needed to decorate the other side [78].

Churches in rural areas were also different from those in Cairo. Cheep whitewash was the most common paint in the churches except for those of Cairo. Also the woodwork and the doors of the desert convents were empty of any inlaying like that in Cairo churches, which were occasionally financed by rich Copts.

3.2.4. Workmanship

In few buildings the bonding is fairly good and the courses alternate with some regularity as headers and stretches. These are the remains of the earliest churches [79]. But in the rural churches, especially after the 8th century, workmanship was rather primitive and not very skillful. This had occurred sometimes in Cairo too. The old church of St George (7th century) was destroyed by fire and was replaced by a “*pitiful building, in*

which all that bad taste and unskillful workmanship could do has been done” [80]. At the church of Ginitti in Nubia the workmanship was even worse. The columns are irregular in shape, unequal in length, and careless in execution, while At El Malak church in Dronka the construction was depicted as “*an example of a mean, unpicturesque vulgarity*” [81].

On another hand, even at some desert churches, where there would seem to be no reason for denying that ornamentation to the outside, which was lavished within the building, Coptic builders have entirely failed to produce a beautiful exterior, although the lines of these desert convents are extremely graceful [82]. Yet, in some other cases, some fine brickwork was used in itself as kind of ornamentation such as that at the virgin convent in *Akhmym*.

3.2.5. Political aspects

Coptic Church had suffered sequential ages of persecution including Roman persecution, Milkate persecution, and Mamlouke persecution. The periods of peace and persecution were obviously observed on buildings’ status throughout different periods. Therefore Coptic architects developed peculiar religious architecture with exceptional defensive arrangements, the development and the distribution of which had followed certain patterns and characteristics.⁶

4. Conclusion

Throughout this study it had been shown that the interplay between the Coptic architecture, in its different phases, and the elements of the local Egyptian environment is undeniable. It appeared in forms, building materials, structural systems, climatic treatments, etc. This interplay had contributed giving Coptic architecture an individual character away from the Byzantine architecture and the Christian architecture in the rest of the world afterwards. The rarity of the examples in which Byzantine features/influences appeared, supports this assumption.

A statistical survey was accomplished in Table 4-1 examining some characteristics of Coptic churches that typify this fact. The sample that was chosen for this survey represents different regions, from Nubia to Alexandria, and different epochs, from 5th to 19th century.

Table 4-2 below summarizes the results of the survey.

From these tables, it is easy to observe the major stylistic differences in the different regions and different epochs according to some issues related to its artificial environment that had been mentioned in the study. For example in south Egypt most of the churches were mainly influenced by the Ancient Egyptian style due to the abundance of the ancient Egyptian monuments in this region. It is also notable that most of the earliest Coptic churches that date from 5th to 7th century are found in this area and were built following ancient Egyptian – not Byzantine – tradition as it was the dominant style in Egypt at that time.

In middle Egypt the short plan with transverse axis, covered with a series of domes was more common. Strange enough, a very special form of plan had occurred in the churches of Akhmym between 15th and 17th century. This plan was not found in any other region in Egypt and was not used in any other

⁵ In orthodox liturgy, at least 9 h should separate each two services held on the same altar. So, more altars within the same church are needed in order to facilitate holding more services in the church within the same day.

⁶ These arrangements had been thoroughly discussed and over-viewed in a previous study by the researcher.

Table 4-1 Churches' characteristics.

Date	Name of the church	Building material	Structural systems	Openings	Women area	Style	
<i>A – Upper Egypt</i>							
18–19th	The convent of the five	Crude brick	Domes on squinches	Small	✓	12 Domes	
5th	Anba Armya convent	Stone	Old columns	NA	✗	Basilican	
NA	The virgin church (El Adawya)	Crude brick + stone	3 High domes + flat roof	In the dome	✓	Irregular	
14th	El Kosair convent	Crude brick + stone	1 Dome on brackets + v. thick walls	In the dome	✓	Byzantine	
12th	Anba Barsum convent	Burnt brick	Domes and vaults	Moderate	✗	Basilican	
8th	Helwan old churches	Burnt brick	NA	NA	✗	Basilican	
18–19th	The apostles convent	Burnt brick	Domes on squinches	Moderate	✗	12 Domes	
15th	El Maymoun convent	Crude + burnt brick	Granite columns	Domes on squinches	Moderate	✗	Basilican
12th	El Azab convent	Crude brick + stone	2 Domes on squinches	In domes	✓	Twins domes	
5th	Angle Gabriel convent	Crude brick + stone	Flat roof + domes on brackets + old columns	Very small	✓	Basilican	
NA	The Virgin conv. (Fayoum)	Burnt brick	2 Domes on brackets + vaults	Very small	✗	Basilican	
7th	Anba Samuil conv (Magaga)	Crude + burnt brick	Stone vault	Moderate	✗	Irregular	
18–19th	El Sankorya convent	Burnt brick	Domes on squinches	Moderate	✗	12 Domes	
18–19th	Mari Mina conv. (samaloot)	Burnt brick	Flat roof + domes on pendentives	Moderate	✓	12 Domes	
18–19th	Anba Athanathious (Matay)	Crude + burnt brick	Domes on pendentives	Large	✓	12 Domes	
NA	Abu Saifain ch. (Samaloot)	Burnt brick	Domes on squinches	Small	✓	12 Domes	
NA	Mari Mina ch. (Samaloot)	Burnt brick	Domes on squinches	Small	✓	12 Domes	
NA	The Virgin ch. (Gabal El Tair)	Stone	Flat roof of stone	Very small	✗	Irregular	
NA	Abahor convent	Crude brick + stone	Flat roof of stone	✗	✗	Irregular	
6th	Abu Fana convent	Crude brick	Flat roof + 1 dome on brackets + old columns	Very small	✗	Basilican	
18–19th	Anba Bagoul convent	Burnt brick	Domes on pendentives	Very small	✓	12 Domes	
5th	Ashmoneen Basilica	Stone	Old columns	NA	✗	Basilican	
18–19th	The Angle church (Malawy)	Crude brick	Flat roof + domes on pendentives	Small	✓	12 Domes	
NA	El Diek convent	Crude brick	Vaults	Very small	✗	Nun basilican	
NA	Antinoe convent	Stone + crude brick	NA	NA	✗	Basilican	
6th	The church south of Antinoe	Crude brick	NA	NA	✗	Basilican	
6th	Abu Hanas conv. (Malawy)	Stone + crude brick	Flat roof (replaced by domes)	Moderate	✗	Basilican	
12th	El Borsha convent	Crude brick	Domes on brackets + half domes	Very small	✗	Byzantine	
18–19th	The Virgin ch. (Dair Muas)	Burnt brick	Shallow domes on pend + 1 dome on squin	Moderate	✓	12 Domes	
18–19th	Anba Serabamon conv	Crude brick	Shallow domes on pendentives	In the dome	✓	12 Domes	
NA	El Kasier convent (El Kosya)	Stone + crude brick	NA	NA	✗	Irregular	
13–16th	El Moharak convent	Crude brick	Shallow domes on squin + wooden roof	Very small	✗	12 Domes	
18–19th	El Shaheed Taudrous	Burnt brick	Shallow domes on pendentives	Moderate	✓	12 Domes	
6th	Mankabad churches	Stone + crude brick	NA	NA	✗	Basilican	
18–19th	The Virgin ch (Manfalot)	Crude brick + burnt brick	Shallow domes on pendentives	In domes	✓	9 Domes	
NA	Suspended conv. of Mari Mina	Stone	Flat roof	Very small	✗	Irregular	
18–19th	Mari Girgis ch. (Bani Mur)	Burnt brick	3 domes on squinches	Moderate	✓	12 Domes	
NA	Basri convent	Crude brick	2 domes on brackets and squinches + flat wooden roof	In domes	✗	Irregular	
15th	Anba Hermina	Crude brick	8 domes on pend. + 1 on squinches	Very small	✓	9 Domes	
5th	The Virgin ch. (Dronka)	Stone + crude brick	Flat roof of straw and mud	✗	✗	Irregular	
5th	Rifa convent	Stone + crude brick	Flat roof	✗	✗	Irregular	
5th	Anba Athanathious church	Burnt brick	Flat wooden roof	Very small	✓	Basilican	
6th	El Balayza convent	Stone + crude brick	NA	NA	✗	Irregular	
6th	El Ganadlah convent	Stone	Flat roof + stone dome	✗	✗	Irregular	

Table 4-1 Churches' characteristics.

15th	Virgin ch. (El Ganadlah conv.)	Crude + burnt brick	Flat roof + domes	In domes	✘	12 Domes
16–18th	Abu Makar	Burnt brick	Domes on squinches	Moderate	✘	12 Domes
NA	Keryakous & Yolita church	Burnt brick	Flat roof + wooden dome	Very small	✘	Basilican
18–19th	El Shaheed Felosaus church	Burnt brick	Flat roof + wooden dome	Very small	✘	Irregular
5th	White monastery	Limestone + burnt brick + Granite columns	Flat roof (replaced by domes & vaults)	Very small	✘	Triconh
6th	Red monastery	Burnt brick + Limestone + granite columns	Flat roof (replaced by domes and vaults)	Very small	✘	Triconh
16–17th	Anba Shenuda (Akhmym)	Crude brick	Domes on pendentives	Very small	✘	Akhmym st.
14th	Anba Tomasa (Akhmym)	Crude brick	Shallow domes on pendentives	Very small	✘	Triconh
6–7th	Anba Bakhom (Akhmym)	Crude brick	Wooden roof + wooden dome	Moderate	✘	Triconh
15–17th	Abu Saifain (Akhmym)	Burnt brick	Shallow domes on pendentives	Small	✘	Akhmym st.
15–17th	St Demyana (Akhmym)	Burnt brick	Shallow domes	Small	✘	Akhmym st.
15–17th	The virgin ch. (Akhmym)	Crude brick	Shallow domes + 1 on pendentives	Very small	✘	Akhmym st.
15–17th	El Shohadaa conv. (Akhmym)	Crude brick	Shallow domes	Very small	✘	Byzantine
15–17th	The angle conv. (Akhmym)	Crude brick	Shallow domes + 1 on pendentives	Very small	✘	Akhmym st.
15–17th	The seven mountains convent	Stone	Flat roof	Very small	✘	Irregular
15–17th	Mari Girgis conv. (Akhmym)	Crude brick	Shallow domes + 2 on pendentives	In domes	✘	Akhmym st.
16–17th	Anba Besada convent	Crude brick	Shallow domes + 1 on brackets	Very small	✘	Akhmym st.
NA	The virgin ch. (El Manshaa)	Crude brick	Flat roof + wooden dome	Moderate	✘	Akhmym st.
16th	The angle conv. (Gerga)	Crude brick	Shallow domes + 2 on pendentives	small	✓	Akhmym st.
NA	The virgin ch. (El Belina)	Burnt brick	Shallow domes + 2 on brackets	Moderate	✘	Akhmym st.
NA	El Naghamish convent	Burnt brick	Domes on brackets	Moderate	✘	12 domes
15th	St. Demyana and Anbba Moyses	Burnt brick	Domes on brackets	Moderate	✘	Irregular (7ch.)
16–17th	Anba Badaba	Burnt brick	Shallow domes on penden. + wooden dome	Small	✓	Irregular (9ch.)
4–5th	Anba Bakhomyous Basilica	Stone + granite	Old columns	NA	✘	Basilican
6th	Dandarah basilica	Stone	Old columns	NA	✘	Triconh
18–19th	Mari Girgis (Nakada)	Burnt brick	Shallow domes	Moder. (few)	✓	12 domes
6th	El Hayz convent	Stone	Old columns	NA	✘	Basilican
6th	Mari Matta (El Dakhla)	Stone	Old columns	NA	✘	Basilican
17th	Abu El Lief convent (Nakada)	Crude + burnt brick	Shallow domes + vaults	Very small	✘	12 domes
14–16th	Angle Michael (Kamula)	Crude + burnt brick	Shallow domes on pend (conical-primitive) + vaults	Very small	✘	Byzantine
12th	El Mogamaa conv (3 churches)	Burnt + crude brick	Shallow domes on squin. + pend. + vaults	Very small	✘	Byzantine
15–19th	The cross convent	Crude brick + stone	Shallow domes on pend. (oval)	In the dome	✘	Nun basilican
9–11th	Mari Bektor convent (Nakada)	Crude + burnt brick	Domes on brackets + vaults + conical vault	Very small	✘	Byzantine
NA	Abu Saifain (Nakada)	Burnt brick	Flat roof + 3 shallow dome	Moderate	✓	Irregular
18–19th	Mari Bektor convent (Hegaza)	Burnt brick	Shallow domes on pendentives	Small	✓	12 domes
17–18th	El Shayeb convent	Burnt brick + stone	Shallow domes (29 dome)	Moderate	✘	Irregular
6th	Churches beside Luxor temple	Stone	Old columns	NA	✘	Basilican
15th	El Mohareb convent	Stone + burnt brick	Shallow domes (oval) + semi domes	Small	✘	Irregular
NA	El Romy convent	Stone + burnt brick	Flat roof + domes on pendentives	Small	✘	Irregular
8th	Inside Habu temple	Stone	Old columns	NA	✘	Basilican
16–17th	All saints convent (Tod)	Crude brick	Shallow domes on pendentives	Small	✘	Irregular
6th	Basilica Armant	Stone	Old columns	NA	✘	Basilican
18–19th	Mari Girgis conv. (EL Rozaikat)	Crude brick	Shallow domes	Small	✘	Nun basilican
12th	El Fakhory convent	Crude + burnt brick	Shallow domes (central high + 4 shallow on corners) + on pen + vaults	Small	✘	Byzantine
11–12th	El Shohadaa conv (Esna)	Crude brick	Domes on brackets + pend + cross vaults	Moderate	✘	Irregular
NA	Anba Bakhomyous (Edfo)	Burnt brick	Shallow domes	Small	✓	Irregular

Table 4-1 Churches' characteristics.

12th	El Kobanya church	Crude brick	1 dome on brackets	Small	✓	Triconch imitation
11–12th	Anba Hedra	Crude brick + burnt brick + stone	Domes on brackets + stone vault + semi domes	Small	✗	Triconch imitation
9–13 th	Anba Antonios conv. (Red sea)	Tree branches + burnt brick + stone	Shallow domes on pend + vault	Small	✓	Nun basilican
5 th	Shams El Deen church	Stone	NA	NA	✓	Basilican
17 th	Anba Bola conv. (red Sea)	Stone + burnt brick	Domes on brackets	Small	✗	Irregular
<i>B – Lower Egypt, Cairo & Nubia:</i>						
4–5th	Cillia churches	Crude brick	NA	NA	✗	Basilican
8th	The Syrian convent	Roughstone + Burnt brick	Pointed vault + domes on squin + 2semi domes	Small	✗	Basilican
9–14th	St Mariam ch. (Syrian conv.)	Lime stoneBurnt brick	Barrel vault + domes on brackets	Small	✗	Byzantine
8–10th	Anba Beshoy convent	Burnt brick + stone	Pointed vault + domes on squinches	Small	✗	Basilican
14th	Abu Makar convent	Crude brick + burnt brick + lime stone	Pointed domes + vaults	In domes	✗	Byzantine
7th	El Baramous conv	Burnt brick + stone	Pointed domes + pointed vaults	In vaults	✗	Basilican
6th	Basilica Abu Mina	Stone	NA	NA	✗	Basilican
8th	Burial church	Stone	NA	NA	✗	Basilican
6th	The church at Ain Makhura	Stone + crude brick	Old columns	NA	✗	Irregular
7–8th	Mari Saba church	Burnt brick	Flat roof	Moderate	✗	Basilican
6th	Tapoziros church	Stone	NA	NA	✗	Basilican
5th	The church at Marina	Stone	NA	NA	✗	Basilican
4–5th	The church at Burg El Arab	Stone	NA	NA	✗	Basilican
4–5th	The church at El Farama	Burnt brick + stone	NA	Very small	✗	Irregular
5–6th	The church at Tal El Makhzan	Stone	NA	NA	✗	Basilican
5–6th	The 3 churchs at Austrakin	Stone	NA	NA	✗	Basilican
5th	St Catherine convent	Burnt brick	Peached roof	Moderate	✗	Basilican
19th	Mari Girgis Ch. (Sandabis)	Burnt brick	2 Domes on pen. + cross vaults on corners	Small	✓	Basilican (1 minaret)
18–19th	Angle Michel (Kafr El Dair)	Burnt brick	2 Vaults + 6 domes on pendentives	Moderate	✓	Nun basilican (2 minarets)
18–19th	Angle Michel (Seberbay)	Burnt brick	2 Domes + flat roof	Moderate	✓	Nun basilican
18–19th	The Virgin ch. (Ashfin)	Burnt brick	3 Domes on pen. + flat wooden roof	Moderate	✓	Nun basilican
18–19th	Mari girgis (busat)	Burnt brick	Flat roof + octagonal dome	Moderate	✓	Nun basilican
18–19th	The Virgin ch. (Raydanya)	Burnt brick	3 Domes on squin. + 4 domes on the corners + 1 in the center + flat roof	Moderate	✗	Nun basilican
18–19th	Mari Girgis church (Mit Ghamr)	Burnt brick	2 Vaults + flat roof	Moderate	✗	Irregular
18–19th	Mari Girgis church (Sahragt)	Burnt brick	2 Vaults + 3 domes on pendentives	Moderate	✓	Nun basilican
18–19th	El Sitt Refka church (Sonbat)	Burnt brick	2 Vaults + 3 domes on pendentives	Small	✓	Irregular
18–19th	Mari Mina church (Abyar)	Burnt brick	3 Domes on chapel. + 4 domes on the corners + 1 in the center + flat roof	Small	✓	Basilican (1 min.)
18–19th	The Virgin church (Abyar)	Burnt brick	2 Domes + flat roof	Moderate	✓	Basilican (2 minarets)
18–19th	Anba Serabamon (Batanon)	Burnt brick	2 Domes + flat roof	Small	✓	Nun basilican (1 mi.)
18–19th	The Virgin ch. (Sobk El Ahad)	Burnt brick	2 Domes on chapel & the center. + 4 domes on the corners	Moderate	✓	Basilican (2 minarets)
18–19th	Anba Serabamon (Mlig)	Burnt brick	3 Domes on chapel. + 4 domes on the corners + 1 in the center + flat roof	Moderate	✓	Basilican (2 minarets)

Table 4-1 Churches' characteristics.

18–19th	St Abanoub (Samanood)	Burnt brick	3 Domes on chapel. + 4 domes on the corners + 1 in the center + flat roof	Small	✓	Basilican (2 minarets)
18–19th	The Virgin ch. (Fisha)	Burnt brick	3 Domes on chapel. + 4 domes on the corners + 1 in the center + flat roof	Moderate	✓	Basilican (2 minarets)
12–13th	St Demyana (Belkas)	Burnt brick	4 Domes	Very Small	✗	Irregular
7th	St Sergious (Abu Sergah) ch.	Burnt brick + lime stone	Wooden peached roof + wooden vault + flat roof + 2dome on stal. + wagon vault (crypt)	Small	Upper fl.	Basilican
7–8th	St Berbarah church	Burnt brick	Wooden vault + flat roof + 2semi domes on stal.	Moderate	Upper fl.	Basilican
9–10th	El Moalakah church	Burnt brick + stone	Wooden vault + flat roof	Moderate + Mashrabya	Upper fl.	Basilican
9–10th	Kasryat El Ryhan church	Burnt brick	4 shallow domes on pend + flat roof + vault	Moderate + Mashrabya	✗	Irregular
10th	Abu Saifain church	Burnt brick + stone	Peached wooden roof + 4 half domes on brackets + dome on pend. + fan vaults	Moderate + Mashrabya	✓	Basilican
8–10th	Anba Shenuda church	Burnt brick	Wooden peached roof + flat roof + 2shallow domes on pend.	Moderate + Mashrabya	✓	Basilican
8th	El Damsherya church	Burnt brick	Wooden vault + flat roof + 1dome on pend.	Moderate + Mashrabya	Not any more	Irregular
11th	The Virgin ch (Bablon El Darag)	Burnt brick + stone	Wooden vault + falt roof	Moderate + Mashrabya	Upper fl.	Irregular
11th	Prince Tadrous	Burnt brick	6 Domes (2 deep + 4shallow on pend. and stal.) + cross vaults + flat roof	Moderate	✗	Irregular
10–11th	The angle ch. (Bablun El Darag)	Burnt brick	Domes on brackets	Moderate	✓	Irregular
11–12th	The Virgin ch. (Harat Zwaila)	Burnt brick	Wooden vault + dome on stalactites	Moderate + Mashrabya	✓	Basilican
18–19th	The Virgin ch. (Harat El Rum)	Burnt brick	Domes on brackets and pendentives	Small	Upper fl.	12 domes
8th	Mari Mina ch. (Fom El Khalig)	Burnt brick + stone	Brick vault with stone ribs	Moderate + Mashrabya	✓	Basilican
7th	Wady Gahzaly	Crude brick + stone	Brick vault	NA	✗	Basilican
7th	Fila church	Stone	NA (probably tunnel vault)	NA	✗	Basilican
7th	Sitt Gashma	Burnt brick + stone	Tunnel vault	NA	✗	Basilican
7th	Qirush	Stone	Tunnel vault	NA	✗	Basilican
7th	Suba	Burnt brick + sand stone	NA	NA	✗	Basilican
7th	Mahndy	Burnt brick + stone	Tunnel vault	NA	✗	Basilican
7th	Kasr Abrym	Burnt brick + stone	Tunnel vault	NA	✗	Basilican
7th	Gabal Addah	Burnt brick + stone	NA (probably flat roof)	NA	✗	Basilican
7th	Sera	Burnt brick + stone	Cenntral dome + tunnel vault	NA	✗	Basilican
9–11th	Fakir Deeb church	Burnt brick + stone	NA	Very small	Upper fl.	Nubia st.
9–11th	Garf Hosain	Crude brick	NA	Very small	Upper fl.	Nubia st.
9–11th	St Rafael church (Tameet)	Burnt brick + stone	8 Shallow domes + 1 high at the middle + vaults	Very small	Upper fl.	Nubia st.
9–11th	Qau church	Burnt brick + stone	8 Shallow domes + 1 high at the middle + vaults	Very small	Upper fl.	Nubia st.
9–11th	Gandinary church	Burnt brick + stone	8 Shallow domes + 1 high at the middle + vaults	Very small	Upper fl.	Nubia st.
9–11th	Abdallah Nirqi church	Burnt brick + stone	8 Shallow domes + 1 high at the middle + vaults	Very small	Upper fl.	Nubia st.
12–14th	Madique el Nuba	Burnt brick + stone	Vaults	Very small	Upper fl.	Nubia st.
12–14th	Shayma Amalica	Burnt brick + stone	2 Domes + 2 vaults on sides + 1at western end	Very small	Upper fl.	Nubia st.
12–14th	North of Kasr Abrym	Burnt brick + stone	2 Domes + 2 vaults on sides + 1at western end	Very small	Upper fl.	Nubia st.

Table 4-1 Churches' characteristics.

12–14th	Basilica Tameet	Burnt brick + stone	2 Domes + 2 vaults on sides + 1st western end	Very small	Upper fl.	Nubia st.
12–14th	St Rofaeel	Burnt brick + stone	2 Domes + 2 vaults on sides + 1st western end	Very small	Upper fl.	Nubia st.
12–14th	Faras	Burnt brick + stone	2 Domes + 2 vaults on sides + 1st western end	Very small	Upper fl.	Nubia st.
12–14th	Adendan	Burnt brick + stone	2 Domes + 2 vaults on sides + 1st western end	Very small	Upper fl.	Nubia st.
12–14th	Gandal Arki	Crude brick	NA	Very small	Upper fl.	Nubia st.
12–14th	Fakir Antawi	Burnt brick + stone	2 Domes + 2 vaults on sides + 1st western end	Very small	Upper fl.	Nubia st.

(1) This sample includes almost all the Coptic churches that were built between 5th and 19th century. Only some churches of irregular shapes or completely ruined were neglected. (2) Original structural systems had been mentioned as much as possible. (3) The dimensions are for outer walls, apses and inner door has different measurements. Some churches have different thickness for the four sides, the measurement here is the average.

Remarks (Upper Egypt): (1) The churches beside Luxor temple : the columns of the churches imitates the columns of the temple but in a smaller scale. (2) In most of the buildings stone or burnt brick is used for structural elements while crude brick is used for walls. Most of the churches before 8–9th centuries used the old monolithics.

Remarks (Lower Egypt): (1) In the syrian convent: There was a wooden roof which was replaced by a stone vault. (2) Anba Beshoy convent: The church used to have a wooden roof that was replaced by stone vault. The thin columns, which used to carry the wooden roof, had been also removed. (3) El Baramous convent has an outer dining room for feeding strangers without entering the fences of the convent. The wooden roof of the church had been also replaced by domes and vaults. (4) Basilica Abu Mina: the marble of the main basilica was transported to Baghdad in the Abbassid era. The Roman bathes (5–6th century) are the only part built red brick to resist water. (5) The openings in most of the churches, even if they are of a moderate size, are very high. (6) The structure form which was common in lower Egypt is flat roof + 1 central dome + 4 domes on the corners. Or 3 dooms on chapels + 2 vaults on the nave. (7) St. Catherine convent was built by Gostinyanous in the 6th century. But, the pitched roof is from the 15th century.

Table 4-2 A summary of the results of the survey.

Upper Egypt (95 total)			Lower Egypt (34 total)			Cairo (13 total)		
<i>Building materials: economical feature</i>								
B. brick	C. brick	Stone	B. brick	C. brick	Stone	B. brick	C. brick	Stone
30	40	25	22	1	11	13	0	0
Combination of 2 materials = 31			Combination of 2 materials = 7			Combination of 2 materials = 5		
<i>Openings: climatic feature</i>								
Small	Moderate	In domes	Small	Moderate	In domes	Small	Moderate	In domes
46	20	9	10	13	2	2	11	0
16 churches not available (ruined)			9 Churches not available (ruined)			0 Churches not available (ruined)		
4 churches has no openings at all			0 Churches has no openings at all			0 Churches has no openings at all		
<i>Roofs: climatic and economic feature</i>								
M. domes	Coalition ^a	Flat roofs	M. domes	Coalition	Flat roofs	M. domes	Coalition	Flat roofs
36	24	19	7	15	1 + 1peach.	1	12	0
7 churches NA + 9 old columns			9 Churches NA + 1 old columns			0 Churches NA + 5 old columns		
<i>Women area: social feature</i>								
Triforya	In the nave	None	Triforya	In the nave	None	Triforya	In the nave	None
0	25	70 ^b	1	13	20	6	5	2
						Triforium of El Damsherya was blocked		
<i>Style: cultural feature</i>								
Basilica	12 Domes	Others	Basilica	12 Domes	Others	Basilica	12 Domes	Others
21	20	44	19	0	15	7	1	5

^a The term "Coalition" refers to multiple vaults, or an alliance of domes, vaults and flat roofs.

^b Most of these churches were built between 18th and 19th century, in which the southern part of the church was usually reserved for women but with no physical separation like this that was found before.

period other than those churches in this particular time and this particular region. This could be explained by the fact that this model resembles the Nubian model of churches, and most of these churches were built around the time when the Nubian kingdom controlled Upper Egypt and shortly after it.

The churches of the Delta also utilized multiple domes arrangement, but not in large numbers like those in middle Egypt churches. Only three or five domes, accompanied with flat roofs, were used. Furthermore, in the churches in Delta plans were rather prolonged and short plans rarely occurred. The arrangement of the multiple domes is probably related to Ottoman influence, especially that most of these churches were built after the 17th century.

The churches of Cairo had totally different character with its wooden roofs – either barrel vaults or pitched roofs – and their rather unique ornamentation, where the arabesque spirit of ornamentation is very obvious. Desert churches also introduced their own character with basilican plans covered with an assembly of vaults and domes and reflecting a similar attribute like these of Old Cairo.

It was also notable that churches had developed from time to time from longitudinal axis to transverse axis and vice versa, according to the population number and economic issues.

Some other characteristics of Coptic churches that are not to be found in any other place like the women area at the western part of the nave, the Doxars, the Mandarah, etc., are also evidences of the deep locality of this style and a reflection to the local spirit in it, as they had certainly taken place due to social and cultural factors and not to a religious ritual.

From the tables, it is also easy to realize the differences between the churches in the different regions that had occurred due to the natural environment. Building materials, number of openings, and their sizes, reflect this fact. The big number of stone churches in Upper Egypt and the rarity of these churches in Cairo and Lower Egypt is another evidence of it.

From this, it can be concluded that the overall architectural character of Coptic architecture – as thoroughly discussed above – had differed from region to region and developed from an era to another, due to the interaction with the elements of both the natural and artificial environment in Egypt and was a consequence of the defining factors related to this particular context.

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