ARCHITECTURE IN MULTICULTURAL COMMUNITIES AN ANALYTICAL STUDY OF THE IMPACT OF CULTURAL DIVERSITY ON CHURCHES THROUGH COPTIC ERA

By

Arch. Maha AbouBakr Ibrahim

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
ARCHITECTURAL ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Architecture in Multicultural Communities

An Analytical Study of The Impact of Cultural Diversity on Churches Through Coptic Era

Key Words:
Multiculturalism; Coptic architecture; Coptic Churches; Shape grammars; Rule schemata

Summary:

Multiculturalism is a two-edged sword, with its negative and positive repercussions on society in general and on architect in particular. For more than 30 years, researchers in the West have taken this approach to research and scrutiny to address its disadvantages. While the Egyptian society of deep history has long experience in this regard, and consequently an impact on the inherited architectural product. Hence the interest of this research focuses on a part that has been ignored from this history, the Coptic era and its architectural heritage of ancient churches. Through research into the nature of this society it has been shown that it is an interactive plural community, which has dynamic cycles to transform or reform its identity. The largest possible number of floor plans of the churches that were established from the 300 C.E. to the 900 C.E., were analyzed to determine the grammatical shape rules governing their formation so that their architectural language could be derived and the cultural roots of those bases were followed. It was found that architects of the time were able to simply and spontaneously interact with their inherited cultures and incoming cultural groups, and offer an architectural product that fulfills their needs, expresses their identity and deals with the tools of their time, avoiding a large part of the negativity of multiculturalism.

In the name of Allah, the Entirely Merciful, the Especially Merciful

And obey Allah and His Messenger, and do not dispute and [thus] lose courage and [then] your strength would depart; and be patient. Indeed, Allah is with the patient

Allah the Almighty always says the truth.
(The Holy Koran, Sura Al-Anaal, Verse 46)

سورة الأنفال، الآية 46

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For my parents
to whom I owe every achievement in my life.
I also dedicate this work to my brothers
and my sweetest sister.

Table of Contents

List of Tables

List of Figures

Abstract

According to the views of many authors and researchers, multiculturalism is a double-edged sword, with its positive and negative aspects which, in turn, affect the society in general and the architect in particular as part of the overall composition of society. Thirty years ago, researchers studied multiculturalism in western countries as they were interested in presenting, scrutinizing and addressing the negative part of it. It is based on two basic problems: the first is the fragmentation and division of different cultural groups within a society; the second is the denial, neglect or forgetfulness of its heritage. Since Egypt is a country deeply rooted in history, it has long been subjected to large periods of multiculturalism and has a valuable experience in this field to benefit from and to trace how all that has affected Egypt's architectural production process.

Hence, the importance of this dissertation is that it examines carefully and in minute details one of the neglected periods in the history of Egypt, which is the Coptic era. During that period of time, different cultural groups lived in Egypt and left behind a rich architectural heritage worth of study and analysis in order for architects to maximize the pros and reduce the cons, and also to be conscious enough not to fall into the trap of the disadvantages of multiculturalism and benefit from its potentials.

The research investigates the social situation of the Egyptian society and determines its type in terms of multiculturalism, whether it is a cosmopolitan society or a fragmented pluralism or interactive pluralism society. Each type has its own features and characteristics that affect any architectural product. Research and study have shown that it is a dynamic and interactive plural society with a strong and clear identity that can be observed in its architecture with a cycle of interaction that passed through different periods of time until it reached full maturity.

The study examines the largest possible number of architectural floor plans of churches established throughout the Coptic period (from 300 CE to 900 CE); they were carefully analyzed and the grammatical rules governing their formation were determined to deduce the architectural language of the churches of that period so as to identify the cultural roots of these rules, and to know to what extent the architects back then were able to assimilate the inherited cultures alongside the cultures to which they were exposed, and how they could weave them into an architectural product that would meet the needs of the society, with the tools used at that time, and expresses their identity.

In conclusion, the architects of that era were able to simply and spontaneously avoid a great deal of the disadvantages of multiculturalism; they made good use of their capabilities in weaving diverse cultures within their society into a unique and innovative architectural product that expressed their identity and time on a strong basis of the architectural culture inherited from the ancient Egyptians. However, this does not mean that those architects did not go through the same periods of imbalance experienced by the Egyptian society during the dynamic process of transformation, which was characterized by some attempts to deny the inherited architectural culture. This did not occur in a complete manner due to the nature of that cohesive society, dominated by conformity pressures of unity, as well as the development of new architectural solutions that emerged with exposure to new cultures.

Chapter 1 Introduction

1.2. Scope of Work

1.3. Research Problem

1.4. Research Goals and Objectives

1.5. Hypothesis

1.6. Research Limitations and Delimitation

1.7. Research Methodology

1.8. Research Outline

1.8.1. Chapter One: Introduction

1.8.2. Chapter Two: Multiculturalism Definitions and Types

1.8.3. Chapter Three: Multiculturalism in Egypt through Coptic Era

1.8.4. Chapter Four: Shape Grammars as an Analytical Tool and Preliminary Analyses of Coptic Churches

1.8.5. Chapter Five: Language of Coptic Churches in Preference to Time, Form and Shape Grammars

1.8.6. Chapter Six: Discussion and Recommendations

1.9. Expected Findings

1.10. Conclusion

1.1. Introduction

In the last few decades, multiculturalism became an issue for many authors and philosophers. Many reasons affected the social structure of different communities all over the world, whether the old countries or the emerging ones. Nowadays, researchers in the civilized countries recognize the importance of studying this phenomenon, which is to stand on its nature and influence on communities. By introducing some of those researches, it is easy to notice that authors usually reach negative conclusions about their case studies [1]. In other words, they draw attention to the fact that having more than one cultural group in one community is a huge problem and serious danger that could threaten the safety of any community, whether by denying the neglected valuable heritage or by fragmenting the bonds between the internal social groups, or at least they consider it a big challenge. Multiculturalism can divide the inner culture groups of the community, or may ignore and deny their valuable heritage. Consequently, they try to introduce academic solutions through their dissertations.

Egypt is a very old country with a long history and experience in dealing with multiculturalism. Although other countries around the world suffer from that negative impact of having different cultural groups in their societies, Egyptians were able to get over the multicultural problems and make good use of their potentials over different periods of time by creating some kind of integral diversity. Throughout history, multiculturalism has become one of the characteristics of Egypt. That social and cultural state cast its shadows on Egyptians in their everyday life, and this has been evident in their different cultural production in terms of literature, art or even architecture. For this reason, it is very important to look at Egyptian architecture from that perspective.

In the Egyptian history, the Coptic era witnessed many achievements that can be grouped. Although the whole world appreciates and treasures such achievements, Copts and Egyptians are still unaware of many of those achievements of that era. Coptic monasticism, for instance, is one of the most important civilized achievements that Egypt offered to the Christian world. Coptic architecture has flourished in its monasteries, in addition to the Coptic arts, the various handcrafted productions, and the Coptic literature. That had huge influence on the European culture and caused many universities in the western world to establish special academic departments for studying the Coptic heritage. Nevertheless, monasteries do not only draw attention to the history or heritage of the church, but also to the bases of every spiritual and educational renaissance. Copts used to deal with different cultures like those of the Romans, Arabians and many others for long centuries. They learned from their predecessors' art techniques and architecture and developed them to fulfill their needs. That has created such a rich fortune to conduct research on their experience of dealing with other cultures.

Ancient Coptic architecture has crucial historical value for Copts in general and the Coptic Orthodox Church. Researchers of Coptic architecture and archeology always argue about its origins. There is a group that reminds them of ancient Egyptian architecture and the resemblance between the plan of the ancient Egyptian temples, from an outer courtyard to an inner sanctuary hidden from that of the Coptic churches, an external narthex (in the rear buildings) and a sanctuary hidden behind an iconostasis. Others esteem the first Coptic churches wonderful, such as those of the Byzantine and Roman periods and the Greco-Roman basilica.

Thus, the Coptic architecture has combined the traditions and indigenous materials of Egyptian architecture and Greco-Roman and Byzantine-Christian styles. The fertile styles of nearby Christian Syria had a much greater influence after the 6th century. After the Muslim

conquest of Egypt, one can observe that Coptic art and architecture cast their shadows on Egyptian Islamic architecture.

Throughout the Coptic history, Egyptians constructed a huge number of churches. Many academics conducted research on them by introducing their various types and classifying them into groups. This research focuses on the plans of the Coptic Church to analyze them carefully. The relationship between the inner spaces of the church forms its character.

Multicultural communities are of different types. This relation between the internal cultural groups differs from one type to another. Each one of them has its own cultural/multicultural effects and influences. That shows how Egyptians in the Coptic period were able to deal with their state of multiculturalism at the architecture level, and this gives a clue about other levels.

1.2. Scope of Work

This thesis is concerned with multiculturalism and its effect upon architecture. Architecture is considered an obvious indicator for the communities' status; it clarifies some of their social, economic, political and religious aspects. In terms of culture, communities differ from each other due to various aspects. One of the most important aspects is their heritage; cultural/multicultural heritage. Most of the communities that are deeply rooted in history have experienced that state of multiculturalism. India, Indonesia, Malaysia and others, for example, reflect that experience of having more than one cultural group. Other new communities, like Canada, America and Australia, are also experiencing that multicultural state. Communities of such countries are formed, basically, from immigrants from all over. Each community has its own type of multiculturalism and varies from one to another. However, multicultural communities were basically classified into three main types: Cosmopolitanism, fragmented pluralism, integrated pluralism. [21]

The influence of each of the previous types on architecture should be studied academically and thoroughly in order to reveal the precise shape grammars of that Coptic architectural language that represent its architectural product at the cultural/multicultural level.

Egypt is one of those countries with long and history of multiculturalism. In ancient Egypt, Egyptians preserved their cultural identity, and this casted its influence on their social life as a whole. However, Egypt, back then, was exposed to the cultures of many countries around the world for some commercial, military and other reasons [2]. That was reflected on their culture, and was clear in their various architectural products. Egyptians used to employ those cultural influences from the outside world to perfectly fulfill their needs. After that ancient Egyptian period, Egypt was occupied by different conquerors from different parts of the world: the Greeks, the Romans and then Arabs governed Egypt for centuries. They adapted to the existing Egyptian culture which was crystalized by its location, nation and deep religious attempt. On the other side, Egyptians were flexible enough to absorb other cultures and use them in their own special way. That cultural interaction was evident in the architectural products and the compositions of their architectural vocabularies and design elements.

This thesis focuses on multiculturalism in Egypt by studying Coptic architecture. Nevertheless, Copts interacted culturally with several "others", exchanged with them huge experiences including the architectural experience. In the early part of the first century, the Apostle St. Mark brought Christianity to Egypt, and from that time the Coptic culture started to come out [3]. It was a strong religion that supported the establishment of a strong culture, which has existed until now, and throughout two millennia. Therefore, it is extremely

important to highlight the architecture of that genuine Egyptian culture, and study the transformations that took place upon its grammatical compositions. However, in spite of the importance of the Coptic epoch and its representative architecture, the academic studies performed on it have not been enough. Few researchers make good efforts to study the history of Coptic era with its architectural production. However, those studies have not been enough so far compared to the real importance of that part of history as a world heritage.

Coptic architecture lies under several classifications [4], which are classified according to its architectural features; such as Somers Clarke's [133] and C.C. Walter's classifications, or due to its chronological sequence like Grossmann's classification. However, the latest one is attributed to Dr. Samy Sabry [5]. He classified the Coptic architecture into 9 classes in terms of its architectural features, its location, and finally its chronological aspect. Therefore, this thesis is built on that classification.

1.3. Research Problem

The main issue here is to draw attention to the ways in which all Egyptians— regardless of their races, religions, political thoughts, lifestyles, or moral orientation—have come to speak the language of tolerance and show respect for cultural diversity throughout their history or during some periods of it.

> "Multiculturalism's worldview is also relativistic. Its moral relativism breeds a worrisome version of tolerance. The "tolerance" of multiculturalism affirms all cultures and lifestyles. If there is no standard of truth by which one can judge one culture or another, then, following the logic of multiculturalism, all perspectives and worldviews are equally valid and we cannot make judgments regarding right and wrong along biblical principles. While multiculturalism, like other secular worldviews, can sometimes bring into relief issues that need greater attention and focus, the very real dangers of multiculturalism cannot be ignored." [1]

The problem of this research is the side effects that may appear on the architectural products representing communities with multicultural groups (political, religious, gender, age…..etc.). Many regions around the world are suffering from dangerous problems because of their cultural diversity, such as USA, Canada, and Australia [6]. They have issued lots of laws and conducted various researches to solve their problems to avoid fragmentation of their communities. Nevertheless, they are still suffering from that problem. However, this research tries to find solutions to those problems by studying the case of Egypt as Egypt has a deep history of multiculturalism, with various experiences of successes and sometimes failures.

Egypt was characterized by the existence of multicultural groups, living and interacting together and that was reflected on their architecture that time. This research focuses on the Coptic architecture by studying the different types of churches in successive periods of the Coptic history to trace the transformation of churches' design that took place due to the multicultural interaction. That can help to distinguish the beauty and harmony within diversity, by studying and analyzing selected and distinct classes/types of Coptic churches.

After the 25th of January 2011 Revolution, Egyptians suffered from hard polarization between its citizens, separating them into various groups. However, they are scattered in different regions (Saini, Nuba, Upper Egypt, etc.). They are also categorized according to their professions (laborers, doctors, etc.) and and there are many other social groups. It was the first time for this generation to feel the negative sense of diversity. That was a sign of danger for the community, which was rapidly reflected on its architecture with all features of nastiness, ignoring any environmental aspects and breaking all laws of construction. This is a

social hit that caused cultural disturbance. From this point, it was very important to stop and look back at the Egyptian heritage to learn from their architecture and their ways of dealing with cultural diversities during a particular period of time. Consequently, that helps Egyptians to avoid any future architectural cultural crisis if they ever go through similar circumstances, by giving them the mechanism to deal with that. The Coptic era was one of the most ambiguous parts of the history of Egypt although it was full of huge political events that reflected on the social and cultural life back then. It is part of the distinctive and genuine Egyptian heritage. It is based on a very deep and strong religious culture. Despite the importance of the Egyptian heritage, it has not been carefully or academically studied. Back then, Egyptians were exposed to external cultural groups with their own vigorous cultures. It is good to study the influence of that multicultural state on Egypt's very rich architectural production despite the shortage of information about that period.

The research problem can be defined in how the Coptic architectural product was a tool to deal with multiculturalism problems/potentials in order to satisfy the needs of the community in terms of architecture, in order to avoid any kind of polarization that may lead to other social diseases like discrimination and to save such valuable heritage.

1.4. Research Goals and Objectives

The goal of this research is to shed light on the Coptic era from the architectural perspective by, recognizing and determining the Egyptian antecedents' architectural experience with multiculturalism in their community through an important part on the Egyptian history timeline. This will take place by analyzing and studying their architectural production. This research can provide professional architects and academics with a precisely analyzed architectural language to interact with a multicultural community, where they can capitalize its pros and reduce its cons. This goal can be achieved through the following objectives:

1. Drawing an approximated image of the social and cultural life in Egypt through the Coptic era (from 300 C.E. to 900 C.E.). That can be deduced from the major political events, and the legacy inherited about monks who lived at that time. That image can provide visualization about the cultural groups that existed, features of the boundaries of those cultural groups, and the characteristics of the relationship with each other, in addition to the nature of their relation with the social whole that articulated their external boundary or paradigm.
2. Introducing the different types of multicultural communities to distinguish which one represents the Egyptian case through the Coptic era, considering the social and cultural dynamic changes that took place.
3. Selecting the Coptic architecture to study the interactive state of the Egyptian culture with 'other' surrounding cultures. To achieve this objective the research dealt with the documented plans of Coptic churches erected through that period, and listed them chronologically to facilitate tracing the transformations of the inner spaces that took place due to the dynamic transformation of the Egyptian social order during that time.
4. Using shape grammars as an analytical tool, to get physical and precise results. Shape grammars can distinguish the compositions of the architectural vocabulary of the Coptic churches, to extract its grammatical shape rules.
5. Comparing the extracted rules with other cultural religious architecture that existed back then to distinguish points of identification, similarity or difference.

6. Finding the cultural reasons of any of the three results, whether identification, similarity or even difference, between the Coptic Church's architecture and the other cultures' architecture.

By achieving the main goal and objectives, the research problem could be solved and more outcomes could be achieved concerning the Coptic architecture and its architectural languages, grouping and classifications, and applications of 'Shape grammars', as a theory, on Coptic architecture whether in design, academic or analysis use.

1.5. Hypothesis

The main hypothesis of this research is; if Egypt has passed by many periods of multiculturalism, then it has huge architectural experiences for adapting/recruiting the representative architectural product to satisfy its cultural social needs, by transforming the design of churches in certain stages in a way similar or different from other churches' designs of that time. Coptic churches embody the architecture of the Coptic culture through many centuries. Yet, by observing and analyzing their elements, it will be easy to notice that they carry multicultural architectural vocabularies evident in the Coptic architecture of churches. Some of these vocabularies are similar to those of ancient Egyptian vocabularies in the early Christian period, as they were influenced by roman compositions later and then by some Islamic features. That means that layers of transformations of the churches' design took place through several transitional periods in which the grammatical rules of designing a church have transformed due to that cultural/multicultural state throughout the time. Therefore, the employment of shape grammars theory can help in identifying the different influences of ancient Egyptian, roman, Islamic or architectural styles on the Coptic architecture of churches.

1.6. Research Limitations and Delimitations

Dealing with architecture in multicultural communities with special concern in Coptic architecture is a very complicated academic topic, because of the broadness of the subject. Moreover, the topic is divided into two deep issues. The first one is the issue of multicultural communities. Here the research has to clarify the nature of such communities, and specify their distinguished types, and which type of them represents the Egyptian case according to its features in the Coptic era, taking into consideration the dynamic transformations that may had occurred.

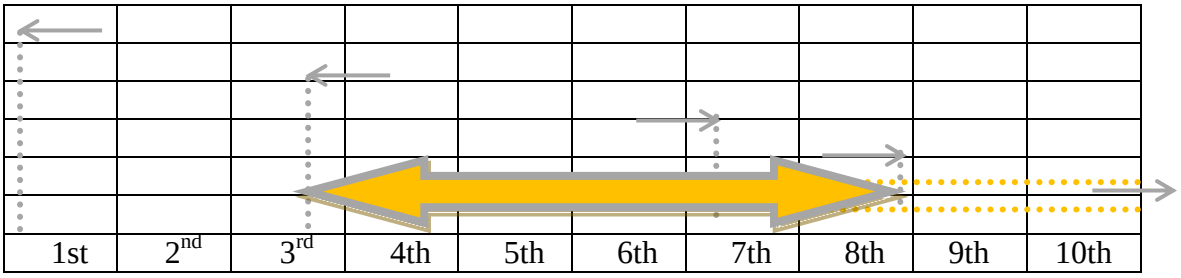
The second issue is the Coptic architecture. To be accurate about the scope of the research, the researcher has to make clear when the Coptic era started and ended. Those two questions are very critical to answer, because historians have various opinions about those two dates. About its beginning, a group of authors believe that the Coptic era began in the first century as St. Mark introduced Christianity to Egyptians in Alexandria by the middle of the first century. However, another group tends to believe that the Coptic era begin by the spread of Christianity among Egyptians, that is when the majority of Egyptians turned from the ancient Egyptian religion to Christianity. Finally, some historians say that the beginning of Coptic era was marked by the beginning of using the Coptic calendar in 284 C.E. This date is consistent with the spread of Christianity in Egypt.

Similarly, specifying the end of Coptic era is very debatable. A group of historians believe that the Islamic conquest put an end to it on 641 C.E. Another group also believes that the Coptic era ended when the majority of Egyptians entered Islam by the ninth century

[81]. The last group sees that the Coptic era has not ended yet, as Copts have always been in Egypt throughout two millennia and they still practice their Christianity. [7]

According to this research, the Coptic era began when the majority of Egyptians embraced Christianity. Concerning its beginning, when Egyptians first used the Coptic calendar in 284 C.E. it was almost the same time when most Egyptians became Christians and practiced their rituals freely. This means that the researcher believes that the Coptic era started by the end of the third century or at the beginning of the fourth century and it ended by the end of the eighth century. This is mainly because, back then, Copts were erecting their churches officially and freely. Before that, building churches was forbidden, and the Copts were practicing the rituals of their religion secretly in their homes, old temples, tombs (Catacombs), or in small churches in remote places and in the desert. Furthermore, there are no enough and precise sources of information about Coptic churches and monasteries that were built between the first and third centuries.

Case studies are selected from those about the churches built between the fourth and eighth centuries, taking into consideration of the Islamic conquest in 641 C.E.



▲ Figure 1.1. Diverse opinions of authors about when the Coptic era began and ended. The yellow line represents the period on which this study depends.

Finally, and as for the goals of the research again, the case studies must be selected carefully, to draw an appropriate methodology to use the case studies suitable to the nature of the research.

In order to make the results clear, the scope of analysis of the architectural elements should be determined, whether they are plans, roofing system, facades or even precise architectural elements within the Coptic churches, such as columns, decorations, altar, bell tower, …etc. The time period chosen for this thesis dictates that scope. This period of time goes back a long time, casting a shadow over the remaining architectural product. Most of the remaining churches of that period, whether due to nature, time or purpose, or due to the several attacks on these churches or their development in one way or another have been destroyed. Also, large and important parts of their elevations had been destroyed.

As for the architectural plans, many of them have been documented scientifically depending on their remains and ruins. In addition, those documented plans have been scrutinized by contemporary researchers who documented the developments that happened to those churches over time. Therefore, the influence of multiculturalism on the architectural elements can be read by analyzing these plans. Also, the influence of different cultures to which the Egyptians were exposed in the fourth century and the cultures they had inherited before that can be seen in those plans.

1.7. Research Methodology

To study the effect of multiculturalism on the architectural product of the Coptic era (from 300 C.E. to 900 C.E.), it is important to introduce the social and cultural construction of that community. However, it is very hard to collect enough information about such ancient periods. Therefore, this research depends on a deductive inductive methodology to reconstruct the social and cultural image of that community out of reading the political history of the Coptic era, in addition to what has been written about the biography of important persons who lived back then and the physical inherited art production. From those readings the researcher can deduce the presence of various cultural groups in that community, the kind of bonds between them and the nature of social whole paradigm. Moreover, the researcher can deduce the characteristics and features of that multicultural community and how the dynamic changes occurred due to political and social events. To trace the reflection of the cultural social state, shape grammars are used in this research to find out the rule schemata of Coptic churches that reveals the relationship rules of their architectural vocabularies. Thus, the research can deduce the way in which architects of that time were able to turn multicultural architectural vocabularies into a new creative and unique design of churches

1.8. Research Outline

The research consists of seven chapters upon which the main studied topics are distributed as follows:

1.8.1. Chapter One: Introduction:

In this chapter the research is introduced through the following steps after the introduction:

- Scope of work.
- Research problem.
- Research aim and objectives.
- Hypotheses.
- Research limitations.
- Research methodology.
- Research framework.
- Expected Findings and Problems.
- Conclusion.

1.8.2. Chapter Two: Multiculturalism Definitions and Types

This chapter gives a concise review of the term multiculturalism. It introduces experts' and authors explanations and definitions of that expression, followed by a brief discussion of every definition and focus on the most comprehensive one. In addition of that it explains the three main types of multicultural communities compared to the assimilation type communities. Multicultural types are:

- Cosmopolitanism.
- Fragmented pluralism.
- Integrated pluralism.

Also, the assimilated community, which is based on one cultural group, is explained. This chapter explains the features and characteristics of each type and shows which type of them that accurately describes the community of Egypt during that period of time that will be discussed in the next chapter by comparing between the characteristics of those types and those of the Egyptian society.

1.8.3. Chapter Three: Multiculturalism in Egypt through Coptic Era

This chapter gives an overview of the history of Christianity in Egypt, to build a general historical idea about the Egyptian community and the lifestyle of individuals during that time. It focuses on the social side, to locate Copts as the major cultural group between the other groups as they were occupying the largest proportion of population compared to the other cultural groups, between 300 C.E. and 900 C.E. To reconstruct this social idea, this research depends on the impact of the major political events on the Egyptian social life, in addition to the inherited biographies of important persons who lived at that time, and the physical products of the different cultural groups that reflected the nature of the community during that period. According to the previous chapter that addressed the types of multiculturalism, this chapter explores the different social and cultural groups in Egypt at that time. It explains both the relations between that group and other cultural groups, as well as the relations between the Coptic group members. By comparing that social state with the features of the three types of multicultural communities, it will be easy to show under which type falls the Egyptian community. That helps to trace the reflections of those features on Coptic architecture.

Finally, this chapter focuses on the social dynamic changes that occurred throughout that period to trace the development of the Egyptian multicultural type. Nevertheless, they, spontaneously, were able to preserve the Egyptian identity, however, other cultural groups casted their shadow on it.

1.8.4. Chapter Four: Shape Grammars as an Analytical Tool and Preliminary Analyses Of Coptic Churches

This is beginning of the analytical part of this dissertation. It is divided into two parts. The first part deals with the shape grammars as an analytical tool, discussing why it is suitable for this research. This chapter introduces the pioneers of that theory, and explains theorists' definitions and explanations of that term and the main applications of it in the field of architecture. Then, the research explains the 'transformations of design' using shape grammars, because that is the way of analyzing the case studies of this research.

The second section of this chapter deals with Coptic architecture (the architecture of Egyptian churches). It starts with general overview of the history of Coptic Church architecture, and how and where the Copts were practicing their religion secretly. This part reviews the important classifications of Coptic churches architecturally and chronologically. Then, this part discusses the methodology of analysis. It begins by collecting case studies of Coptic churches that were constructed during that period; from the fourth to the ninth centuries. They are 108 churches. Then, it puts those churches into groups according to the architectural features of their plans. Finally, this part discusses the plans of Coptic churches, their features, spaces and elements. That helps to extract their rule schemata in the following chapter.

1.8.5. Chapter Five: Language of Coptic Churches in Preference to Time, Form and Shape Grammars

This part analyses Coptic Churches through several centuries – from the fourth to the eighth centuries – using shape grammars as an analytical tool. This tool helps to establish the main grammatical rules of the Coptic architecture shape language. Hence, that can help to reach the origins of Coptic churches and their development over time.

'Shape grammars' is applied here after grouping the selected case studies in chapter four. This process passes through six stages, to know the shape-rule schemata of Coptic churches. This analysis depends on previous experience of applying 'shape grammars' on Churches' plans [8], beginning with the analysis of Coptic churches representing the fourth century, as a base of rule schemata, then analyzing the plans of the successive centuries, from the fifth to the eighth centuries, to add more rules and complete the whole grammatical rules of the studying period. Those rules are applied on a representative church from each group type to show how the derivation works. Finally, churches can be regrouped in a form map illustrating their development. At this point of research, exceptional churches, which were not subject to any of the previous illustrated groups, emerge. .

The following discussion chapter shows the dynamic transformations of Coptic architecture and the influence of multiculturalism state on it.

1.8.6. Chapter Six: Discussion

Depending on the previous five chapters, chapter six discusses the dynamic changes that occurred on the design of churches throughout five centuries; from the fourth to the eighth centuries, whereas the structure of the Egyptian community can be considered of interactive pluralism type that casts its shadow on the design of Coptic churches. All along, dynamic changes happened to the community. It just turned to that interactive dynamic pluralism state.

By tracing the rule schemata of Coptic churches in chapter four, we can notice the dynamic reflection on the design of churches that occurred. Here, the discussion goes deep through various stages of analysis applied in chapter five, to discuss each of them from a cultural/multicultural perspective.

The final part of this chapter deals with some architectural elements that are not included in the analytical part, such as roofing and the bell tower, to give a comprehensive mental discussion around the design of the whole Coptic churches.

1.8.7. Chapter Seven: Conclusion and Recommendations

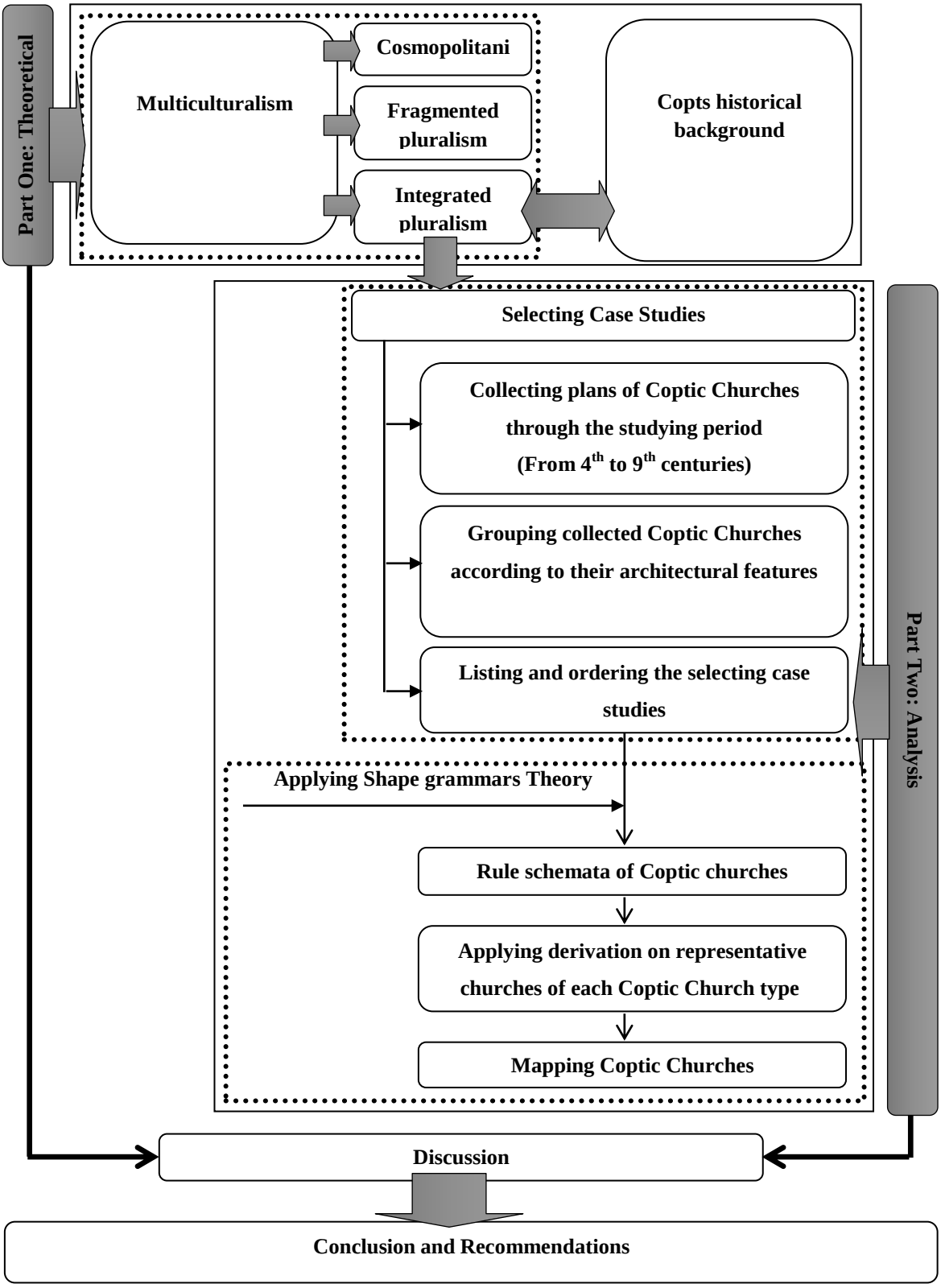
This chapter is concerned with two points: multiculturalism of the Egyptian community through a crucial period of the Egyptian history (the Coptic era) and the influence of multiculturalism on the architecture of that community.

After showing making it clear that the Egyptian community proved to be a multicultural community throughout that studying period, we have to make evident the advantages and disadvantages of this type, taking into account the dynamic move that might have occurred. This type of studies can help researches and academics to introduce creative methods of dealing with such communities. They can work on reducing those disadvantages and maximizing their advantages, giving their community tools to control and improve their performance generally and architecturally as a specific concern.

In terms of architecture, this research focuses on the rule schemata of Coptic architecture. This part of the architectural history needs a lot of deep studies and research.

This dissertation satisfies a part of those needs. However, in this final part the, research recommends to perform more studies on the Coptic architecture with more research and analysis of the elevations, roof systems and bell towers of the used case studies. Research papers can also analyze the architecture of ancient monasteries, as well as analyze the architectural Coptic product after the 900 C.E. Also, academics can utilize the results of the analytical part; rule schemata of Coptic architecture, with more deep analysis from other perspectives; economical, environmental, etc.. Moreover, they can use them for education requirements. However, professionally speaking, the use of those rule schemata can be computerized to facilitate the design process using Coptic architectural language. That can be facilitated by computing this Coptic architectural language. Nevertheless, designers have to take into consideration the type and influence of cultural/multicultural community they are dealing with and the dynamic changes that may have occurred.

Last but not least, and as a part of the national reasonability, this research recommends to do all efforts to restore the Coptic era architectural works to their normal state. That can be done by translating the inherited manuscripts that were written back then in the Roman and Byzantine languages. In addition, Egyptians have to rebuild bonds in all fields with all countries that deal with Egypt in many aspects back then in order to have more research and studies carried out so as to revive such values of that period of time.



▲ Figure. 1.2. The sequence of the research outline

1.9. Expected Findings and Problems

Although this research is basically concerned with the Coptic architectural history, it is a social study to trace those cultural reflections on the selected and representative case studies. From this point of view, some problems can be expected as follows:

- To distinguish the effective cultural groups that existed during the research time period. That can be considered a problem, because it is hard to separate between social groups in Egypt from their social whole and trace the cultural features for each one of them because of the lack of sources of information and social studies about this point.
- To select the representative case studies that reflect: a) the architectural development of the Egyptian churches that were built to satisfy the Copts religious needs along six successive centuries; from the fourth to the eighth centuries. b) The deal with the social cultures that affected the Coptic social group. Nevertheless, former social groups that existed before Christianity and lasted after or subsequently gave birth to social groups such as the Romans, Byzantines, Nubians and Arabs.
- To determine the nature of relationships between existed social groups at the time of the study. That is important to state how strong or weak those relations were, and on which bases they are built, whether economically, culturally, religiously, linguistic, etc. Therefore, this states the effect of those relations on the social whole and its reflection on the architectural language.
- To find out the rule schemata of the Coptic architecture language and trace the way in which Coptic architects were able to breed -architecturally wise- the cultural diversity they had been exposed to.

1.10. Conclusion

The methodology of this research adopts a theoretical and analytical deductive approach. The following chapter introduces multiculturalism and its definitions and types. Then, the research presents a brief idea about the Coptic history and selects the studying period, focusing on the relationship between cultural groups of the Egyptian society at that time. After that, the research takes a practical turn by describing the shape grammars theory as an analytical tool. This point clarifies the definitions of 'Shape Grammars' and its potentials. In addition, the research reviews an introduction about Coptic architecture and the selected period of study. That leads to the main part of the dissertation that applies shape grammars on the selected case studies of Coptic churches to deduce their rule schemata. Finally, the discussion part focuses on those rules within cultural/multicultural influences to put objective recommendations about architecture in multicultural communities.

Chapter 2 :Multiculturalism| Definitions and Types

2.1. Introduction

2.2. Multicultural Communities

2.2.1. History of Multiculturalism

2.2.2. Definitions of Multiculturalism

2.2.3. Definitions of Related Concepts

2.3. Multiculturalism in Sociological Terms

2.3.1. Basic Issues Concerning Multiculturalism

2.3.2. Visions of Difference Framework

2.4. Types of Multicultural Communities

2.4.1. Assimilation

2.4.2. Cosmopolitanism

2.4.3. Fragmented Pluralism

2.4.4. Interactive Pluralism

2.5. Multiculturalism in Art and Architecture

2.6. Conclusion

2.1. Introduction

Because there is a fundamental problem about the lack of theoretical clarity about what we mean by multiculturalism, this chapter introduces a brief review about the phenomenon of multiculturalism and multicultural communities. The term is explained by presenting its definitions and explaining them. However, many authors and sociologists have defined this term from more than one perspective.

For that, this part of study compares between those definitions and selects the most comprehensive and appropriate one to the research goals, which explains the Egyptian situation. In addition, types of multicultural communities are illustrated here, to explain the features and characteristics of each type to show which type of those describes accurately the community of Egypt through the period of the study that will be discussed in the next chapter.

2.2. Multicultural Communities

This part of the research introduces a general background about the term 'multiculturalism' with its history, definitions and types, in addition to some related concepts, such as culture, communities and diversity.

2.2.1. History of Multiculturalism

Multiculturalism was first introduced in Australia in 1968 by Jerzy Zubrzycki, an academic member who first called it ‘cultural pluralism’ to defy the assimilation idea, projecting a new interaction between groups in Australia. In 1971, the movement developed to be referred to as ‘multicultural’ movement. Canada later on resorted to the adoption of ‘Multicultural society’, English and French, in their case. The Canadian Premier, Gough, and his minister of immigration, Al Grassby, accepted the ideology, putting an end to the traditional Australian criteria of immigration that is based on race in 1973. In 1975, the Australian Prime Minister Malcolm Fraser introduced Racial Discrimination Act of 1975 (Cth). 1

‘Multiculturalism’ as a term could be used in a variety of instances. There are three main uses of multiculturalism2:

- To describe the state of cultural diversity in a society.
- It is an ideology that legitimizes the incorporation of ethnic diversity in a society.
- It is a public policy.

This particular section of the research does not just attempt to provide detailed explanation of the ideological side of ‘multiculturalism’ or even from the official public policy, as this is deviation form the prime aim of this study.

Detailed discussions are out of the scope of this study. Nevertheless, they are extensively published in the literature by authors such as Goldberg (1994), Taylor (1994), Rex (1996), Baumann (1999) and Joppke & Lukes (1999). However, this part describes the state of cultural diversity in a society.

2.2.2. Definitions of Multiculturalism

Multiculturalism developed over the past three decades to become the focus of interest of a variety of groups, authors and academics, who attempted to define it as a new term. Authors

offered a variety of interpretations of the term. Among those authors were Taylor (1994), Du Mont et al. (1994). Multiculturalism is a complex term that depends on the context in which it is used and it refers to the evolution of cultural diversity within the community [9]. Definitions varied between being descriptive and normative [10]. Being a descriptive term, it refers to cultural diversity.

The definition of "multiculturalism" is complicated and depends on the context in which it is discussed. Some international organizations recognized the importance of defining that term. In the Canadian environment, for instance, the Canadian Multiculturalism Act (1985) explains that

> "Canadians recognise and promote the understanding that multiculturalism reflects the cultural and racial diversity of Canadian society and acknowledges the freedom of all members of Canadian society to preserve, enhance and share their cultural heritage."[11]

Carson [12] explains that in the United States multiculturalism has become a social and political movement. According to him, multiculturalism in the United States is

> "Values the diverse perspectives people maintain and develop through varieties of background and experience and stemming from sexual orientation, gender, ethnic, racial, and/or class differences in society. It strives to uphold the ideals of equality, freedom and equity."[12]

The Department of Immigration and Multicultural and Indigenous Affairs argues that Australian multiculturalism:

> "Respects, accepts, recognizes and celebrates cultural diversity. It embraces the heritage of Indigenous Australians, early European settlement, our Australian-grown customs and those of the diverse range of migrants now coming to this country. The freedom of all Australians to share and express their cultural values is dependent on their abiding by mutual civic obligations."

Authors have often interpreted multiculturalism in terms of the certain multicultural movement they are supporting. Gutman (1994), for example, refers to multiculturalism as follows:

> "Referring to a social mosaic of identifiable and bounded cultures cohabiting a common territory in the context of a single dominant culture."

Lubisi emphasizes that cultures that are part of this mosaic are often defined only in ethnic terms. This is supported by Charles Taylor (1994) who similarly defines multiculturalism as

> "A demand by ethno-cultural groups or minority cultural groups for recognition of their marginal cultures." [13]

Similarly, Clara M. Chu explains multiculturalism as:

> "Multiculturalism is the co-existence of diverse cultures, where culture includes racial, cultural or religious groups are manifested in customary behaviors, cultural patterns, values and assumptions of thinking, and communicative styles." [14]

In this definition, she did not describe the multicultural manifesto of communities with cultural diversity. Rather, she regards multiculturalism as an action of cultural cooperation between different cultures to coexist, preserving their own unique communication pattern/s. Also, Abraham Rosman put another simple definition saying:

> "A multicultural state is composed of several ethnic groups, none of which is officially recognized as dominant." [15]

Here, the components of the state of multiculturalism were identified. It was described on the basis of the existence of diverse cultural groups in the same community, but no group could be distinguished by itself.

Other authors used a wider description of the term multiculturalism, like Kymlicka (1995) and Okin (1999). This goes beyond the limits of ethnic cultures and includes a wide variety of other social or cultural groups. Lubisi (2001: 2) summarizes the definitions of those authors by saying that in addition to ethnic and linguistic communities, other groups may also be included in the definition of multiculturalism, such as:

- Religious communities Groups defined by gender and sexual orientation
- Marginalised communities.

Instantly, Gred Bauman defined multiculturalism from one perspective. He said:

> Multiculturalism, anthropologists argue, reifies and essentializes cultures as rigid, homogeneous and unchanging wholes with fixed boundaries. [16]

His description of multiculturalism is very clear, stating that cultural thought is difficult in a particular society, operates in a static state, is almost identical, and consists of fixed aggregates of ideas that barely change or even evolve. This definition may be acceptable in a certain fixed moment in the history of a particular society.

In 2011, Douglas Hartmann took the "multiculturalism" expression from its positive side, he said:

> "The view of cultural diversity in a country as something good and desirable is called **multiculturalism**". [17]

He regards the richness of cultural patterns of one community. That can have its own positive value for the whole society.

It refers to the political ideologies of a particular community as a multicultural society, as a normative term. It is generally applied to the demographic make-up of a certain place. Caleb Rosado, in 1997, talked about that part of multiculturalism:

> "Multiculturalism is a system of behaviors and beliefs that respects and recognizes the presence of all diverse groups in a society or an organization or, values and acknowledges their socio-cultural differences, enables and encourages their continued contribution within an inclusive cultural context which empowers all within the society or organization." [18]

He put multiculturalism itself in a framework that controls the cultural diversity. The role of that framework is to entrench respectable spirit between groups and individuals, and, moreover, use those differences to weave cultural diverse patterns into beneficial whole.

From another point of view, Jeffrey C. Alexander saw multiculturalism as a reaction of the community behavior. He said:

> Multiculturalism is a response—or a set of responses—to diversity that seeks to articulate the social conditions under which order achieved and difference can be incorporated from diversity. [19]

From his perspective, multiculturalism seeks to prevent social chaos that may result from the existence of different cultures in a society that tries to pursue cultural and social dealing system between its groups.

According to the previous discussion, and for the purpose of this research, multiculturalism can be defined as

> a society with various cultures. This diversity can be recognized, respected, accepted and celebrated. The reasons for this state are different, whether ethnic, gender and/or any other cultural difference. Currently, multiculturalism absorbs cultural groups from around the global society, not just within local nations.

2.2.3. Definitions of Related Concepts

Many terms refer to the expression of multiculturalism; Culture, communities, cultural diversity, ethnicity, minorities and multilingualism, for example, to avoid confusion. This part of the study briefly illustrates the number of terms that correspond to the scope of this research.

2.2.3.1. Diversity

Cultural diversity refers to the complicated composition of society. According to Khan, [106] recognizes that the society consists of interest groups. They hold general commonality and are always distinct.

Diversity ***allows*** different cultures to exist in a particular cultural sector, but society is not obliged to recognize or support alternative cultural forms. Thus, pluralism also allows the dissolution of cultural formations

Multiculturalism ***encourages*** different cultures. Individuals are seen as part of groups that have a purpose for their lives. Multiculturalism is looking for ways to support these groups

2.2.3.2. Culture

The variety of definitions given to multiculturalism is often due to a disagreement over what constitutes a "culture". According to the Center for Ethnic Evidence (2005) website, culture is a complex social phenomenon and its definition is problematic. Culture consists of common beliefs, values, and attitudes that guide the behavior of group members

In support of the above definitions, Baumann (1999: 83) emphasizes that the meaning of "culture" is not static, but changes according to the views and needs of human society.

The above definitions of culture allow different social groups (not just ethnic groups) to be able to own, produce, transmit and receive culture. This view is in line with the wider and broader definition of multiculturalism, which allows a variety of cultural groups in a multicultural society to be the product of diverse cultural experiences and backgrounds, such as language, religion, ethnicity and/or orientation.

2.2.3.3. Communities

In WordNet conference, 2005, the following relevant definition of the term ‘communities' was provided:

> "A group of people having ethnic or cultural or religious characteristics in common"

Although the term "minorities" is widely used internationally to discuss different groups in a multicultural society, in some countries the term "community" is preferred. (Beukman, 2000:32).

2.2.3.4. Ethnicity

The website of the Ethical Evidence Center, (2005), states that the concept of ethnicity is complicated. It is recognized that people identify their social group according to cultural reasons, including language, lifestyle, religion, food and origins. Therefore, the basis of ethnicity is often a tradition of common origin or marriages and a common culture or history. The Center considers it important to recognize that ethnicity in a world of migration and ethnicity is more dynamic and not fixed.

2.3. Multiculturalism in Sociological Terms

This research examines the impact of the social and cultural challenges of Egyptian diversity on its architectural product during a particular period in its history, which is related to the term "multiculturalism". Therefore, this part will illustrate this phenomenon and its types, as many authors have defined and classified "multiculturalism" from different perspectives. There are many multicultural types or movements of multiculturalism, such as critical multiculturalism, conservative multiculturalism, essential cultural pluralism, pluralistic multiculturalism and liberal multiculturalism. [20]

D. Hartmann and J. Gerteis, 2005, [21] proposed a theoretical framework that describes the sociological dimensions of order that are integrated into alternative responses to differences in the scientific work. More precisely, their model differentiates between the social and cultural bases of social cohesion in the context of diversity, with the "social" dimension referring to interactions between nations, groups and individuals (what Durkheim called "social integration" or what Tocqueville called "association") and the "cultural" aspect refers to the more normative basis of the social order ("moral regulation" according to the terms of Durkheim, and "mores" according to Tocqueville). They used these two dimensions to create a two to two matrix that describes three different types of multiculturalism (cosmopolitanism, fragmented pluralism and interactive pluralism) connected to the traditional liberal response to assimilation and difference. They used this framework to define and clarify four different views of differences, focusing in particular on the order and solidarity that existed in each of them, and on the strength and direction of their respective social boundaries (Figure 2.1.). The organization of these four types in a two by two matrix reveals some of the characteristics that differentiate each of those types, but also reveals some unexpected or at least never realized similarities between the relationships of the resulting pairs that help to solve a series of key issues related to current academic debates. On the basis of this model, this research can conclude, by discussing some incriminations of this conceptual model for the solid experimental analysis of multiculturalism, diversity and related issues in the Egyptian culture throughout the Coptic era.

		Dimension 1: Basis for Cohesion	
		Substantive Moral Bonds	Procedural Norms
Dimension 2: Basis for Association	Individual in Society	Assimilationism	Cosmopolitanism
	Mediating Groups	Interactive Pluralism	Fragmented Pluralism

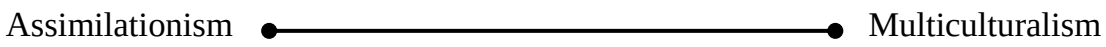
▲ **Figure 2.1. Two-dimensional framework for visions of difference.** (D. Hartmann and J. Gerteis, 2005)

2.3.1. Basic Issues Concerning Multiculturalism

The widely common concept of multiculturalism in scientific circles and popular discourse has a negative side, in relation to what multiculturalism is not or what it is in opposition. In this usage, multiculturalism represents heterogeneity rather than homogeneity and diversity as a contrast to unity. This implicit opposition between social cohesion and multiculturalism is carefully considered in the diversity issues that are usually manifested in opinion polls - a place where popular and scientific thought is combined. Consider this key question of the multicultural model of the 1994 Social Survey on Multiculturalism in American Society. [22]

Here, responses are formulated specifically so that one relies on the supposed unity of the whole social ("melting pot") as opposed to an alternative concept of society as a group of distinct and presumed ethnic and racial communities. An equivalent graph of this statement would place the unity at one end of a continuum with diversity or fragmentation on the other one. In the same spirit, Schlesinger's famous critic (1991) described multiculturalism as "disuniting a phenomenon". [23]

There are a number of problems associated with this negative concept, a dimension of multiculturalism (Figure 2.2.). One of those problems is the static and narrow concept of the social order involved. At the same time, it is difficult (if not impossible) to assess the value, utility and even functional need of differences in modern societies. Social differences can be tolerated in this point of view, but they are always inherently divided, threatening social unity. This is not necessarily the case, as differences are often caught without massive social eruption, and the basic claim of most multicultural societies is that differences must be evaluated on their own. *



▲ **Figure 2.2. The one-dimensional model.** (D. Hartmann and J. Gerteis, 2005, by edition)

Authors who oppose multiculturalism usually mention the metaphor of musical harmony; however it is an important one. Harmony is not based on the homogeneity of the music pass but actually requires a variety of notes that fit and complement each other. It is not the insistence that every variety is good, but only to suggest that any diversity is not bad and that some forms can be really good. On the other side of this opposition, contemporary multiculturalism defenders often support "diversity" without identifying the forms of difference they support or, more importantly, how to maintain order and stability in the face of growing diversity. Conservative multiculturalism critics, despite other shortcomings, have a point of view.

Another problem with this one-dimensional vision is that it is very easy to confuse it with the political opposition between the right and left, the conservative and the progressive. In recognition of this fact, many progressive and liberal people have argued that valuable multiculturalism must be based on equity, economic redistribution and social restructuring policies. The mutual need for recognition and redistribution [24] is at the root of what is often called "critical multiculturalism". [25-28]

The visions of redistribution are important and point to a very vague ambiguity in discussions on multiculturalism. However, it is important to distinguish between the structural form and the political implications of different concepts of differentiation. The two

are not linked neatly or constantly and their integration can lead to more confusion of clarity. Instantly, there was a "good multiculturalism" among middle-class suburbanites [29], where participants expressed a preference for social and cultural diversity, but they rejected a government policy that aimed at achieving these goals. Similarly, others discovered a "multicultural boutique" market-oriented celebrated voluntary identity expressed by choice and consumption [30]. On the other hand, many of the liberal and progressive voices [31] of multiculturalism were attacked and looked upon as a threat to shared culture.

In this sense, we believe that multiculturalism can be better understood as a critical theoretical project, an exercise in the evaluation of concepts inherited from solidarity in the context of addressing the reality of growing and ever-increasing diversity in societies. The main objective of this part is to explain a theoretical framework that goes beyond this one-dimensional conception by recognizing order concepts that enhance differential delimitation images and provide points of comparison between them.

2.3.2. Visions of Difference Framework

This section identifies a more formal framework for organizing concepts of difference and order in Egyptian culture. The aim is to create a theoretical network that does not only recognize the important differences between recent theories of multiculturalism. Before laying out the grid more clearly, there are two important points about this task that should be emphasized. The first is that this model seeks to understand the theoretical views of differences rather than the actual patterns of social relationships. Here, this model focuses on those theories, and the goal is to understand how different theories of difference are articulated. It is not intended to take the side of one view over the others, but to set contradictory approaches to productive tensions.

Although part of this task is to show the ways in which theories of difference are suitable to this framework and to shed light on the important views we are discussing, they should be understood as ideal types rather than serious representations of certain theories. The purpose of this framework is to be an indicative tool aimed at highlighting key elements that characterize those types [33]. However, this point has a significant impact, meaning that every particular theoretical framework may fit this structure to an extent, and can meet more than one of its classifications. Apart from the one-dimensional problem point of view, it is possible to draw a theoretical ground about the so-called "visions of difference" in two dimensions to reflect two essential areas of sociology for order and cohesion,which are; cultural (the base for social cohesion) and the relational (based on social association).

Some insist on the need for significant linkages and common practices to maintain social cohesion. Others consider it to be impractical or undesirable and consider common norms or committing with legal codes to be adequate. The most important concept of moral bonds offers a thick form of solidarity, because the system will be based on profoundly shared commitments. Thick visions emphasize the need for interdependence; common lifestyles, values, mutual recognition and understanding.

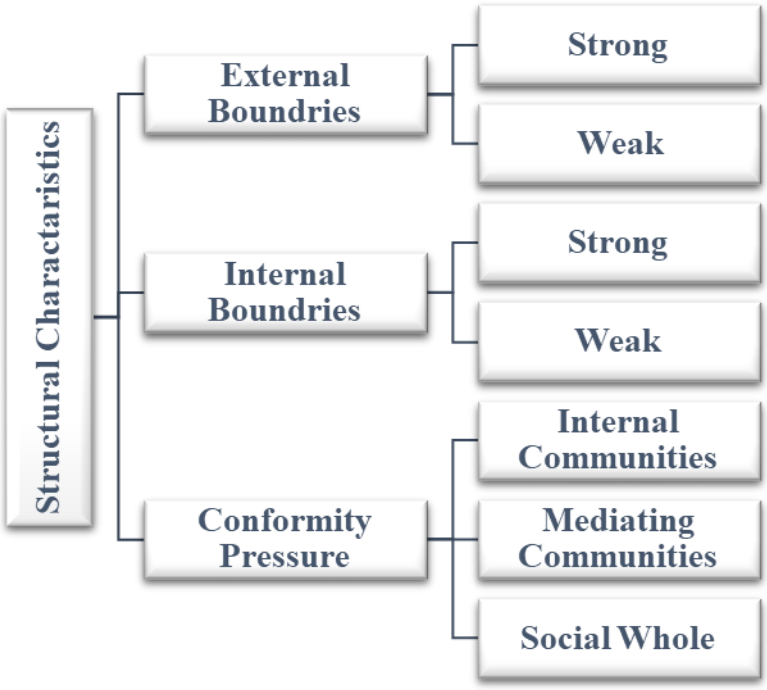
On the contrary, higher visions accept the fact that other values, obligations, and practices remain, but they suggest that common rules of procedure in the form of rules or laws can provide a suitable cover to maintain a social order, even in the face of profound moral divisions. In extremely differentiated societies, common values or ethical obligations may be impossible or undesirable. Here, individuals and groups remain organized and respected on the basis of what they materially share in terms of lifestyles or values, and more in terms of the legal and political process abstractly or more direct procedural criteria for interaction.

The second dimension is concerned with the foundation of commitment. This dimension refers to the social or relational base of the system in the visions of difference. The argument of diversity and multiculturalism differs in their understanding of how individuals, groups and the nation interact, providing a basis for stability. This is the fundamental difference between the visions, suggesting that the foundations of social cohesion are the individual interaction and those that play a central role for the groups. In the most liberal individualistic tendencies, the human actor appears directly in society. Other theories suggest that groups occupy a central position between individuals and society. In such statements, social groups whether ethnic, religious or otherwise constitute an essential basis for the formation of identity and the construction of a social order. Thus, order at the community or national level is based on the relationship between and through these groups. Belonging to the social whole, to the extent that it is considered absolutely important for the identity of the individual, can accurately be explained through the membership of the group.

Because the challenge of difference has always been at the center of the social institution, dimensions actually have deep roots in social theory generally. The associative dimension refers to Durkheim's concept of social integration [34] or Tocqueville's emphasis on the role of associations. Perhaps the most important relationship with classical theory comes from Simmel’s (1971) understanding of "sociation" [35] as an essential process in the production of society and the tension between the social presence of the individual as an individual and that as a member of social groups. The cultural dimension which indicates the foundations of cohesion has its deep social roots, pointing out to what extent Durkheim (1984) defined "moral regulation", which varies from a solid mechanical solidarity to a thin organic form.

The combination of these two dimensions of diversity in old sociological tradition construct a two-by-two to matrix with four different cells pointing out distinct views of difference (Figure 2.2). These views describe different ways in which social differences can be integrated into the texture of the social whole. Three of them can be considered diverse forms of multiculturalism. Assimilationism is not a form of multiculturalism, but its position in this context shows its complex (and likely evolving) relationship with multiculturalism in all its forms. After Alexander [19] and other recent discussions, it is clear that assimilation is a real reaction to difference and should be seen as such with other types of visions

The identification of visions of these dimensions also reveals some structural features of the type of social system to which each one refers to. The strength of the boundaries of internal or subnational groups, the source of "external" boundary that comprehends the social whole, and the position of pressure of integration or adaptation are crucial [36]. These features are shown in Figure 2.3.

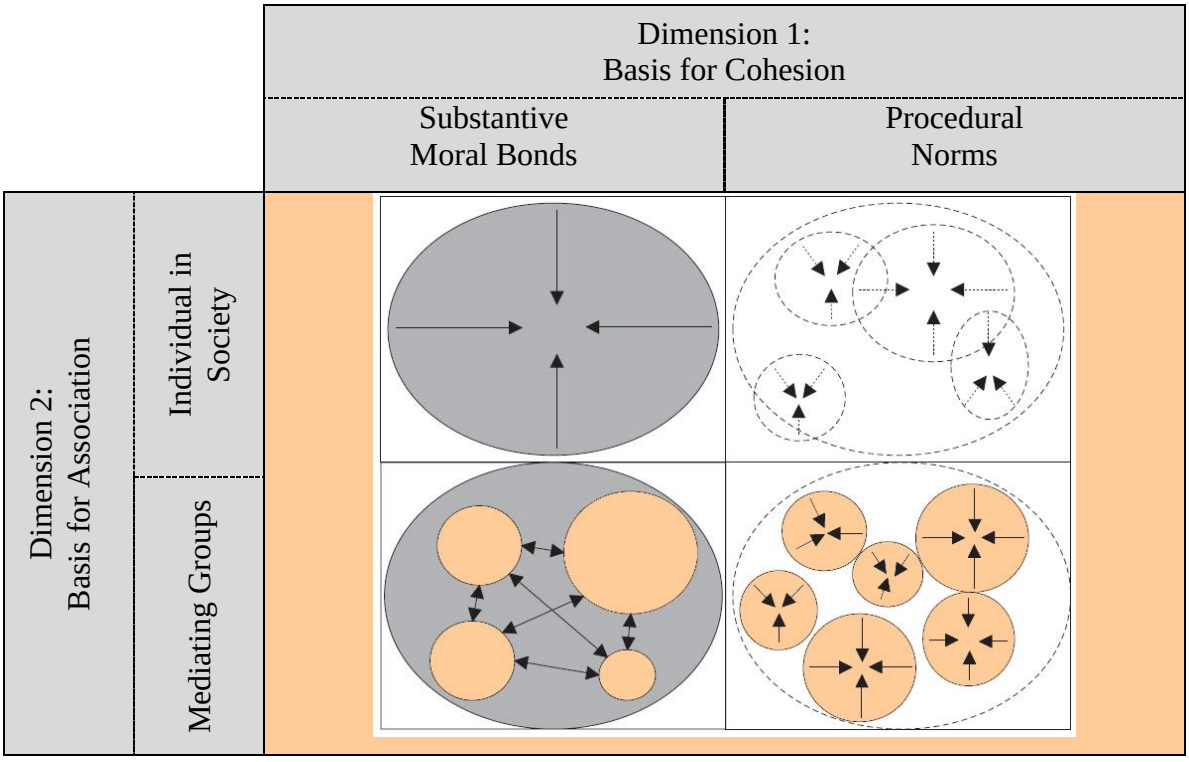


▲Figure 2.3. Structural characteristics relating to the kind of social order

Such boundary could, for instance, identify Egyptian citizens and be able to identify some of the substantive commitments. Simultaneously, they can exclude outsiders who do not belong to them culturally or legally. On the contrary, a weak external boundary can lead to a degree of identification, without clear exclusive elements. The strength and specificity of the national border are therefore directly linked to the first element that defines this framework. In visions that emphasize substantial moral ties as the basis for cohesion, the outer boundary tends to be relatively strong and concretely defined. In visions that focus on procedural rules, they are relatively weak and inadequate.

In theory, members of a social whole can be divided by any notable definitive boundaries, but religion, ethnicity and race are consistently the ones that most academics concentrate on. The more sturdy the internal boundaries are in a particular view of the difference, the more visible groups within the community are seen as separate from each other in terms of values, practices, and identities. Like the external border, internal borders are mutually inclusive and mutually exclusive. The strength of internal boundaries is directly related to the second element identified in this framework.

Models also differ in the strength and position of the conformity pressure: strong conformity pressure comes from strong borders, but visions differ from the source of this pressure. Pressure on members of a social unit to preserve or retain values, practices or identities can come from internal mediating, internal groups or the social whole and can reach all members of that social whole, only within the boundaries of groups or between social groups



▲ Figure 2.4. Structural images of social order.(D. Hartmann and J. Gerteis, 2005)

2.4. Types of Multicultural Communities

Each type of the multicultural communities has its own features and characteristics that control the relationship between the inner cultural groups and the social whole. That depends on the previously illustrated basis of cohesion and basis of association. The following part introduces the features and characteristics of each type of them.

2.4.1. Assimilation:

Although assimilationism is one vision of the variation in this model, which is usually not called "multicultural", this part demonstrates it because it is the simplest vision to depict and it is the datum on which most authors set their views of difference. Ultimately, assimilationism is often defined as the traditional view of integration. Because of this situation, some authors praised it and others condemned it. Factually, there has been a radical opposition of this concept recently. It is important that all parties agree on the principles of the traditional concept of assimilation rooted in ethnicity and race. [37]

In the first dimension, assimilationism is based on the importance of substantial moral ties as the basis of moral cohesion. Particularly, the focus is on common responsibilities coming from fundamental values and cultural obligations. The connection between the individual and the social whole is considered direct more or less. Rather, the social whole of assimilationism takes on "group". Functionally, the nation and the group are equivalent. The boundaries of the social whole yet tend to be substantial, while the boundaries of the internal group are nonexistent, weak, or incorporated in the whole. Conformity pressure that promotes

social fusion in this model is the force for individuals to lose the identity features of any outsider and to embrace the basic values of their society.

This vision addresses the difference by removing it. The difference is understood as something serious to get rid of or at least reduce it. Instead of imposing a strict social seal on society, Alexander emphasizes that this vision eliminates the difference by transforming out-group members into in-group members in a peculiar way that separates individuals from their characteristic features [19]. The external identities and cultural characteristics that preserve these identities must be abandoned, at least in public, before full integration into the social whole can be achieved. In other words, no groups are predicted to assimilate. Instead, individuals are expected to lose their old characteristic features of identity and to take over these of the social whole.

Besides, Alexander mentioned that the private difference can be accepted in this vision provided that it is not put forth into the public sphere. For instance, religious or ethnic practices that have been privately observed may be condoned, provided that they are compatible with the general respect of the laws and practices of society. This common core of values is what Shils [38] and other sociologists have described as "center".

Loyalty to the center is a fundamental characteristic of this vision. As a result, the pressure to adapt is extremely strong and the members are remodeled in a "rigid and uncompromising manner" [36] so that there is a common understanding of the very social nature and that it becomes the salient identity, if not the only members.

Due to the solid nature of macro-social boundaries, there is a solid defense of the Center against the intrusion of outsiders and peculiar cultures they can bring with them. So, the outlines of national culture tend not to be a matter of change. Practically, this usually means that assimilationists prefer to minimize migration, as many authors have acknowledged. However, it is important to recognize that this vision is at least theoretically consistent with even higher migration rates. Because migrants are willing to abandon the values, practices, and identities of groups in favor of the basic culture of the host society, they are not considered a problem.

Based on this insistence on homogeneous social adherence to the fundamental principles, assimilationism has usually been described as a conservative view, but the preservation of moral or common values is not necessarily in conflict with policies of social justice or redistribution more than incompatible with the reception of migrants as long as they are adapted to the established dominant culture.

2.4.2. Cosmopolitanism

In its most basic form, the cosmopolitan approach recognizes the social value of diversity, but remains skeptical about the obligations and limits that social cohesion and group membership can impose on individuals. So, this vision supports diversity only to the extent that it permits and extends individual freedoms and rights. Contrary to the vision of assimilationists, the most distinguishing features of cosmopolitanism are its weakness of cultural particularity and the vagueness of its outer boundary. While the assimilationist vision sees a solid macro boundary and a dense and substantial understanding of moral solidarity in this first dimension, cosmopolitanism rests on a weaker and more understanding of the procedure of the macro culture. However, with respect to the other two multicultural visions presented below, the weakness of subnational mediating communities is distinct here too.

The significance of this vision is tolerance and individual freedom rather than shared obligations. It also means that those who represent this vision do not commit to members sharing what is beyond the minimum commitment of membership. For those who are

affected, belonging to the social whole is one of many sources of identity and not necessarily the most important one.

Group differences can be important, but group identities should not immerse or be a source of public rights or duties. Often, they can also be transversal. Shortly, it is a massively individualized and voluntary vision. It is individualized in the sense of Simmel [35], because the members are intrinsically distinct from multiple and overlapping boundaries. It is also individualistic in a more pedantic sense, since belonging to the group becomes the choice and source of individual identity. The white ethnic identity in America [38, 39] is almost a good model to illustrate the identification of this weak group. To identify a "German American" with today's United States does not mean accepting a strong or separatist identity, for instance, because there is nothing about "German" that is particularly suspenseful with "American", and also because there is no significant pressure to choose between this and other ethnic identifications like "Irish". A cosmopolitan vision would bring all groups into such secure contexts. [40]

Therefore, cosmopolitanism tends to be the most subtle vision, but at least one in which differences can exist without significant conflict. The weakness of external and internal boundaries means that inclusive identifiers are neither very strong nor exclusive pressure that sustains social conflict. This vision is essentially similar to what Alexander calls "ethnic hyphenation", where group qualities are neutralized rather than denied, while providing "opportunities emotionally, dialogue and understanding bonding that be a reason of increasing rates of friendship and intermarriage" [19]. However, Alexander has relatively little to say about this model, and later he considers it a transition point between assimilationism and real multiculturalism, just like Taylor [36] who defines it as "neutral liberalism".

It is likely that the weakness of concrete or actual limitations in this model is problematic for many observers who want a stronger vision of the community. Still it is also the weakness of limitations in this model that has made it attractive to a group of researchers. This was the predominating vision of a number of previous liberal intolerance reviews [41], but it is also one that has a positive attraction force on the ordinary American audience because it focuses on choice and volunteering and assert on the permeability of membership and group inner boundaries. For Hollinger, the ideal society is that one where every section in story could have the equal authenticity for a public audience and power. It is the one in which every individual has the freedom to choose his place in the ethnic mosaic. [42]

2.4.3. Fragmented Pluralism

Fragmented pluralism emphasizes the existence of a multitude of different and relatively autonomous mediation communities as a social reality, but also as a necessity and force. This vision is the closest vision to the opposite of structuring assimilation.

In the first dimension, this model is based on norms of procedure rather than mutual moral bonds. In the second dimension, the model emphasizes the role of groups. Therefore, the structural content of this vision tends to be a lower macro-social boundary, but very strong boundaries for internal groups.

In assimilationism vision, social groups are socially absorbed in the social whole. In a fragmented pluralism, the entire social whole dissolved into its collective components units. Shortly, the group calls the individual not the nation. In cosmopolitanism vision, belonging to the group was a matter of individual freedom of choice. Here the affiliation to the group is regarded as essential and not as partial and voluntary. It is believed to be based on strong pre-existing group boundaries rather than freely chosen ones. Maintaining strong group cultures for a distinctive group is one of the main points of interest for the proponents of this vision.

Therefore, conformity pressure is strong here; however it is group-specific rather than sticking to a common "center" that counts. Individuals are basically engaged to subnational, mediating communities, but national order is ensured by respecting collective self-determination and the rights of the group.

This shift towards diversity may be closer to the standard definition of multiculturalism as opposed to social homogeneity. Correspondingly, this vision was the objective of cultural critics, , who feared disunity and moral relativism they consider as original in it. In a great part, the emergence of such strong claims about the difference in the 1980s and afterward, that led to the debate about losing the "center" [43]. Insistence on preserving group differences - be they ethnic, racial, or otherwise - is at the root of what advocates consider an advantage and critics regard it a threat to this model.

Value systems, in all groups, can be divergent or directly opposite in some cases, under fragmented pluralism. Consequently, substantial moral ties at the macro-social level no longer form the basis of social cohesion. As with cosmopolitanism, the focus is on procedural rules. However, attention tends to be reduced on interaction rules than to group rights, such as legal rights to preserve separate practices or institutions. The state and its legal structures are therefore particularly important for cohesion as a mediator between group requirements. However, the state is considered largely empty because it deals with the inconsistent rights-claims of the groups without imposing even essential moral claims. In a sense, the significance of the state as a judge of shared rights increases in proportion to the decline of society as the creator of common values.

Although this view is in some ways counter to an assimilationist view, it is crucial to emphasize that it is not very different in another sense. This vision can be seen as a version of assimilationism where groups are replaced by nations. If the assimilatory vision approaches what Durkheim calls "mechanical solidarity," fragmented pluralism is tantamount with an exception that each cultural group acts as its own community of solidarity [34]. Because the inner boundaries in this model, not the outer boundaries that bear the cohesive weight, the limits of the group are controlled by the way social boundaries are in assimilationism. The groups have an obvious idea of who fits and who does not. For the entire social-whole there is no separation between insiders and outsiders. In the absence of a common sense of shared value, there is simply no cultural basis upon which such distinctions can be made, and there is no way of telling where the boundaries of the social body are.

However, the more comprehensive implication of the concept and the reason why it is so useful here are what indicate a particular vision of the multidimensional difference. Nevertheless, the Indonesian society, for example, is not a homogenous culture in itself, but a collection of different cultures and groups. Assimilation does not lead to the loss of these differences, but their construction, in other words, is the assimilation in the group difference.

2.4.4. Interactive Pluralism

Although the term "multiculturalism" has sometimes been used to refer to any vision for differences, it has recently been used, in particular, by Alexander [19] and Taylor [36], among others. This distinctive version, which is known here as interactive pluralism, embodies the existence of different cultures and groups. But unlike its fragmented cousin, it establishes the need to cultivate a common understanding through these differences through mutual recognition and constant interaction. In fact, for many of its members, intercultural dialogue and exchange will be the characteristic and ultimate value that needs to be nurtured.

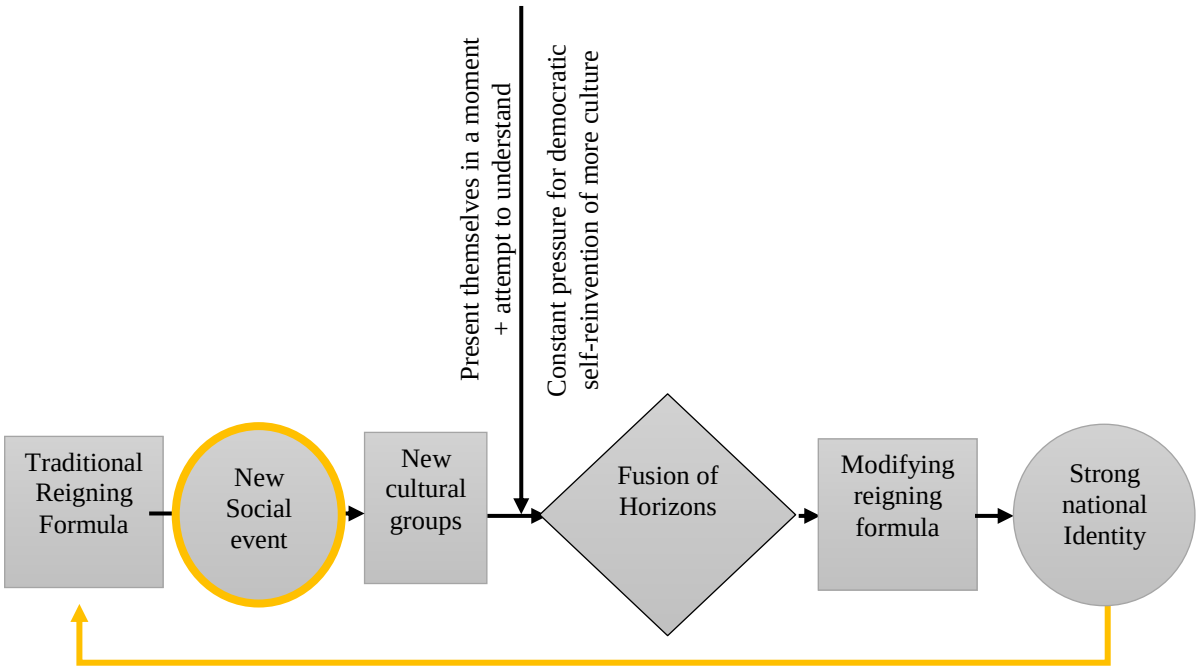
Alexander and Taylor tend to show that their favorite form of multiculturalism is farthest from assimilationism. This seems correct in one respect - multiculturalism is based on the acceptance and recognition of differences rather than denial - but is certainly overall

inadequate. The distinction is usually stated in terms of acceptance (assimilationism does not accept difference, while multiculturalism does), and that is an important point. The placement of this vision within this framework demonstrates its complex connections with other visions. Similar to assimilationism, this vision is based on a substantial form of relatively "thicker" cohesion. For assimilationism, these links focused on shared responsibilities based on common values, while interactive pluralism focused on mutual respect for differences and mutual recognition. Like fragmented pluralism, this vision stresses the importance of groups as the main reason for association in society. While both visions magnify the role of groups, interactive pluralism focuses on groups that interact with each other and form a substantial moral whole. Therefore, the important place of interaction is between and not within groups.

In this interactive model, group differences are celebrated and group identity claims are considered as legitimate entry points in public life. All in all, there is a "decentralized" view of national culture, that is, plurality and not merely an emanation of the cultural vision of a single group. However, this assertion does not mean that there is no coherent macroculture such as segmented assimilation. On the contrary, a key feature of this vision is that interaction between groups creates a new, constantly redefined macro-culture, a complex social whole that is valued and recognized.

Under fragmented pluralism or cosmopolitanism, macroculture has a tendency to be more essentially thinner procedural. Under assimilation, the moral core of macroculture is considered substantial and fundamental. In other words, its claim of legitimacy is rooted in tradition and therefore always precedes the social interaction that forms it. However, with interactive pluralism, the essential moral order is understood as emerging - not something that "is" but something in a continuous state of becoming. Moral order and social boundaries are more or less democratically produced by group interaction. This is fundamental. As groups' formations change, the very nature of macro culture changes itself; there are always content-related obligations, but these are constantly regenerated and can take very different formations at various points in time. While new forms of difference and new groups can emerge continuously, there is always a relatively strong national or social identity.

For instance, Taylor [36] stated that assimilationism has diminished with increasing immigration while immigrants and other internal "others" may need to modify the "Reigning Formula" to accommodate them rather than the exited one. Taylor suggests that the result will be a constant pressure for a democratic "self- reinvention" of macro culture, suggesting that this should not be done on the basis of an empty liberalism like that in cosmopolitanism vision. On the contrary, it must necessarily imply a sort of democratic hermeneutics where understanding the "other" implies a new self-understanding. "The attempt to comprehend leads, if successful, to a "fusion of horizons" that is suggested by Taylor [36]. In the context of Alexander, integration means that it is not individuals but the qualities of foreigners that make the change. Incorporation mean differs from "inclusion" of foreigners in a predefined cultural domain to a "achievement of diversity "in the same sphere. [19] (Figure 2.5.)

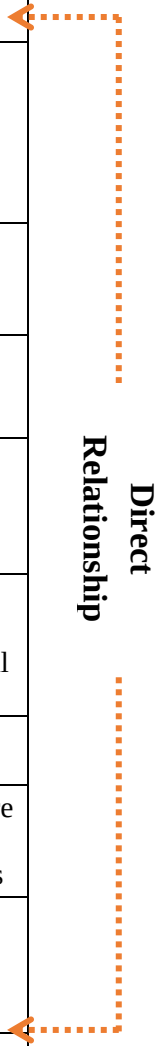


▲ Figure. 2.5. Dynamic state of interactive pluralism society (the researcher)

To sum up the previous discussion about the four visions of cultural difference, table 2.1. explains a comparison between them. That comparison helps researchers and scholars to put their fingers on the most important features that characterize each of these vision with relevance to the other types, particularly the assimilation vision.

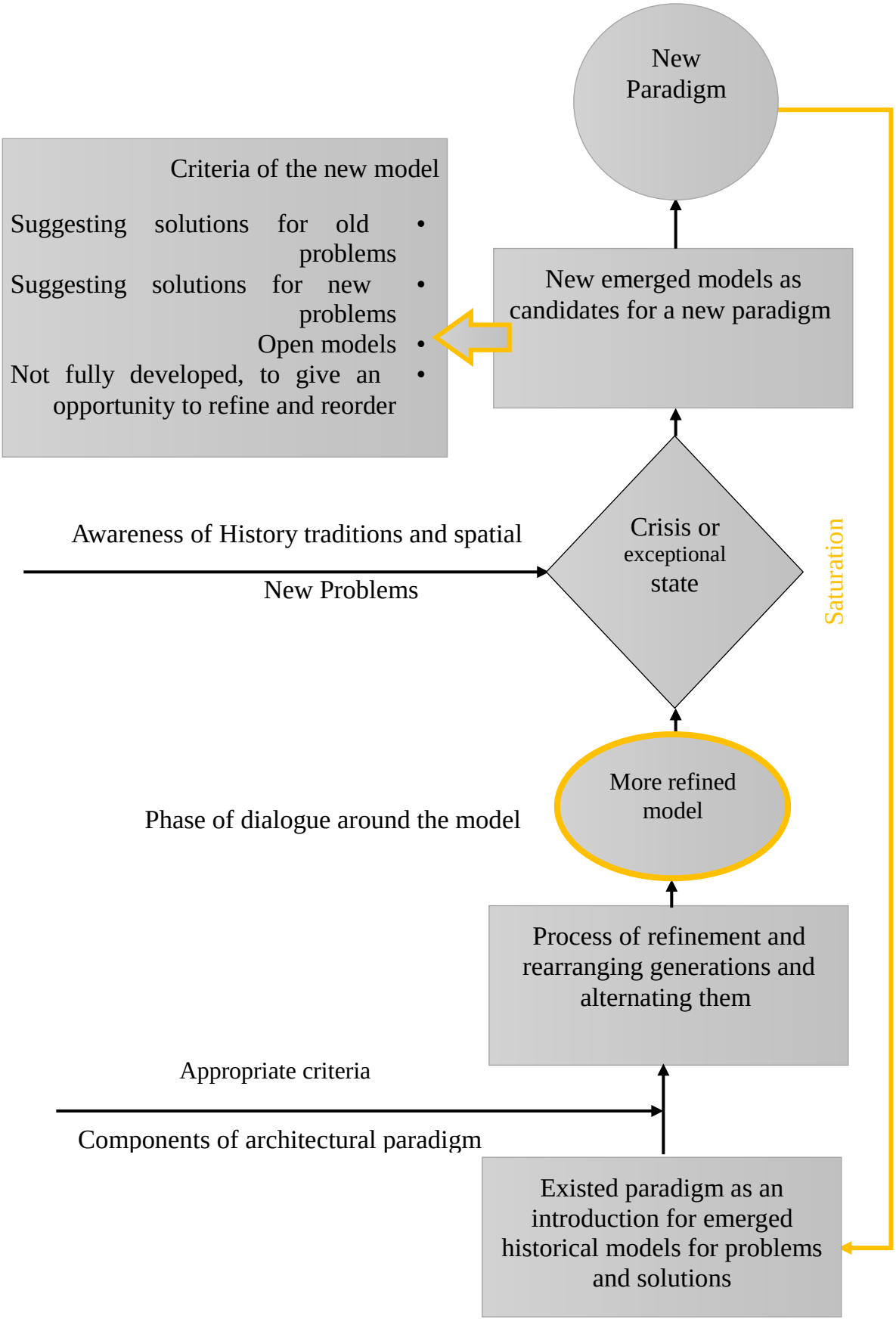
Table 2.1. Compares between characteristics of each type; Assimilation, Cosmopolitan, Fragmented pluralism and Interactive Pluralism:

	Assimilation	Cosmopolitan	Fragmented pluralism	Interactive Pluralism
Basis for Cohesion	Substantive Moral Bonds	Procedural Norms	Substantive Moral Bonds	Procedural Norms
Basis for Association	Individual in Society	Individual in Society	Mediating Groups	Mediating Groups
External Boundaries	Strong	Weak ambiguous	Weak	Strong
Internal Boundaries	×	Weak ambiguous	Strong	Thick based on respect
Conformity pressures	Push individuals to adopt the core values of the society	tolerance and individual choice	group-specific	Interactive conformity pressure
Relation with the center	Adherence	Voluntaristic	Through group rights	"decentered" vision of the national culture
groups mediating role	×	Voluntaristic	Strong	Cultivating its identity
Group membership	Obligation	Optional	Obligation	sometimes optional and sometimes obligation
Relationship between groups	×	Shallow	Discrete	Based on constituting a substantive moral whole
Insider vs outsider	Clear-cut	Shallow	Shallow	Shallow
Identity	Strong	Shallow multiple identity	Concerning groups	identity claims are regarded as legitimate points
Differences between cultural groups	Dissolved	Accepted	accepted	Celebrated Plural
Macro-culture	Coherent	thinner and procedural	thinner and procedural	Redefined by the interaction between groups
Moral order	is rooted in tradition	tolerant	×	constant state of becoming



2.5. Multiculturalism in Art and Architecture

The question is: why did culture and especially the arts have been the main objective of multiculturalism? Several authors have suggested various reasons. About the United States, Avery F. Gordon and Christopher Newfield show that some people think that "any debate about cultural difference would lead to insignificant racism [or class conflict] " and that "equivalent respect would alternate mutual culture in substitution for social cement." [44]. They conclude that the emphasis on culture - and yet by expanding to art – relies on the traditional belief in its capability to overcome social pressures and to provide multicultural communities with a position of independence and strength. In the same context, Gordon and Newfield reported multiculturalists like Cary Nelson that educators believe that to make people familiar with different traditions, education can supply "a new interactive terrain" that can "basically reorder the dominant definitions about culture" and distribution of resources and power [44], which means that a better understanding of culture can help to make a social cultural change. [45]



▲ Figure 2.6. Dynamic state of architectural paradigm (Helmy, S., 1993)

2.6. Conclusion

This chapter presents a review about multiculturalism, where some authors of sociology consider it a threatening problem for any community, while few of them find that multiculturalism is a social potential of which communities can make use. This expression emerged in the 1970s where there were many old countries with more than one cultural group in their communities. Multiculturalism is of four distinctive types: cosmopolitanism, fragmented and interactive pluralism and assimilation), and this framework can be helpful to this study and other scholars as it more precisely specifies, analyzes, and recognizes the complexity of any multicultural terrain. That helps practitioners –in any creative field- to find the suitable way to deal with the community they are serving and representing.

From the previous discussion, it is clear that there is no multicultural type that is better than the other; each one of them has its own features and characteristics that figures its nature and draws lineaments to deal with and to make the best use of its potentials. Nevertheless, communities are dynamic. This means that, by time, the same community may change from one cultural/multicultural type to another, due to different circumstances of political, social, economic, and environmental nature.

The next chapter studies the case of Egypt during the Coptic era from a social point of view. It analyses the social and cultural groups of the Egyptian community at that time. It studies the characteristics of the relationship between those groups to specify their suitable multicultural types.

Chapter 3 Multiculturalism in Egypt throughout the Coptic Era

3.1. Introduction

3.2. Coptic History

3.3. Determining Coptic Era Period

3.4. Factors Affecting Egyptians Self Culture

3.4.1. Controversial Identities

3.4.2. Self-Definition Based on Religion

3.4.3. Ideology

3.5. Cultural/Multicultural Groups of Egyptian Community

3.5.1. Cultural/Multicultural Groups before the Coptic Era

3.5.2. Cultural/Multicultural Groups through Coptic Era

3.6. Multicultural Type/s of Egyptian Community throughout the Coptic Era

3.7. Multiculturalism in Arts throughout the Coptic Era

3.8. Conclusion

3.1. Introduction

The main goal of this chapter is to have an overlook on the Coptic history, to build a general historical idea about the Egyptian community and the lifestyle of individuals back then. That can be deduced from the important political events that had occurred, the inherited biographies of significant leaders who lived during the Coptic era, and the physical artistic products that have been existent since that time which prove the interaction between cultural groups. This part also specifies the date of the Coptic era, where theorists and historians have different opinions about determining that date precisely, which clarifies the studying period in this dissertation.

Moreover, and according to the previous chapter, this chapter addresses the types of multiculturalism, explores the different social and cultural groups in Egypt at that time, and discusses the relationship between the Coptic individuals, and the Copts as a cultural group, with the other cultural groups. This is to recognize the features and characteristics of the Egyptian community, at both the social and cultural levels. That process helps to determine the suitable multicultural type that represents the Egyptian community during that period of time. Furthermore, this part of research shows the social dynamic changes that occurred throughout that period to show if the Egyptian multicultural type had found its way to change to another type or not.

3.2. Coptic History

During the Coptic period (300-900 C.E.), the Egyptians were masters of self-expression. Particular pictures are reminiscent of a Coptic hermit which, despite all opposition, remains in a life of denial. General studies as well as more specialized studies on [46] the history of Coptic Egypt helps Egyptians to declare mental images they want to submit. In this way, modern perceptions of that history can be adopted by ideas that may have had only one view among few people who lived in Egypt during that Coptic period of time. Those writings can hide huge realities, as well as those ideas of the history of Coptic Era.

Often, the Egyptian approach of the Coptic period was the one in which the emphasis was on limited means of self-expression or on ever-evolving patterns of life. Life in Egypt has been described as one of the extremes and some issues have not been addressed.

The presentation of monolithic realities of the Coptic period raises the question of why an attempt to rigid self-definition seems necessary for the survival of society and to what extent self-consensus is possible. Intersections and contradictions between and within the various types of evidence are highlighted. The contrast provided by the Egyptian Coptic study allows a new perspective on these issues. This period of fragmentation and rejection forced the Egyptians into a completely different worldview, the Egyptian of the Coptic period compared to the non-Egyptian past.

The strong self-definition of the Egyptian state is undermined by some of the surviving evidence. Even with the most centralized power base, at the time of the New Kingdom for example, inadequacies and inconsistencies in statements settled by the king and his circle must not be ignored, nonetheless, and for the most part, the general stability

and strength of the world view of the Egyptian world that allowed it to survive for three thousand years.

With the Coptic era, an equivalent energy was invested in the creation and maintenance of a Christian world view, which, according to Frend (1982) after the Council of Chalcedon in the Czech Republic, became a specifically Egyptian-Christian worldview, a period of turbulent change for those in Egypt because the Egyptian past was projected in a completely negative light. It was not the first time that the past was rejected in Egypt. Some Egyptian kings separated from the old rulers and destroyed the evidence of their rule. Each interim period was also represented by the leaders who wrote a moment of disorder out of it, which should be rejected. For the first time, however, a completely new ideological system was proclaimed in Egypt, in which there was no period in the Egyptian past that could be viewed with nostalgia or admiration.

However, the past could not be entirely forgotten. Christianity has also been rooted in ancient Egypt by Coptic researchers [48] and Afrocentric [47]. In this, specific features of the Copts were distinguished and then traced to the ancient Egyptian world directly. For instance, the Coptic interest with 'moral conduct' was linked to the ancient Egyptian who 'was very interested in their moral conduct, behavior and reputation'. Even the everyday behaviors, like wearing perfume by Coptic women, were influenced by the practices of ancient Egyptian [48].

Christianity was able to replace one of the longest surviving civilizations which were respected during the Roman role. But it was not able to continue as the main religious or political ideology in Egypt after the Arab conquest in 641 C.E. and as a result the Coptic language died out and the population of Coptic Christianity declined.

This section of the thesis deals with those questions to evaluate the influence of ideology on self-definition that distinguishes Copts as a cultural group.

3.3. Determining the Coptic Era Period

The Coptic era, as understood in this thesis, extended from the fourth to the ninth centuries, where the Coptic language was the official language in Egypt. However, as an expression, the Coptic era has no political reference. Nevertheless, the Coptic speakers, who were the majority of the Egyptian population, were able to preserve their cultural patterns in spite of the political changes.

The term "Coptic Era" is not recognized universally, where many researchers prefer to classify centuries according to political events, such as Roman, Byzantine or Islamic. Moreover, another term is more used which is "Late antiquity", that expression which generally enforces the Egyptian role in the ancient period. Distinguishing the historical periods is a very debatable issue and may cause sharp limits and broadens the scope of generalizations on the evidences of Egypt [49]. In 1970, Lewis tried to call the period when Egypt was under the role of Ptolemy, Romans and Byzantines as "Greco-Roman Egypt" [126], but that was not helpful. This is because the expression was not that precise. The term "Coptic era" may not be that precise as well, however, as defined in chapter one, it helps to achieve the goals of this thesis.

3.4. Factors Affecting Egyptians' Self Culture

3.4.1. Controversial Identities

Many scholars are still eager to study the race of the ancient Egyptians. Vercoutter is one of them and he was willing to regard the Egyptian community as a 'melting pot', and he claimed that distinguishing the race of the ancient Egyptian community requires more physical and anthropological researches. [50]

This imposes more importance on racial diversity. For this reason many racial descriptions took place for the remaining materials from that culture, despite the fact that those remains did not carry in themselves any racial marks. [52]. And the argument about current political and social inequality is inevitably removed from the Egyptian past where race could not influence the ancient Egyptians. [53]. This issue is very crucial as mentioned by Bernal [54] where he explained clearly that he did not find any "biological benefit" to the expression of race. At that time, he presented the reduction of political academic studies:

The labels in the evidence itself are used, which, as seen, were frequently fluid and utterly subjective. Relevant to this thesis, as a point of comparison, it is the issue of Greek identity, something which had no national point of reference, yet held meaning for the Greek and non-Greek: 'a Roman, of course, would often have referred to a Greek as a Greek, not as an Athenian or Ephesian (as they would call a man a Gaul or a German), just as the Greeks had always identified non-Greeks by "national" labels' [55]. Thus, I use the contrast Egyptian/non-Egyptian as a generalization which hides a wealth of other levels of meaning [55].

It is still very difficult or even impossible, to change that mental image that classifies them separately and labels them as different ethnicities. It is very obvious that difference was an essential feature in Egypt throughout the Coptic era, but this does not refer to the existence of ethnic groups. For that, the goal of this part of the research is not to evoke the origin of certain race from any remaining evidence, but to set a mental image about the self-definition context. The resulting classifications from those evidences are very subjective and loose. Thus, this research uses the bipolar Egyptian/non-Egyptian as a kind generalization that covers any reference to certain meaning [55].

This particular part of the research is concerned, alongside the impact of the political state on the social identity, with the impacts on religion and the self-definition past. Religion was considered an issue in the self and other assertion. It can help in activating social unity [56] and can be closely tied to political contingencies.

3.4.2. Self-Definition Based on Religion

From the political point of view, the hazard may be clearer with the analytical tools of ethnicity and race, however, this may seem as enormous weight of the pre-conceptions, and that any attempts at approaching the way Egyptians defined themselves throughout the Coptic period will be just hazy.

The self-definition of a group member may be attached to contrasting factors [57]. For instance, in the past, the political or social levels would be crucial factors for a social member [58], but for other group members gender [59] or language [60] may be more

central issues. The illusion of the term identity has two faces in which the group member may present a different image about her/him from the actual one, and this makes it complicated and hard to clarify the self-definition [61], especially when given the opportunity to change the self-definition of someone due to external factors. Relevant to that, it is not easy to make sure about the infinite changes that may occur to self-definition.

It is sarcastic that people who fight for their independence from imperial powers depend on assuring differences. Nationalist movements rely on believing that people who have adopted the same identity can share a certain land. Due to Anderson [60], this idea of shared identity can be imagined, but it is not less important than being a motivator. Highlighting differences is a fundamental systematic feature in the society, "a crucial feature for a social life" [62] despite the predicted negative results of such differences.

3.4.3. Ideology

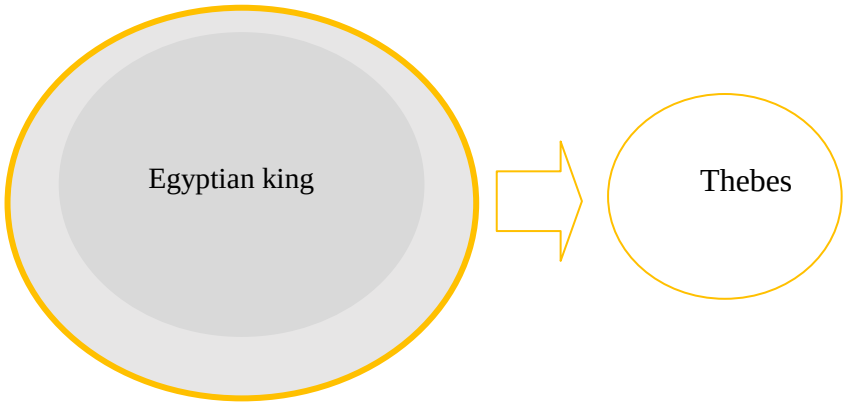
Power of authority is a crucial factor for society and an accumulative part of technology, knowledge and family [63]. Yet, the potentials of a notion, however strong, are limited if that notion -despite the capabilities of its associations- is not able enough. There is another more comprehensive method for analyzing the way societies work according to this ideological multi-sided assessment.

In spite of Foucault's neglect of the expression ideology, his views about knowledge and power provide broader understanding about ideology. Althusser's definition is suitable for discussing the ideologies of the high class social members; however it is important to watch the ways of resisting ideologies in a society. Moreover, the scope of this research is the communication between alternating ideologies or the clear acceptance of the official ideologies.

3.5. Cultural/Multicultural Groups of Egyptian Community

3.5.1. Cultural/Multicultural Groups before the Coptic Era

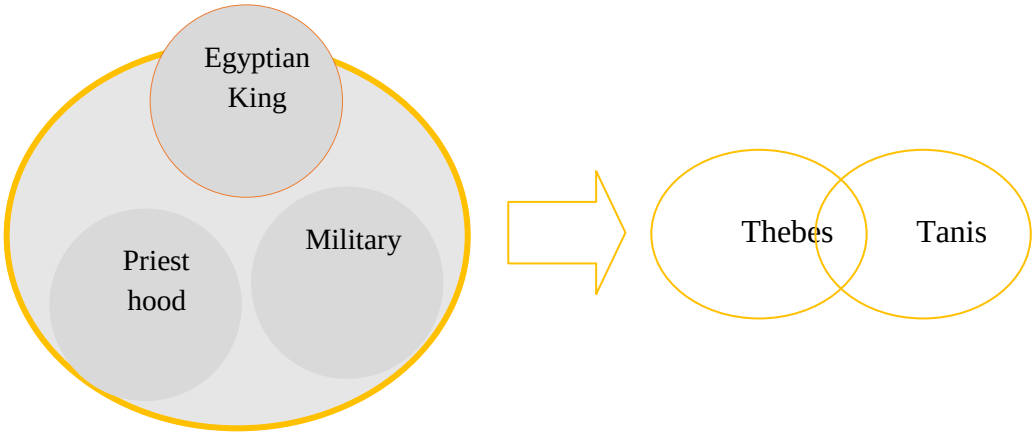
The last period of the New kingdom of ancient Egypt witnessed gradual changes that led to the break of Egypt into political fragments as a unified entity in the end. The power of authority was divided between the king, military and priesthood. The relations between those different associations of the country, military, were under renegotiations, where the priesthood had to be one of the paries, supposing that its power was stronger than that of the king [65]. With the death of Ramsis XI in 1070 B.C.E., a turning point occurred and was considered the end point for the New Kingdom. After that, the authority was divided between Thebes and Tanis [66]. Figure 3.1. shows the structural images of social order during that time.



▲ Figure 3.1. Structural image of social order at the late stages of the new kingdom

In spite of this political division of Egypt throughout the third medieval period (1070-712 B.C. E.), the memory of united Egypt was preserved, with several attempts of reunification in several occasions. Intermarriage between families of Tanis and Thebes supported the communication between rulers, and the excavations in Tanis proofed the broad reuse of structures and ancient Egyptian tools and the high skills of craftsmen.

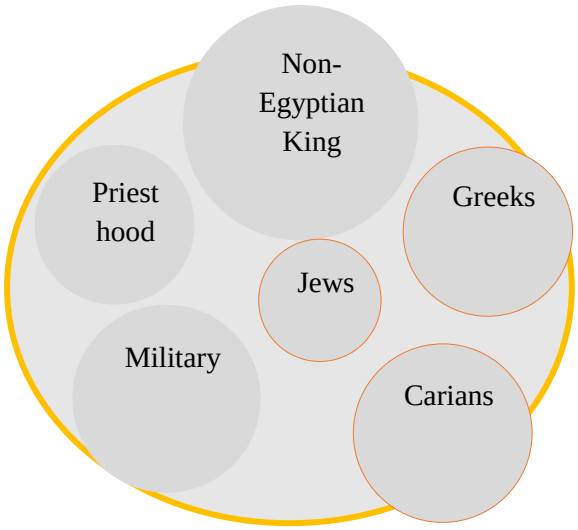
Throughout this period, non-egyptian rulers practiced their authority the same way the kings of New Kingdom did [67], such as Shoshanq I who was related to a Lybian family from Bubastis (945-924 B.C.E.) [66]. He tried to unite Egypt, and ruled Egypt as any original Egyptian king. In spite of the centralization attempts, the third mediavel period was distinguished by the presence of more than one king at the same time in many locations like Leontopolis and Herakleopolis (22-25 dynasties).



▲ Figure 3.2. Structural image of social order at the late stages of the new kingdom after Ramses the XI

Between those dynasties, the 25th dynasty was the most important for a long time. As another non Egyptian king, Piye conquest Egypt directing the north side towards Memphis. He was from Nubia, originally from Napata, and believed in Egyptians and tried to re-organize the regime in Egypt [68]. The late period (712-332 B.C.E.) witnessed the reign of Shebaka (712-698 B.C.E.) who followed Piye who succeeded in unifying Egypt, and a new Nubian dynasty was established as the strongest dynasty in Egypt [66].

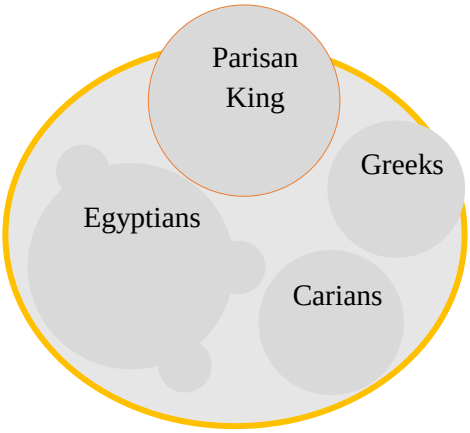
It seems that the origins of the non-Egyptian rulers are notstrange from Egyptian culture. Instead, the non-Egyptian rulers settled themselves as new kings in the history and looked at the past to generate new forms of art [66]. The rule of Egypt was alternated between being a province between others and executing conquests in Nubia and Asia, for instance, Psammetichus I (664-610 B.C.E.) who worked as a basic king for Assyrians [68.]



▲ Figure 3.3. Structural image of social order when Egypt was a province of other empires.

Like the new kingdom, Egyptians formed a vital part of the Egyptian military. Psammetichus I used the Greeks and Carians, and they became important in the trade activities as well. That was flourished during the 7th century by establishing Naukratis city during the rule of Amasis (570-526 B.C.E.) when the latter declared the city as a city for the Greeks only as Egypt became a home for the exiled Jews from Babylon [69].

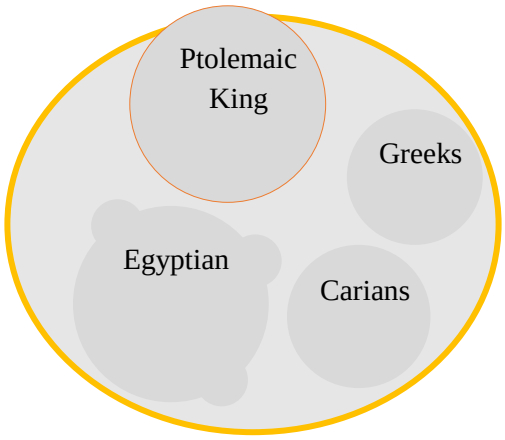
Egypt came under the Parisian rule (525-404 B.C.E., 343-332 B.C.E.) and become one of many provinces that belonged to the Parisian empire. In spite of the bad reputation of the Parisian rule in Egypt, according to Egyptian and non-Egyptian references, archeological evidences proofed that it was not a negative period for the Egyptian culture [70] (Figure 3.4.). Even the sculpture of Darius from Susa, who declared the oppression of Egypt, depended on the forms of the Egyptian art and texts to put him as the only heir of the throne of Egypt [70] (Figure 3.5.).



▲ Figure 3.4. Structural image of social order when Egypt came under the rule of Parisians.

▲ Figure 3.5. Relief of Darius I of Persia, as Pharaoh of Egypt, Temple of Hibis. (www.ancient-origins.net)

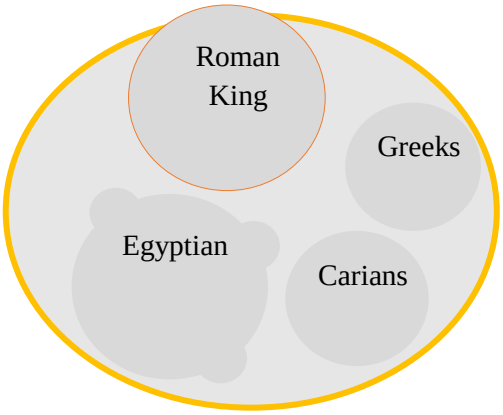
The influence of non-Egyptians on Egypt was supported by establishing the Ptolemy Dynasty (304 B.C.E.- 30 C.E.). That happened thanks to the victory of Alexander the Great in 332 B.C.E., when Egypt came under the Greek reign as an independent country. The Greek culture was supported for Greek residents who settled allo ver Egypt as well as Greek education and language; they settled for instance in Faiyum. The Egyptian temples continued to be used, despite the fact that religious men serving those temples became a part of the Greek structure of authority apart from the Egyptian people [71], where Alexandria was developed at the same time to be a center for the Greek culture and the official identities were given there by the government, and people were treated differently according to their identities: that was not just a personal or a social conscious issue, but it was also an official political issue. And so, being Greek granted some options that Egyptian could not ask for. [72]



▲ Figure 3.6. Structural image of social order when Egypt came under the Ptolemaic reign.

Throughout the Ptolemaic period, that lead to the roman period, historians analyzed the life of people in Egypt using expressions usually linked to the near past. Thus, the literature of Ptolemaic Era was understood as if Egyptians were celebrating Greeks in their national concious, the Oracle of the Potter for instance [72]. Also, the Roman period in Egypt was analyzed as a period of nonstop difficulties for Egypt, yet Egypt became a land for foreigners, a role Egypt had never played before even during the worst times of ancient Egyptians and even when their products remained in their country) [73]. That comment was inspired from the state of Egypt as a personal property of Octavian (Augustus) after Actium war (30 B.C.E.) and then a Roman province (14 C.E.) that imposed heavy taxes on the people of Egypt. [74]

The existence of different groups in Egypt as the country was governed by Greeks and Romans, led to different opinions about that interaction among people back then. Where the antagonism occurred, as what happened in Oracle of the Potter, and open riots between different peoples and revolutions as well [75], there were also an attempt to have that cultural interaction considering it a dominant feature of the Egyptian life [76]. Ritner has mentioned strongly that (the Egyptian elite was obviously more distinct than people who worked in agriculture in rural areas, and the Second-Class people were rarely recognized by the Greeks who were considered the master race) [74].



▲ Figure 3.7. Structural image of social order when Egypt came under the Roman reign.

However, and throughout the Roman period, the new regimes put Egyptians at the lowest level, and this gave the Romans a chance to impose taxes and penalties according to the identity [77] and no official legacy was given to the Egyptian language [78]. However, supporting and developing the Egyptian religious traditions flourished under the rule of emperors, such as Trajan (98-117 C.E., Figure 3.7.) who painted figures for themselves like those of Egyptian rulers [74]. Moreover, the physical Egyptian products clarified the old Egyptian past that was highly valuable [79], and those ancient Egyptian antiquities were taken to the empire capital to form other locations.

▲ Figure 3.8. The Roman emperor Trajan depicted as Pharaoh offering a necklace to the goddess Hathor (www.gettyimages.es)

3.5.2. Cultural/Multicultural Groups through Coptic Era

Egypt remained under the reign of the Roman Empire until 323 C.E., and throughout that time Egypt became part of the Byzantine Empire (it was occupied by the Parisians from 619 to629 C.E.). However, and according to the Byzantine treaty in 641 C.E. Egypt came under the rule of Arabs. But Alexandria itself did not surrender until 642. [80]

This political change was accompanied by the growth of Christianity, reduction of paganism beside introducing Islam after 641 C.E. During the growth of Christianity in Egypt, the whole Christian world was straggling about the way the form of canonical of Christianity should be. That happened after the Council of Chalcedon that was held in 451 C.E. where Christianity in Egypt was neglected. However preserved the monophysite position, in front of what became official dyphysite point of view [81]. By that, different views were presented in Egypt at that time about the way the pattern of Christian life should be, even with the presence of heretics who represented a sustainable source of worry for those who considered themselves Orthodox. The Byzantines ruled dyphysite residences, and the Christian part of them was considered heretical.

Coptic Egypt consisted of different areas from their original style. There were highly urban places, like Alexandria or Karanis Oasis city for instance, in addition to the small settlements that existed around the monastic community. Moreover, there were those who chose to live in boarder zones, on n agricultural or desert lands, either because they desired to lead the lives of hermits by devoting their selves to God or because they needed to avoid the government penalties.

The country was divided into huge real states; their owners took the duty of the country gradually from the fourth century until 641 C.E. [82]. Agriculture was the main source of work [83]. The Islamic conquest seems to be a turning point for Egypt, but despite that there was a high degree of continual for those people live in small cities and villages [84]. Byzantine Egypt was the central authority in terms of taxes and military service. The Islamic influence was limited on the main administrative regions, and so there was extra poll tax imposed to be paid.[85]

The sustainable state in the administration in Egypt through religious and political struggles, was reflected on the community, especially between certain levels of residences. Christianity became a banned religion between 110 and 210 C.E. Nevertheless, it was followed and spread in Egypt by different groups of other religious beliefs and practices. There took place many revolutions that refused banning Christianity at several intervals. For instance, at the beginning of Diocletian rule (284 C.E.), which was the start point of the Coptic calendar, and marked the memory of cruel persecutions that occurred to Christians in Egypt. However, linking between persecutions and using the Coptic calendar did not crystalize until later centuries. The Coptic calendar was not declared as the official calendar of the Coptic Church until the eighth century, and the expression "the era of martyrs" had never been used before the eleventh century. [86]

Constantine's asserting his Christianity in 312 C.E. means that Christianity became the official religion of the Roman Empire, and persecution and exile became the destiny of heretics and non-Christians. Therefore, Athanasius, the patriarch of Alexandria, was exiled many times, first by Constantine in 325 C.E. In 329 C.E. paganism was officially banned [87]. Some of those who embraced Islam acted the same way without turning to Christianity first. [80]

The success of Islamic conquest refers partially to the monophysite residents who were eager to get rid of their diphysite rulers, and this point seems to support the monophysite patriarch to regain his post by the concurs, in addition to other important factors like the inadequacy of the byzantine rulers [83]. During the first centuries of Islamic era in Egypt the freedom of Copts was not limited. Rulers supported the monophysite church, and Copts kept playing an important role in administrating the country and churches that are still built until now [88]. Lapidus mentioned that due to the Arab rulers, the world was concurred by the name of Islam, but not to turn it to Islam.

That was not just a series of simple life, even for those who lived in villages and cities, followed by a series of rebels in the eighth century by refusing huge taxes. In Delta and Upper Egypt, Copts rebelled against their rulers [89]. This rebellion was suppressed at the end (in 832 C.E.) and at the same time the Copts continued to administrate the country and developed its public buildings, such as Ibn Tolon Mosque that was built in 876-9 C.E..

Shortly, through the Coptic Era, Egypt witnessed crucial events that left huge impact on its community. The following table highlights those important dates. (See Table 3.1.):

Table 3.1. Most Important Dates through Coptic era

Event	Date	Impact on society
Christianity was banned in Egypt	110-210 C.E. (before the Coptic Era)	Several rebellions were staged at several intervals on account of refusing and denying Christianity. However, Christianity was followed and propagated in Egypt between different groups of other faiths.
The beginning of the Coptic calendar	284 C.E.	Marking the cruel persecution of Christians by Diocletian.
Constantine's declaration of Christianity	312 C.E.	Christianity became the official religion of the Roman Empire. Persecution and exile became the destiny of heretics and non-Christians.
Paganism was banned in Egypt	392 C.E.	Serapeum was destroyed by Christians. In the sixth century, most non-Christian communities came to an end.
Council of Chalcedon	451 C.E.	Christianity became the Egyptian world view. The Egyptian history lost its respect.
Egypt was surrendered to Muslims	641 C.E.	The use of Coptic language was stopped and Christians became a minority. The Islamic influence was limited to the administrative regions, and the major effect was evident in the taxes system, by classifying non-Muslims as dhimmi

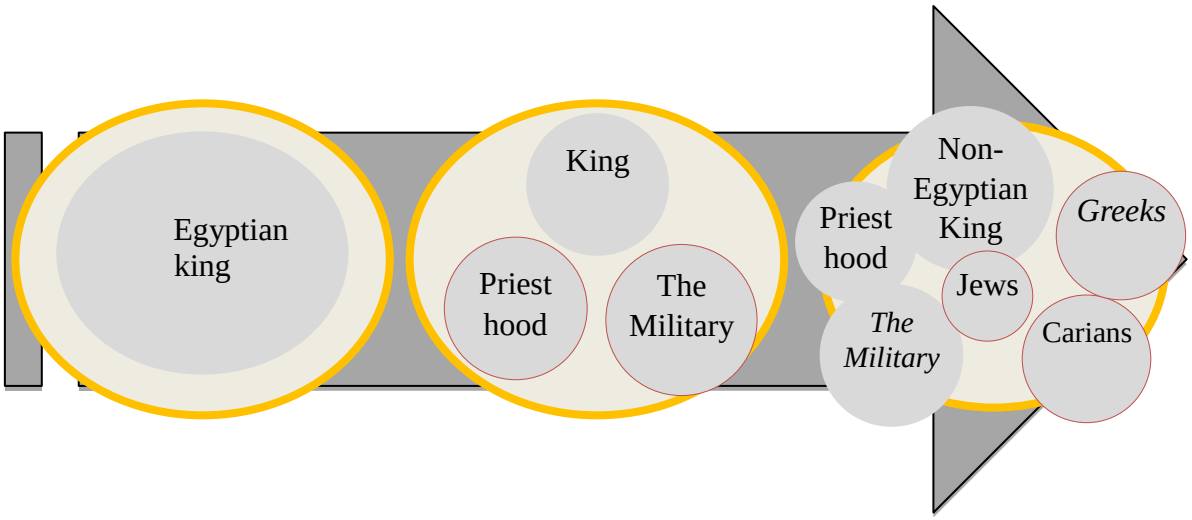
3.6. Multicultural Type/s of Egyptian Community through the Coptic Era

In light of the previous discussion, the structure of the Egyptian community was dynamic. At the time of the late new kingdom period, the ancient Egyptianwas highly centralized, by the power base inadequacies and inconsistencies in statements emanating from the king and his circle, which could not be eliminated. This happened despite the overall stability and strength of the Egyptian world-view which allowed it to survive for three thousand years. The Egyptian community could be classified as an assimilationism structure.

The death of King Ramses XI was an eventual break-up of Egypt as a unified political entity. Power relations between the different structures of the state, the military, priesthood and king had already undergone re-negotiation with the priesthood assuming equivalent and eventually greater power than the king. The scale of power had changed, but the Egyptian community was not torn between those entities; the Egyptians considered them the entire center and kept on revolving around that center. Nevertheless, those in power respected the community legacy of unity, and worked on preserving it, and this, in turn, helped the social structure to preserve its assimilationism.

But with the entry of a non-Egyptian king, bringing with him different ideologies and religious backgrounds, the structural image of that solid social order was defected. Egyptians were forced to survive with other cultural groups politically, and they were forced to preserve their social unity through their inherited morals. This is considered a very crucial point in the Egyptian society. That new state gave them the experience to adapt themselves – unconsciously- with others. Consequently, their structural image turned from assimilationism social order to interactive pluralism.

This is compatible with what was mentioned in chapter two by Hartmann about the dynamic state of interactive pluralism society. (Figure 3.9)



▲ Figure 3.9. Dynamic transition of the structural image of the Egyptian order from the ancient Egyptian period to the Coptic Era.

3.7. Multiculturalism in Arts throughout the Coptic Era

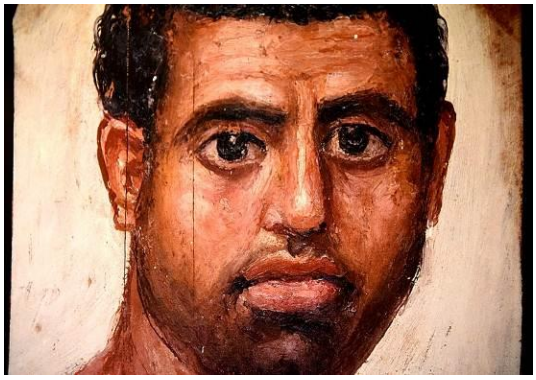
Coptic art is a term used either for the art of Egypt produced in the early Christian era or for the art produced by the Coptic Christians themselves [127]. Coptic art is the heir to 3,000 years of ancient Egyptian art. Evidence of the influence of ancient Egyptian art on Coptic art is the use of the hieroglyphic "Ankh" which symbolizes life representing the Christian cross of Egypt (Figure 3.10.). Also, the Coptic decorations included a bold and original iconography, which in time came to penetrate the distant Latin West and also guided the art of the European high Middle Ages. The Virgin, for example, breastfed Jesus, just as Isis breastfed Horus (Figures 3.11. and 3.12.).

▲ Figure 3.10. A crux ansata at the end of the Codex Glazier, a Coptic manuscript of the New Testament dating back to the 4th or 5th century [129]

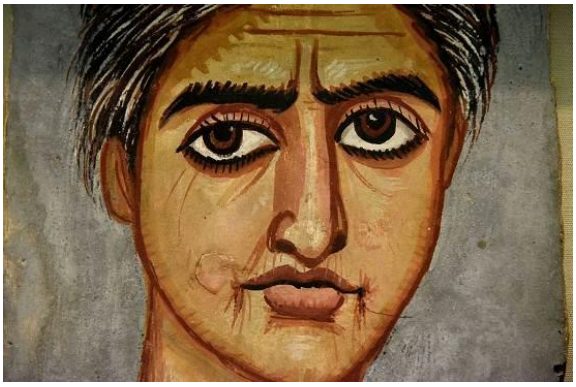
▲ Figure 3.11. Isis nursing Horus from Saqqarah, ancient Egyptian figurine (Louvre, Paris). [129]

▲ Figure 3.12. Mary breastfeeding Jesus, fresco in the Coptic monastery of the Holy Virgin and St. John, Wadi Natroun, Egypt. [129]

Coptic icons have their foundation in the Hellenistic artwork of Egyptian late Antiquity, as exemplified by the Fayum mummy photos. The faces of El Fayum (Figure 3.13. and 3.14.) are examples of the Coptic art within the 2nd century displaying the Greek and Roman impact on the Coptic art with some unmistakable characteristics associated with Egyptian art. [128]



▲ Figure 3.13. Mummy portrait of a man from El- Fayyum, Hawara. 80-100 C.E. The British Museum, London [129]



▲ Figure 3.14 Mummy portrait of a man from El-Fayyum, Hawara. 80-100 C.E. The British Museum, London [129]

Similar to the classical, Egyptian and Greek-Egyptian heritages in Coptic artwork, there are also Persian, Byzantine and Syrian impacts. Egyptian grasp weavers and artists have been drawn to Persia within the third century with the rise of the Sassanian kingdom earlier than the founding of Constantinople after they returned to Egypt. A new Persian repertory of issues like opposing horsemen (Figure 3.15.) or facing peacocks drinking out of the identical vessel (Figure 3.16.) was delivered to Egypt. Borrowing from one culture to another is a natural system of cultural development. Within the fourth century, while Christianity made a triumphal entry into the Roman world the art forms of ascendant Byzantium spread in Egypt and endured even after the Coptic Church broke far away from the eastern Roman Church due to the fact Egypt remained, politically, a part of the Roman Empire. The Copts, however, started to increasingly turn in the direction of the Holy Land, the birthplace of the Lord Jesus Christ; the Syrians' effect on Coptic artwork became obvious in the fifth century, and rigidity got here with it. Some motifs that took their way to Egypt from Syria have been originally of Persian beginnings, such as animals and birds in roundels, and griffins (Figure 3.17). [130]

▲Figure 3.15. The mounted Saints, Sanctuary of Virgin St. Mary Church, El-Sourian Monastery. [131]

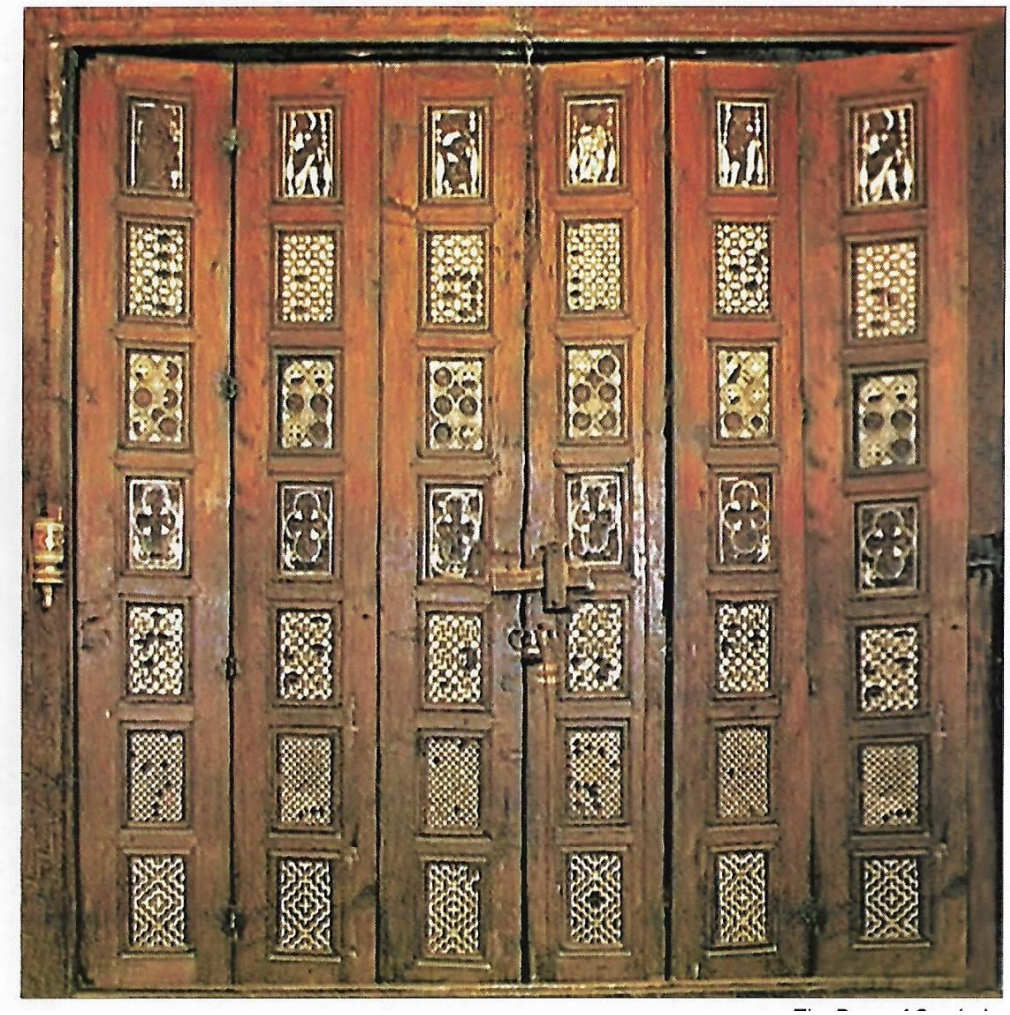
▲ Figure 3.16. Fragment of wool textile decorated by many colors has a shape of two entrances of churches, put on each one a peacock and dove with the Ankh (referring to the Cross) in the middle of them with the monogram of Jesus in the middle dating back to the 5th and 6th centuries. It is shown in the Coptic Museum now. [132]

▲ Figure 3.17. A part of a frieze with scrolls enclosing busts and animals, Limestone, Saqqara, Monastery of St. Jeremiah, from the 6th century. [132]

During the Arabian reign, after 641 C.E., the Coptic monasteries in Wadi El Natroun were restored, and the Arabs themselves used local craftsmen, who were mostly Copts, for enlarging and embellishing the city of Cairo when Copts executed designs and motifs that were acceptable to their Arab patrons. They did this as competently as they had, in classical times, produced classical themes for their Greek patrons. In each case they adopted some of the motifs or designs for their own use (figure 3.18.). [131]Also, Copts wove textiles for Muslim patrons and the Arab "Kufie" script was introduced into their own designs, especially after Arabic started to replace the Coptic language. [129]

A medieval Arab writer, Omar Tussun, wrote about a group of copyists at the Monastery of Saint Makar in Wadi El Natroun, who were capable of drawing Coptic letters in the form of birds and figures. This is still an art form in Egypt, and Arabic calligraphers still use the reed pen, an art inherited from their Coptic ancestors. Copts started to translate their religious literature into Arabic late in the twelfth century and decorated the opening page with lavish pictures and with border designs. It was not until the nineteenth century that Coptic texts transliterated using Arabic started to appear.

Therefore, by visiting the monasteries of Wadi El Natrun for instance, it must be observed that some wall-paintings were produced under the instructions of Melkites monks, others under the instructions of Coptic monks. Also, Alexandrine, Byzantine and Syrian-inspired arts were produced there, and non-figurative metalwork, wooden sanctuary screens, cabinets and furniture were inspired by Persian art. [132]



▲ Figure 3.18. The door of symbols, Virgin St. Mary church, El-Sourian Monastery.

3.8. Conclusion

This chapter determined the studying period of the Coptic Era due to the spread of Christianity in the Egyptian society. That happened between the fourth and ninth centuries. Before that, it took about three centuries to change the religion of Egyptians from the ancient Egyptian religion to Christianity. That period, from the first to the third centuries, is considered a transitional period in Egypt. This religious transition rearranges the social relations between the groups of the community and its members that cast its shadow on the later period. It is very hard to draw a complete picture of the Egyptian and Coptic community between the fourth and ninth centuries, given the lack of sources of information about history in general, especially the precise social information. However, according to the available information, Egypt was weak under the byzantine occupation. There were strong relations between Egyptians regardless the religion of individuals. Nevertheless, the relations between other cultural groups, Jews and Romans, were not that strong for some political reasons, but there was social cooperation at different levels. And due to the glamorous part of the ancient Egyptian civilization, the Romans tended to act like Egyptians, and they adopted the

Egyptians' customs and traditions. This, inadvertently, preserved the Egyptian identity but casted a shadow on it. This image is very close to the features of the interactive pluralism multicultural type.

The last part of this chapter mentioned some examples of the Coptic art during several stages. Those examples do not only proof the existence of various cultural groups, but they also reflect the physical interaction between them.

After analyzing the features of Coptic churches in the following chapters, this chapter will be recalled in the discussion chapter to notice how architects, as well as craftsmen and artistes, were able, back then, to deal with their community and to what extent they were able to represent the community and satisfy the needs of Copts. However, the architectural analyses are more precise.

Chapter 4 Shape Grammars as an Analytical Tool and Preliminary Analyses of Coptic Churches

4.1. Introduction

4.2. Shape Grammars

4.2.1. Defining Shape Grammars

4.2.2. Properties of Shape Grammars

4.2.3. Applications of Shape Grammars in Architecture

4.3. Coptic architecture

4.3.1. Coptic Churches throughout the First Centuries

4.3.2. Classifications of Coptic Churches

4.3.3. Components of Coptic Churches

4.3.4. Methodology of Selecting Case Studies

4.3.5. Exceptional Churches

4.4. Conclusion

4.1. Introduction

This chapter is the beginning of the analytical part of the research. It is divided into two parts: The first part concerns the theory of 'Shape Grammars' as an analytical tool. It introduces the definitions of this theory and discusses each one of them. Then, this part presents the potentials of using 'Shape Grammars' on different levels in architecture. And finally, it illustrates various uses and benefits of the 'Shape Grammars' theory as an architectural tool in the fields of architectural education, design and analysis. That gives a clue about how suitable this analytical tool for this research is.

The second part of this chapter deals with Coptic architecture; Coptic churches. It begins with general overview about the history of architecture of Coptic Churches, trying to collect the maximum number of documented Coptic churches that reached 161 churches. Then, this part reviews the important classifications of Coptic churches architecturally and chronologically. After this introduction, this part discusses the methodology of analysis. It begins with selecting plans of Coptic churches that represent the case studies which were constructed through the study period (from 400 C.E. to 900 C.E.); from the fourth to the ninth centuries, 108 churches. Then, it puts those churches into groups according to the features of their architectural plans. Finally, this part discusses the plans of Coptic churches; their features, spaces and elements. That aids in extracting their rule schemata in the following chapter.

4.2. Shape Grammars

They were one of the first algorithmic systems to create and understand projects directly using form calculation, rather than text or symbol calculations. Simply, for architecture, no one can mistake recognizing ancient Egyptian, Roman, classic architecture, etc. Moreover, no one can misinterpret Frank Loyd Wright's or Zaha Hadid’s designs. That means that each of which has its own architectural vocabulary, which was used in a particular way, through certain processes, to produce their/his/her architectural style or products, that can simply be distinguished.

In this research, this tool is used to trace the roots of Coptics in Egypt, to highlight identification, similarity, or transformation between the existed cultural groups, which projected the influence of multiculturalism on the process of design in both styles. Thus, 'shape grammars' can be used as a tool of analysis. Before getting into analysis, this part of study explains types of shape grammars, showing which one of them that can be the most suitable type to help pursue the goals of the research.

4.2.1. Defining Shape Grammars:

Terry knight has defined shape grammar as:

> “A shape grammar is a set of shape rules that apply in a step-by-step way to generate a language, or set, of designs. Shape grammars are both generative and descriptive. The rules of a shape grammar compute or generate designs, and the rules themselves are descriptions of the forms of the generated designs.” [90]

In this definition T. Knight make it clear that shape grammar is a tool that can be used whether to analyze a given shape or to generate a new design product. The

process of this tool works by a applying a set of rules step by step. Those rules simply explain the components of the product.

George Stiny had already defined shape grammars as:

> "Shape grammars are rule systems containing a basic shape and transformational shape rules. By applying those shape rules recursively to the basic shape, a set of shapes that belong to a certain style or are considered as a part of the same family can be generated." [91] (George Stiny, 1980).

That means that shape grammars – as a tool – has two applying strategies; First, designing strategy; Second, analyzing strategy. In this research shape grammars is used as an analyzing tool. And using shape grammars here supports the explanation of the origins of both Coptic and Islamic architecture. To trace aspects of similarity, identification or even differentiation between them, that can be observed or noticed from the steps of applied rules, in addition to the transformation of design.

Micheal J. Pugliese and Cagan, in 2002, defined shape grammars as:

> "A shape grammar is a form of production system that derives designs from successive application of shape transformation rules upon some evolving shape, starting from an initial shape" [92]

Why shape-grammars is a suitable analytical tool in this research?

That is because of the importance of the architectural identity of the case studies in this research, and the clear communication of issues pertaining to the style throughout a particular cultural community is a valuable asset. The shape grammars-based tool provides additional benefits by further enabling the community to understand how far their architectural style product can be stretched and still maintain the core brand statement and also the ability to merge historical reference with contemporary exploration within a distinguished cultural context. [93]

4.2.2. Properties of Shape Grammars.

'Shape grammars' is with three main properties. First, they are spatial algorithms. Their rules are shapes: line, square or circle, etc., that use shape operations to generate designs, such as addition, subtraction and spatial transformations. Shape grammars uses shape as flexible non-atomic entities, which can be composed and recomposed easily. Finally, 'shape grammars' is nondeterministic. The user of this tool has a range of alternatives in each step. In other words, given the initial shape and rules, it is impossible to predict the final product of the designer.

The following section introduces two shape grammars strategies, dealing with the second one in details for its importance to the research.

4.2.3. Applications of Shape Grammars in Architecture

This part of the research clarifies both kinds of applications:

4.2.3.1.Design:

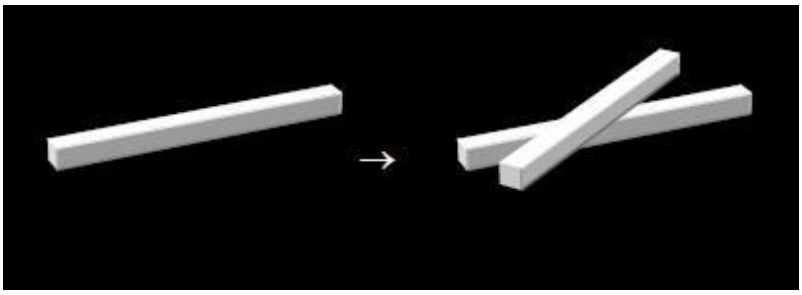
a) Shape grammars:

The components of shape grammars are a vocabulary of shapes and spatial relations between them. Constrains of the spatial relations differ due to the ways of combination between the vocabulary elements. The simple compositional ideas are

the clue of the shape grammars. Adding and subtracting shapes are providing contexts to create designs. Theoretically, any shapes and any spatial relations can be used with infinite numbers, whereas, practically, constraints of design problem can be geographic, economic, or functional requirements, etc., in addition to the concept of the designer that gets more constraints like the style, or design philosophy, that help in selecting a particular shape or spatial relation. Therefore, shapes and spatial relations are used to settle designs with ambiguous meaning and implicit function.

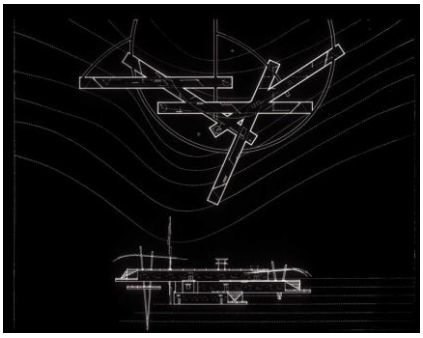
Subtractive and additive shape rules discover the spatial relations. Additive rules define simple shape grammars, which are called fundamental grammars. Those basic grammars can generate all possible simple designs with one or more given spatial relations. They are defined by labeling additive rules in various ways due to the properties of symmetry of the shapes in the rules. Basic grammars are applied recursively to generate many alternatives instantiating the same relations with different transformations due to the existed labels. [90]

Historical museum, San Gimignano, Italy (Randy Brown) is a good example of that process. [94]

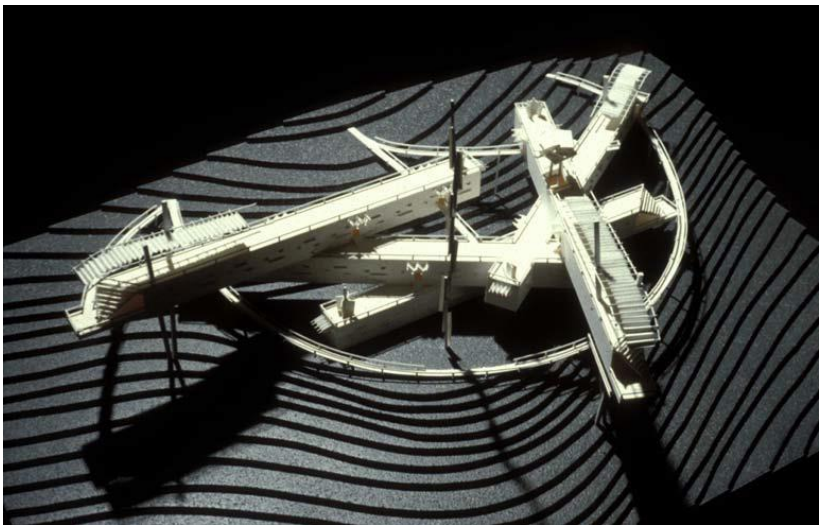


▲ Figure 4.1. Underlying rule

▲ Figure 4.2. Massing study



▲ Figure 4.3. plan and section of the historical museum, San Gimignano, Italy (Randy Brown)

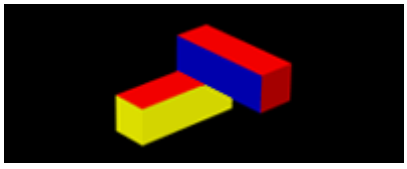


▲ Figure 4.4. A model of the historical museum, San Gimignano, Italy (Randy Brown)

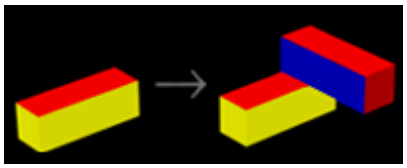
b) Color grammars:

They work and develop in a similar way as basic shape grammars. Here, rules have a color component. In rules, color can depend on color generated designs. Also, they work as indices for other attributes, such as architectural elements, materials, or even indicate the changes of the shape geometries. There are two ways to use basic color design: first, from scratch by using colored shapes as vocabularies and setting spatial relations between them, second, by developing predefined fundamental 'shape' grammars. The process in the second way depends on developing basic grammars to generative alternative forms, then colors are added to certain grammars for articulating and elaborating these forms.

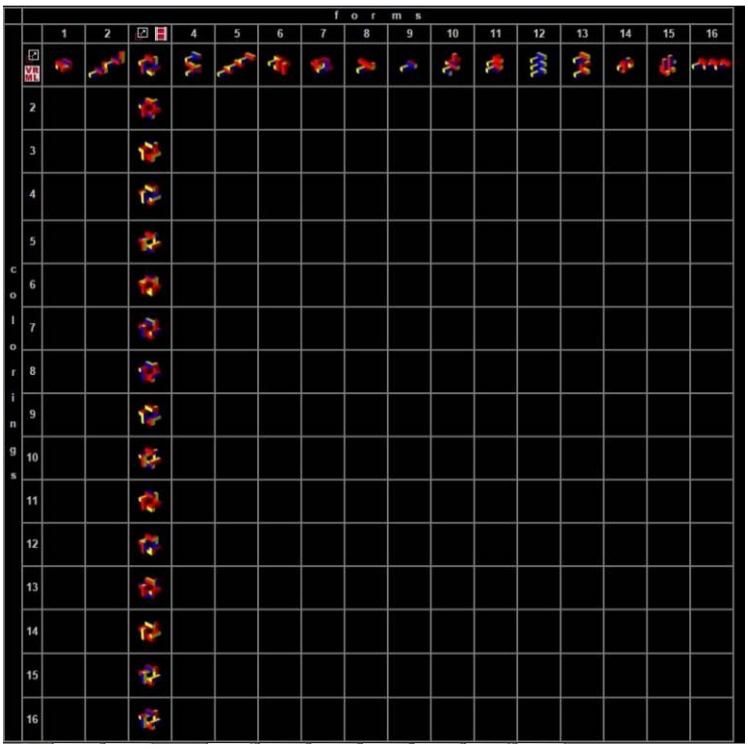
Figures 4.5., 4.6. and 4.7. illustrate the way color shape grammars works. The figure shows a vocabulary consisting of two pillars, one of them with red and yellow faces, while the other one with red and blue faces. The additive color rule can be defined using a spatial relation. The designer can put the two pillars in various positions that keep their geometrical relationship while the color relationships differ. The number of alternatives differs due to the symmetries of the shapes.



▲ Figure 4.5. Color spatial relation



▲ Figure 4.6. Additive rule



▲ Figure 4.7. Development of basic color grammars and designs

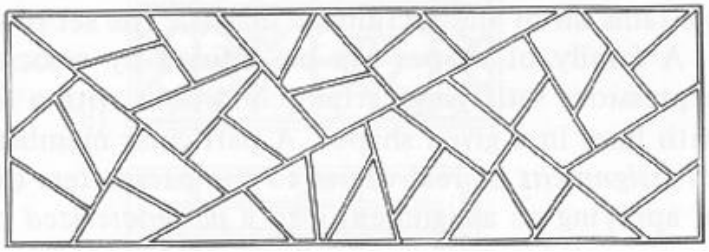
c) Transformations of grammars:

This approach is the most important one for this dissertation. It depends on the idea of developing original grammars or design languages. Here, languages are created by transforming the rules underlying grammars from existing languages. The style is analyzed by deriving a grammar, transforming the rules of grammar, and finally transforming the rules into a new grammar and style.

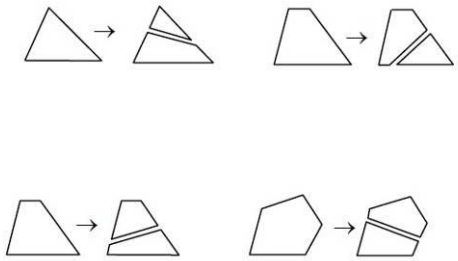
Transformations of grammars have two main applications. First, they can be used to characterize any known or historical style. Also, they are used to create new styles on the basis of given ones.

4.2.3.2. Analysis:

Only analysis was the first application of shape grammars in the first two decades, in which it was known in the theories of design. Stiny was the first one who applied it analytically in his published paper "Ice-ray: a note on the generation of Chinese lattice designs". In that exercise he set the standards of followed rules of shape grammars. He introduced parametric shape grammars that proof the power of the parameters that articulate existing design languages. He extracted five main rules from the existing lattice designs. Based on those rules it was easy to generate an infinite number of new ones, which T. Knight called "hypothetical designs in the same style" [90].



▲ Figure 4.8. Chengtu, Szechwan, 1800 C.E. A sample of Chinese lattice designs. (Stiny, 1977)



▲ Figure 4.9. The four spatial rule set by Stiny after analyzing lattice designs. The fifth one was algorithmic (Stiny, 1977)

The other analytical application of shape grammars was also introduced by Stiny with W. Mitchell in 1978. They studied the grammar of the Palladian villas and extracted their rules [95].

▲ Figure 4.10. Villa Capra "La Rotonda" in Vicenza. One of Palladio's most influential designs

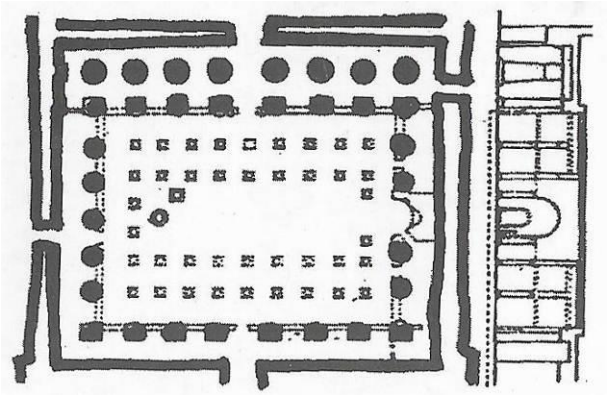
4.3. Coptic Architecture

The church, being the house of God, is naturally the dwelling of God with His people, in them and for their interest. The ecclesial community builds the church as a sacrifice of the love of God, who accepts and sanctifies it, and transforms it into heavenly and holy temples. In it, the community receives the secrets and gifts of God to become the active and living body of Christ.

R. Schwarz believes that building churches is a sacred achievement, based not only on architectural foundations but also on authentic sacred facts of faith. Robert Maguire says, "If you want to build a church, you're going to create something that speaks. It will speak of meanings, and of values. And if it speaks of the wrong values, it will go on -destroying! There is responsibility here!"

4.3.1. Coptic Churches throughout the First Centuries

The church inside the temple of habu is located in the second edifice. Parts of the temple were turned into churches. Figure 4.11. illustrates the way the Coptics turned that place into a church, just by removing the middle column on the east side to insert a semicircular sanctuary, and adding the sink [96].



▲ Figure 4.11. A church inside the temple of Habu, Luxor. (Samual, 2002)

4.3.2. Classifications of Coptic Churches

Many researchers put different classifications of Coptic churches; each of them set his classification focusing on some aspects different from the others. That is because of the different academic and cultural background of each of them. They can be divided into three groups. The first group classifies Coptic churches due to architectural aspects, whether their typology or floor plans. Based on the churches typology, Somers Clarke [133] and Dr. Mostafa A.Sheha [134] set their classifications. However, C.C. Walters and Dr. Azzat Zaky

Hammad classified Coptic churches according to their floor plans. The second group classified them according to chronological bases, such as Heshmat Mesiha, Peter Grossmann, Bishop Samuel and Architect Badee Habib. Finally, the last group classified them according to creed or sect.

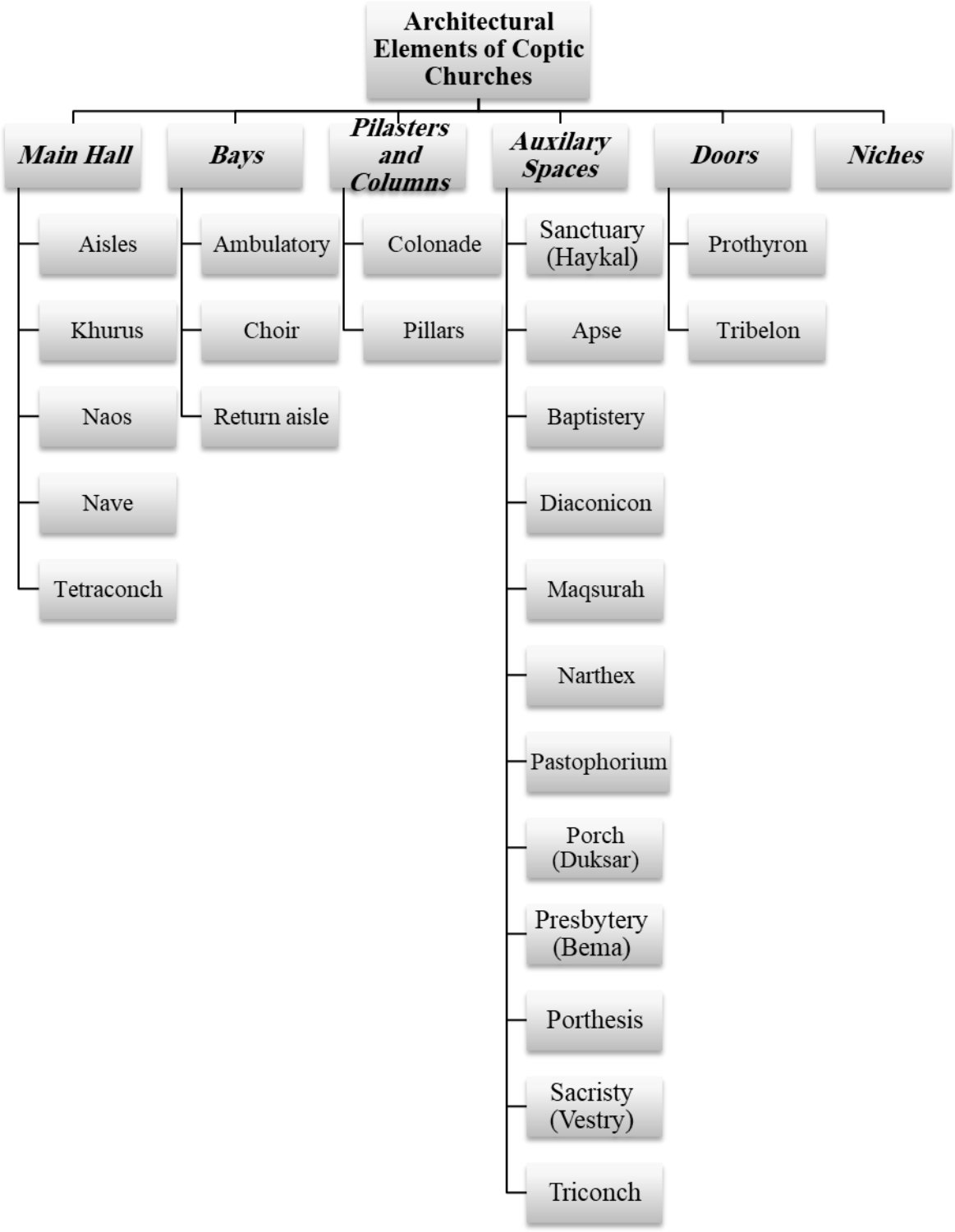
The latest classification was that of Dr. Samy Sabry. Sabry's classification is based on influential cultural and structural aspects. This classification will help to get more precise results in the analysis phase. In this connection, this classification heeds the aspect of social culture and the accumulated heritage of people of Egypt at that time, which is the main pillar of this study "multiculturalism". Moreover, it considers the structural evolution that can be observed in the Coptic churches, which can be analyzed to disentangle its geometrical components to observe and distinguish its spoken architectural language. That can be done by using shape grammars as an analytical tool. He classified Coptic churches into 9 types [5], due to the following criteria:

- Form and distribution of the architectural elements, and inner spaces that form the church's building.
- Sanctuary spaces, with their inner and external forms.
- Choirs system.
- The impact of ancient Egyptian architecture on the architecture of churches.
- The impact of byzantine architecture on the architecture of churches.
- Building technologies (Bearing walls, concrete skeleton system, etc.), flooring types, and ways of covering the different spaces that formulate the church building.
- The volume of the external mass, and inner spaces, and its relation to the human's scale.
- Form and proportions of the external dimensions of church's building; the ratio between the width and length of the building (or its depth).
- Form and proportions of the inner dimensions of the church's nave; the ratio between nave's width to its length (or its depth).
- Complementary elements of the church's building, such as inner narthex, external narthex, the table, and the minaret, with its presence, location and form.

According to this classification, Coptic churches are divided into 9 groups, which are: (1) Churches with domed nave, (2) Churches with vaulted nave, (3) Churches roofed with Domes and vaults, (4) Churches with squared nave, (5) Akhmim Churches, (6) Churches influenced by the Byzantine architecture, (7) Basilican plan churches, (8) Basilican plan churches with triconch sanctuary, and (9) Basilican plan churches with transept.

4.3.3. Components of Coptic Churches

The previous classification helps to distinguish the components of the churches, to facilitate analyzing them. Churches in Egypt –however its sects- consist of two main parts particularly: The first one is the internal part –inside the ecclesiastical building associated with auxiliary hall. The second part is the external –outside the ecclesiastical building- which is the atrium associated with its annexes. The scope of this thesis focuses on the architectural elements of the internal part of the church, which are as follows:



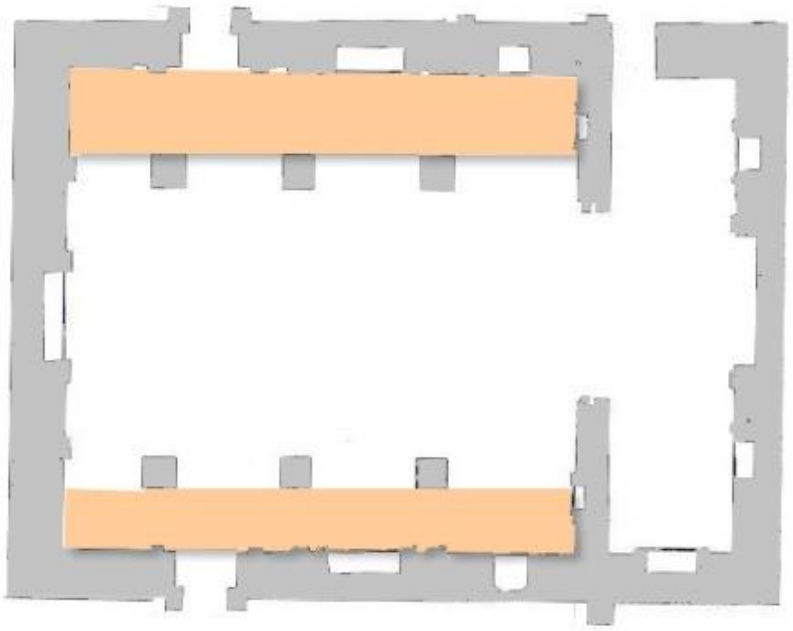
▲ Figure 4.11. Architectural elements of Coptic churches

Those elements are divided into six groups (figure 4.11.). Each group of them is taken in the following part to be explained and to give a general background about the architectural elements of Coptic churches in.

4.3.3.1. Main Hall

Aisle

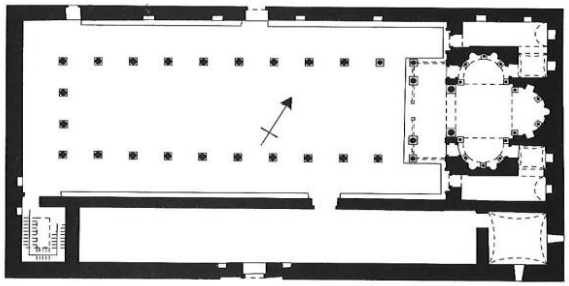
On the north and south sides of the nave lie the aisles of the basilican plan church. Their width is smaller than that of the nave. The aisle is usually separated from the nave by a series of columns or pillars that are connected by arches or lintel. Its function is to expand the inner space of the church and to create a maneuvering space for the users to get in and out of the church. Consequently, and according to the size of the community that the church serves, the church may consist of a nave of two or more aisles, (Figure 4.12). The height of the aisles space is always smaller than that of the nave. In Egypt, the roof of the aisle is usually flat, and there are traces of windows on the side walls of the aisles like those in churches of eastern countries [97]. In Upper Egypt, the walls of the aisles always consist of niches with relatively close sequences [98].



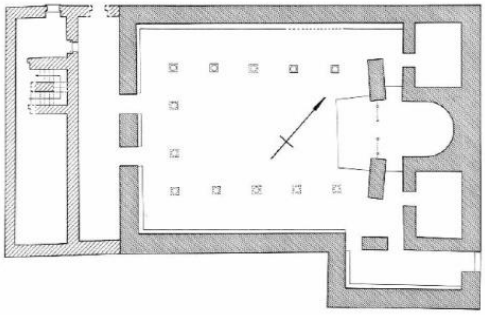
▲ Figure 4.12. Aisles of the South Church of St. Apollo Monastery (6^{th} Century).

Khurus

It is a space lying between the sanctuary and the main hall of the church. It is dedicated to the priests and the serving crew of the church. In Coptic churches it is constructed as a huge wall that reaches the ceiling. At the beginning, the idea of that wall came from the presence of a set of columns –that do not reach the ceiling- in front of the apse area to enrich its image. The sanctuary area of Dayr Anba Bishoi (Figure 4.13.) is a good example of that khurus and the churches located at Habu, luxor (Figure 4.14.)

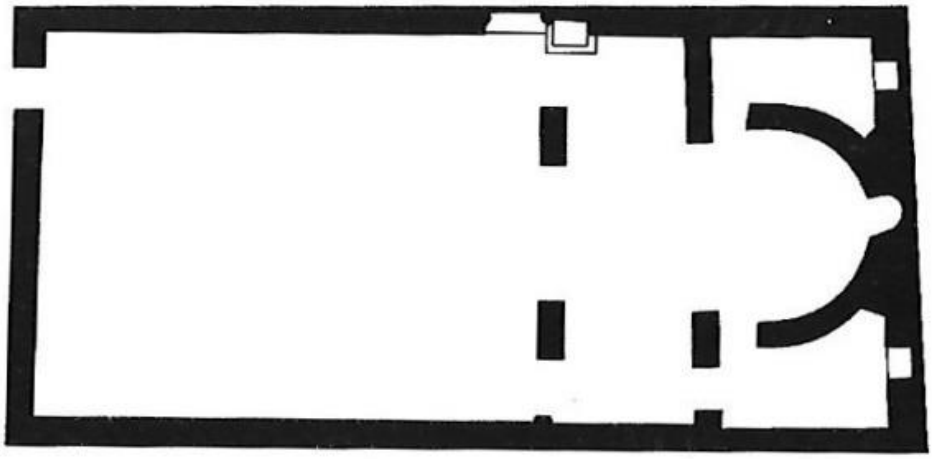


▲ Figure 4.13. The original plan of the Church of Dayr Anba Bishoi (5th century)



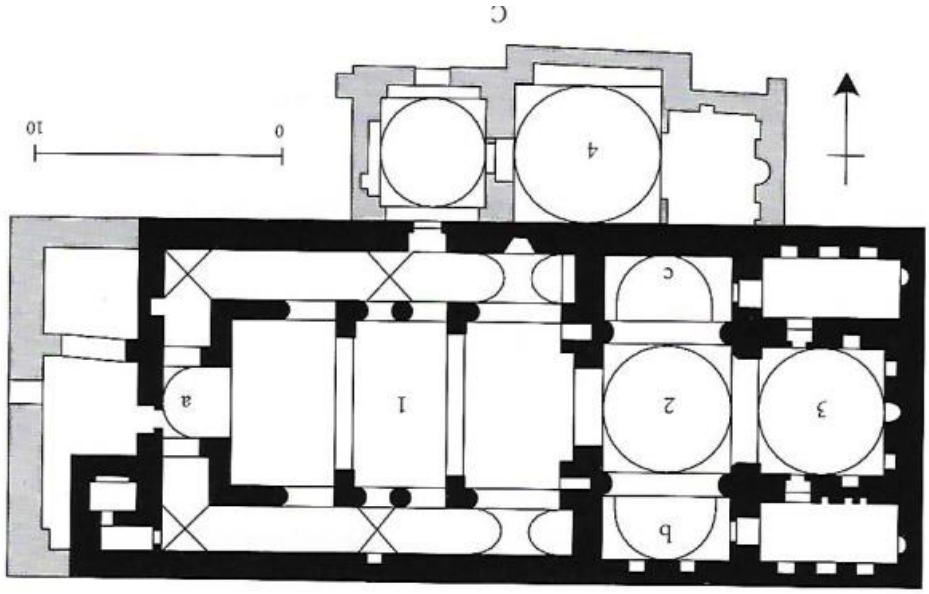
▲ Figure 4.14. Church in front of the eastern gate at Madinat Habu (7th Century)

Later on that wall became shorter; not connected to that ceiling, and then it was replaced by wide wall taking the whole width of the naos. This wall consists of three entrances leading to three spaces. The central room represents the sanctuary area and the others are side rooms. However, in this stage the khurus is represented by a corridor between the sanctuary rooms and the naos, such as that church of Manqabad (Figure 4.15).



▲ Figure 4.15. Church at Manqabad (6th Century)

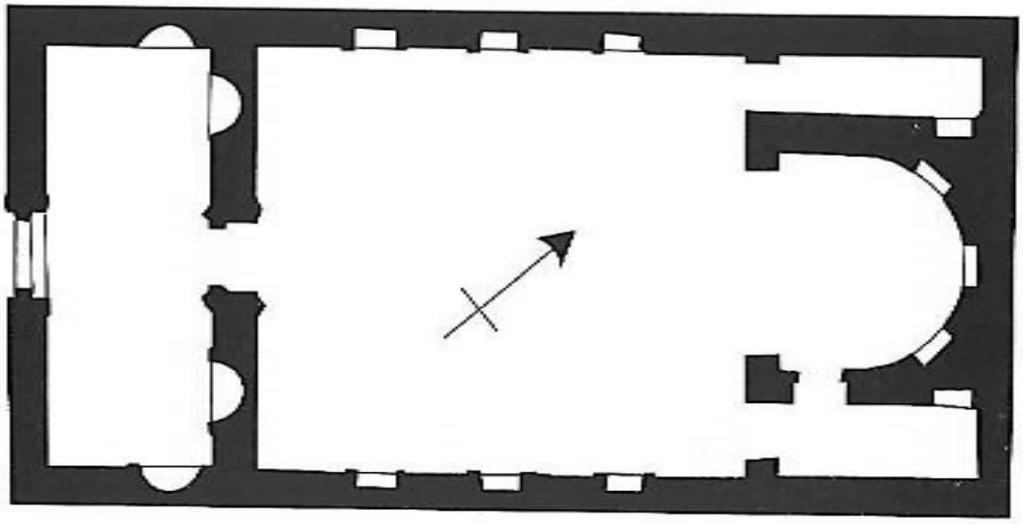
The way to the khurus is not fixed by three entrances. At the Monastery of Al Suryan, Al Adra Church, the khurus has one entrance in the middle (Figure 4.16).



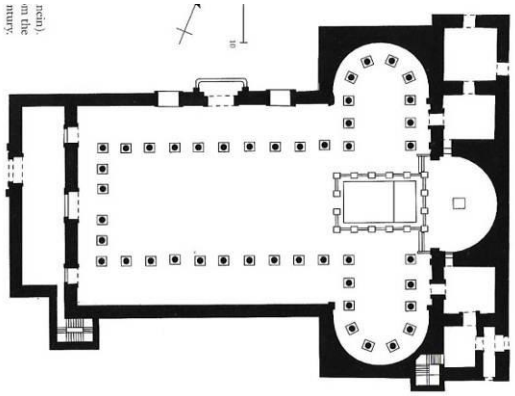
▲ Figure 4.16. Khurus in the Al-Adra Church of Al-Suryan Monastery, Wadi al-Natrun (7th Century)

Naos

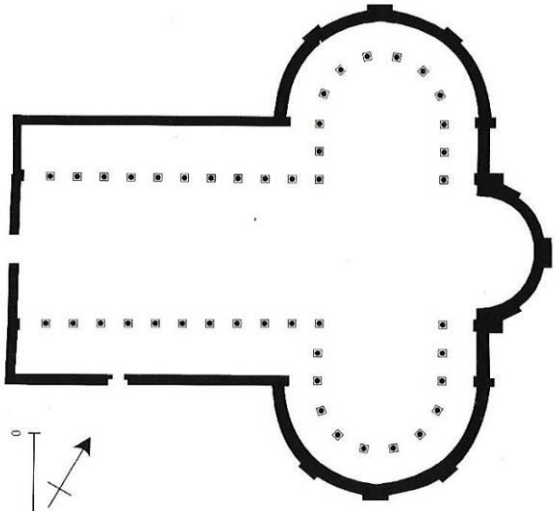
In the church the naos is equivalent to the shrine in the ancient Egyptian temple. The most common form of the naos in Egypt down to the tenth century was the area that includes the nave, aisles and the return aisle. However, sometimes the naos does not include aisles, like that church of Abu Hinnis Monastery (Figure 4.17). As for the basilican plans with transept, the naos includes the transept in addition to the nave and aisle, like the great basilica of Al-Ashmunayn (Figure 4.18.) and that of Hawwariyyah (Figure 4.19). [99]



▲ Figure 4.17. Dayr AbuHinnis, Naos of St. John Church, Mallawi (5th Century)



▲ Figure 4.18. Naos of the basilica of hermopolis (Al- Ashmunayn), (5th Century)



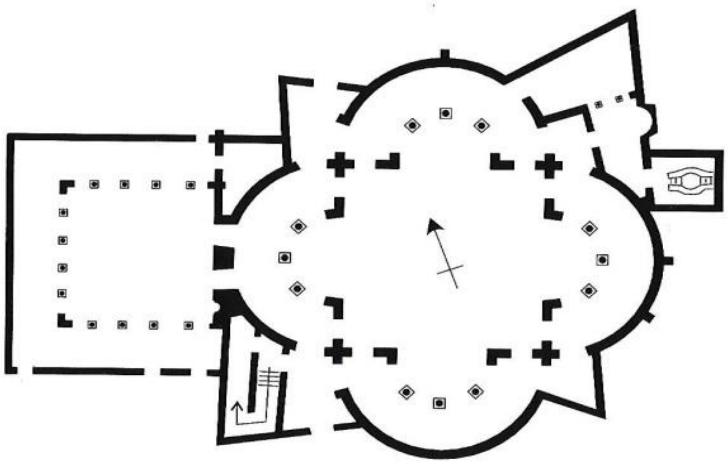
▲ Figure 4.19. Naos of the basilica of Al-Hawariya (5th-6th Century)

Nave

It is the largest area of the main hall of the basilican plan church, surrounded by aisles and separated from them by columns. The height of this area is larger than those of the surrounded aisles.

Tetraconch

It is a central plan church known as Byzantine style church. Its plan consists of a squared area flanked by four semicircular recess opened to it. The Eastern Church at Abu Mina is a good example of that type (Figure 4.20). This type is not common in Egypt.

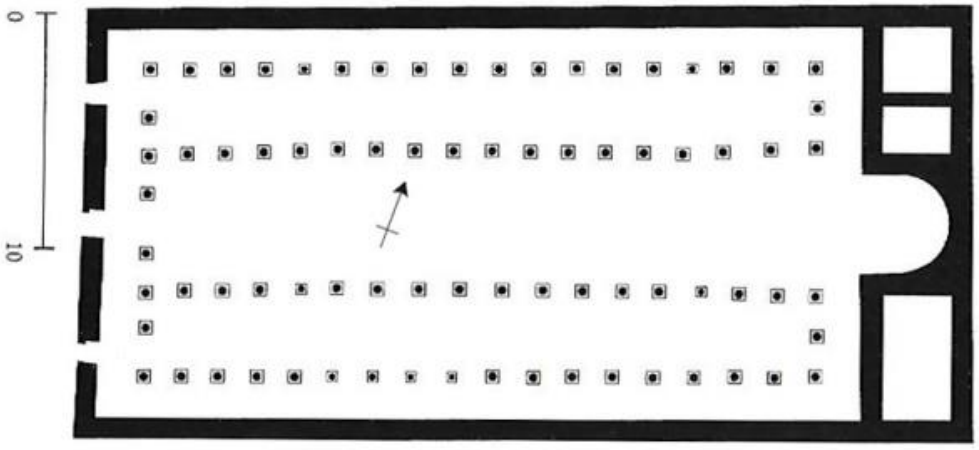


▲ Figure 4.20. Plan of East Basilica, Abu Mina, Alexandria (6th Century)

4.3.3.2. Bays

Ambulatory

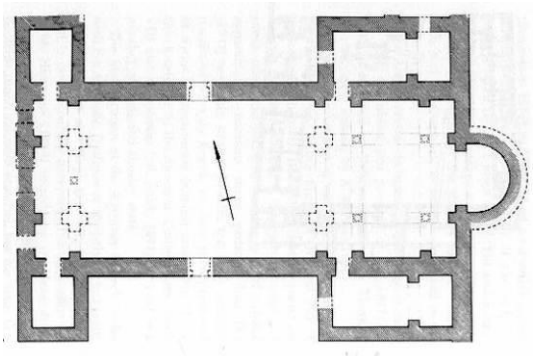
It is a cover corridor in the central part of the church. It is separated from the naos by a series of columns of straight rows. It usually takes a U shape. It links between two sides of the church. The Coptic church of Pbow is a good example of Egyptian ambulatory (Figure 4.21).



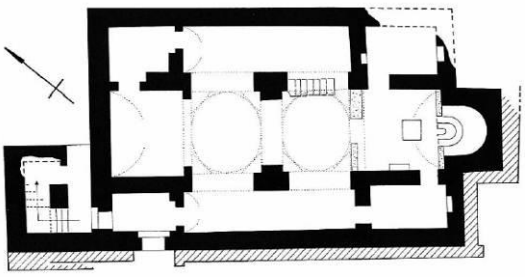
▲ Figure 4.21. Pbow Monastery, plan of the church with ambulatory (5th Century)

Choir

It is the small area located between the naos and the apse area. It is usually rectangular. It works as a place where the choir sings. In Coptic churches it appears in the eighth century, for example the basilica of Tamit and that at Hilwan (Figures 4.25., 4.26).



▲ Figure 4.25. Basilica in front of complex A, Hilwan (7^{th}-8^{th} century)



▲ Figure 4.26. Barrel vaulted pillared Basilica, Tamit (10^{th} century)

Return aisle

It is a walk way located at the western end of the church connecting the two aisles of the church passing by the nave. It is one of the characteristic features of the Coptic churches. It is separated from the nave by a row of columns.

4.3.3.3. Pilasters and Columns

Colonnade

A colonnade is a series of relatively close columns, usually in a straight line connected by arches. It is a distinct feature of the construction of the basilica. When a colonnade forms a connection between two parallel walls, the columns closest to the walls are usually treated as connected columns. In Egyptian architecture, however, the classical setting was abandoned in the ancient Egyptian period, while tall columns were attached to the wall to support the arches.

Pillar

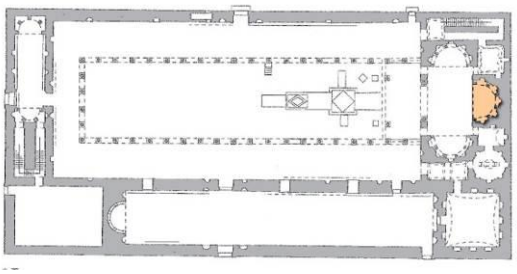
It is like a column, which is a vertical architectural pillar, but in plan it is usually rectangular. Sometimes it can be T-shaped, cross-shaped or octagonal. In traditional architecture, the pillars are made of individual bricks or stones. Since a pillar is huger than a column, it can support more loads. It is therefore a support for large and heavy arches.

4.3.3.4. Auxiliary Spaces

Apse

It is a part of the sanctuary area. It is a semicircular area extended from a quadrilateral space, ceiled by a half dome. In Roman temples, it was a place where the statue of the god placed because of its strong visual impact. In the early Christian time alter was placed in the sanctuary in front of the apse. The width of the apse is a little bit smaller than that of the nave. Copts decorated the apse very carefully and eagerly to give it a rich look. (Figures 4.27, .28)

▲ Figure 4.27. In the Apse of the Coptic White Monastery, Sohag.



▲ Figure 4.28. Dayr Anba Shinudah, plan of the church highlighted its apse. (5th Century)

Baptistery

It is a space inside the body of the church or separated from it. It consists of a pool of water. In Coptic churches there is no fixed date for establishing it. However, traces of baptistery were found in earlier constructed Coptic churches. Copts began constructing this area in the church since the fifth century. Most of Coptic churches with baptistery were located in the west side of the Delta, like the churches at Abu Mina for example. Most of them are integrated with the body of the church or connected to it by an annex; no Coptic baptisteries are totally separated. This area has no significant location in the church; however, most probably Copts locate it on the eastern side of the church, especially on the northeastern corner, near the sanctuary area.

Diaconicon

A diaconicon is a room in a church for the use of the deacons in carrying out their duties. Etymologically, the word "diaconicon" means "belonging to the deacon." In antiquity, the exact location of the diaconicon in the church does not seem to have been specified. From what is known so far, the designation "diaconicon" was used in Syria for the two side rooms off the apse (pastophoria). Early Christian texts from Egypt attest the diaconicon as a side room in the church accessible from the church proper.

The function of this room is to save the supplies of the clergy. It has no fixed location in the church. In this room deacons keep sacred vessels and the incense of the alter. In the church inside a monastery, monks use this room to keep the bread.

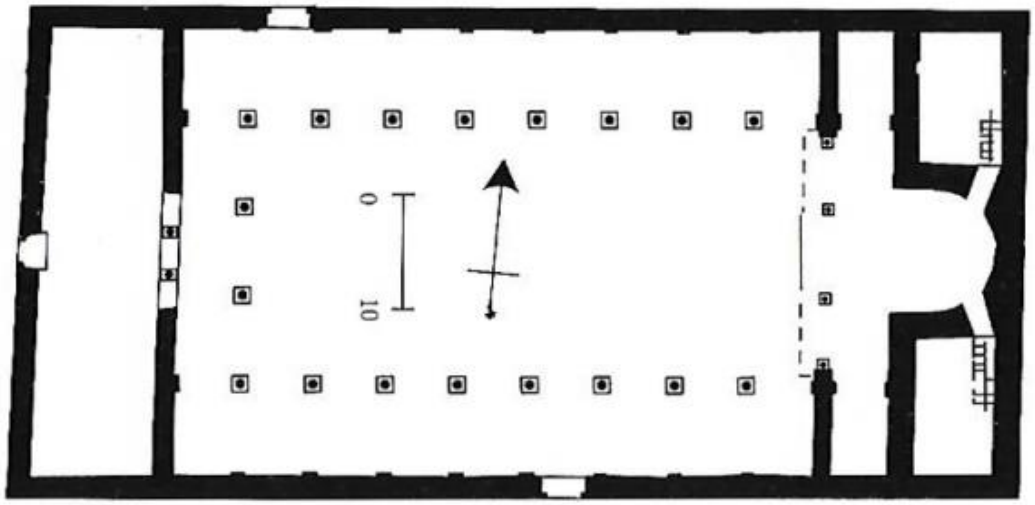
Maqsurah

It is a side secondary room lying beside the sanctuary area. The link between this room and the sanctuary is a small window. This room is dedicated for women to pray in. It is usually decorated by images for the holy Virgin plus other Christian icons. It was firstly constructed during the Umayyad period. The presence of this area is an Islamic influence.

Narthex

In the church, this area is corresponding to the porch of Roman or classical temples. It is considered the foyer of the church. This area is dedicated to preached people. It is usually located at the west side of the church. However, in some cases, it can be located at the south or north side of the church, but it never lies on the east side. This area can be considered outer narthex or inner one. The outer narthex is a simplification of the outer atrium and more common in the west [103]. The Church of Pbow is a good example of this element.

In Egypt, the inner narthex is the most common. It consists of a compact room accessed from outside through an ordinary door and connected to the main hall of the church with another/other door/s. The Monastery of St. Jeremiah is a good example of this feature (Figure 4.29.).



▲Figure 4.29. Dayr Apa Jeremiah, where the narthex is connected by a tribelon with the naos (7th Century)

Unlike late Byzantine architecture, the narthex did not play a major role in Coptic churches since the early Christianity, and its importance decreased over time. It only can be found in the main and important churches. In the middle ages this element was not used and was replaced by another one, which is the duksar.

Pastophorium

This space has many uses in Eastern temples or churches and Jewish temples as well. However, in ancient Egypt, it was the room in which the statue of god was prepared to processions. It consists of two side rooms beside the apse; one on the northern side and the other one on the southern side. They are used to serve the ritual of the holy sacrament. They were introduced in Syria late in the fourth century. Later in the fifth century they became a distinct feature in eastern churches.

Duksar

This area is considered a lobby to the church. It is a covered area. It was first introduced in Egypt in the monastic churches during the Fatimid period [104]. This name is derived from the Greek word doxarion which means honor and glory, which make this element somehow look like a triumphal arch. Its contemporary use is to leave the shoes of the churches' visitors there. The main church of Monastery of St. Hedra is a good example of this element.

Presbytery (bema)

This is a rectangular area raised from the church level in front the apse on the eastern part of the church, where priests practice their rituals. It is the same as the sanctuary. It is separated from the main hall by a cancelli. It can be accessed from north and south sides and from the main hall on the west. Sometimes it is divided into two parts by a partition. In the late seventh and eighth centuries this element lost its importance by developing the khurus.

Sacristy (vestry)

This room is a side one in the church. It is reserved for storing vessels and the clothes and vests of the clergy. It consists of wall niches that can be locked for storing. This is not an essential part of the church, meaning that the presence of this room is optional.

Sanctuary (Haykal)

This is the most important part in the whole church. It is usually a rectangular area around alter and in front of the apse. In Upper Egypt it took a triconch shape where the alter

stands on its central field, and the apse is considered the eastern conch. If the church is located in an urban bishop area, the apse consists of synthronon (حضن الآب). In the middle ages this area was close with a big partition called *hijab*. This room can be opened to its neighboring sanctuaries.

Triconch

Geometrically, this space consists of a rectangular area or semicircular expanded by three semicircular spaces roofed by half domes. Earlier, the central part was unroofed, then it was roofed by a vault, and rarely domed. This feature was influenced by the Roman architecture. In Roman architecture the three expanded spaces were reserved for dining. This element is located in one of the building's sides. In the churches of the Middle East -in Egypt and Palestine for instance- in the Roman Empire, the triconch was used as a religious feature in the sanctuary of the basilican plan. In Coptic churches the width of the triconch is smaller than that of the width of the church.

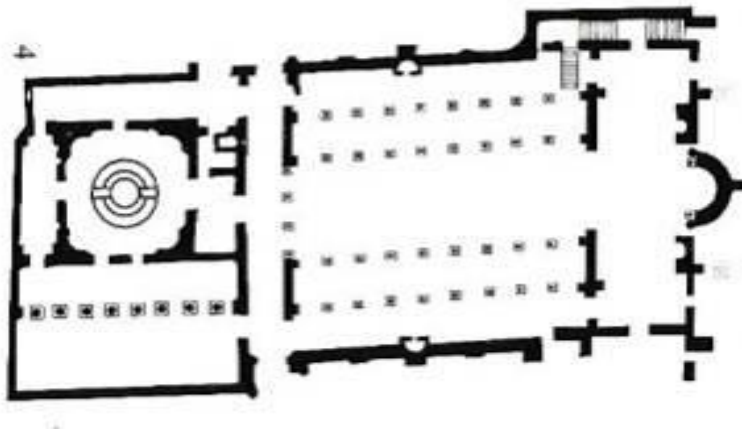
4.3.3.5. Doors

Prothyron

It is a small balcony raised by two big columns in front of the external doors of the church.

Tribelon

It is a corridor divided by two columns producing three openings that can be covered by curtains. The middle one has to be wider than the others. This element was used in ancient Egyptian tombs like Bani Hasan rock-cut tombs. Later, it was used frequently in Greek architecture. Its symmetric characteristic helps using it in churches as an accessing element between spaces but it would be half open. An example of that is the tribelon joining between the narthex and the main hall of the church in the basilica of St. Mina (Figure 4. 30.).

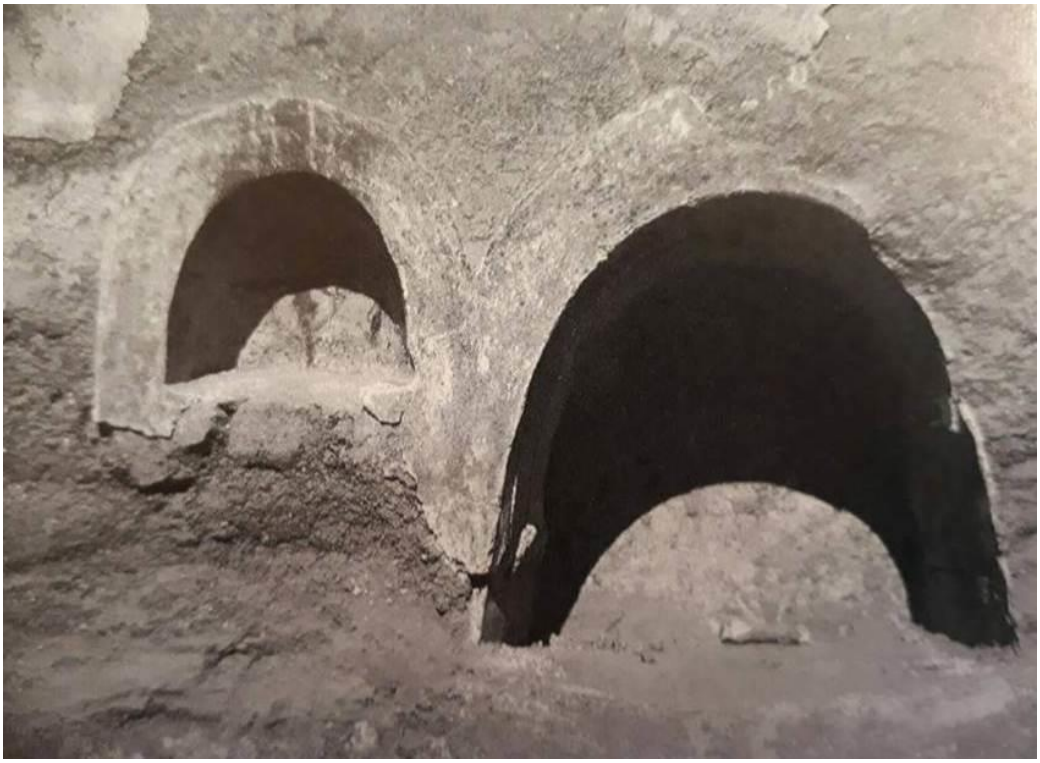


▲Figure 4.30. Plan of the large cultic complex (Great Basilica), phase 4, Abu Mina, Alexandria, (8th Century)

4.3.3.6. Niches

Niches are very essential element in Coptic churches. They are used to store some objects or placing icons of statues.

Usually they are arranged as a composition consisting of one large niche surrounded by to smaller ones. This composition helps to arrange the icons of gods. This can be seen in the niches of Kellia churches (Figure 4.31.). Beside the staircases niches are used to insert lamps.



▲Figure 4.31. Niches in a hermitage at Qusur Al-Rubaiyat, Kellia

4.3.4. Methodology of Selecting Case Studies

Selecting case studies went through five successive stages as follows:

- Collecting architectural floor plans of Coptic churches.
- Listing churches (names – plans – construction period - location).
- Selecting the study period, between the fourth and ninth centuries.
- Grouping Coptic churches chronologically – each century separately-, observing their architectural features.
- Grouping Coptic churches due to main features of their architectural ground floor plans, excluding any design or time aspects.

Note: at this stage, the analysis can lead to the clarification of the first group of exceptional churches according to their different orientation. Here, the research must answer the question about the reasons for that difference, and discover if they were cultural reasons or otherwise.

4.3.4.1. Collecting and Listing Plans of Coptic Churches

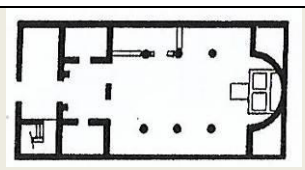
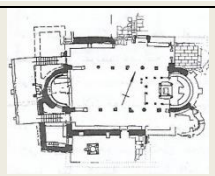
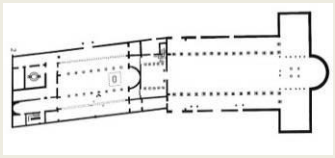
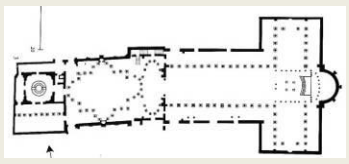
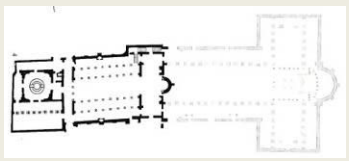
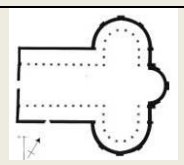
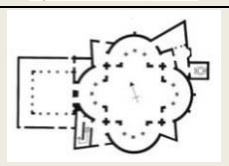
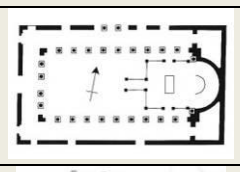
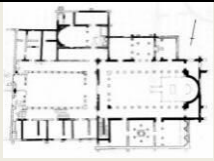
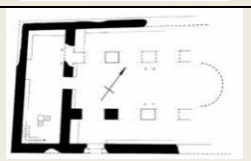
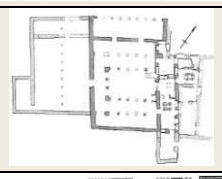
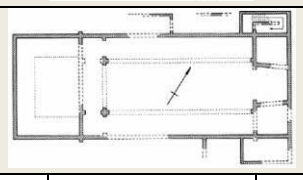
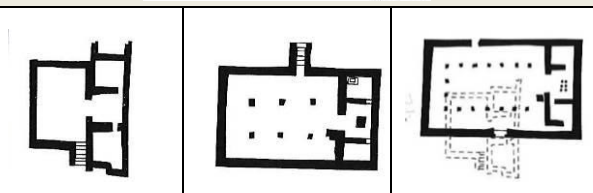
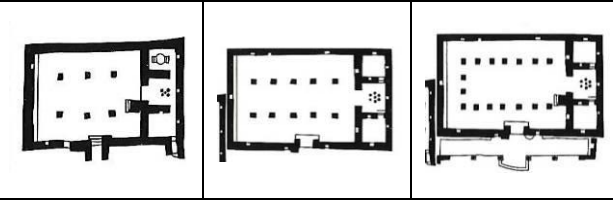
The first step of selecting case studies is to collect as many as possible of published floor plans of Coptic churches, to grant the minimum pieces of architectural information that can

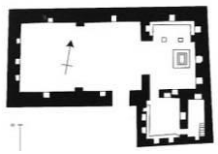
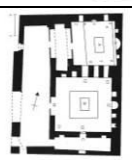
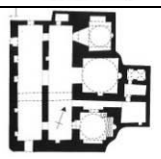
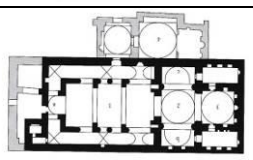
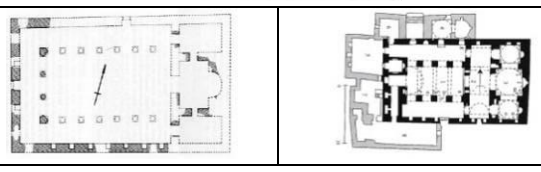
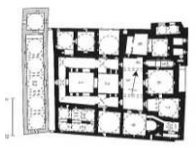
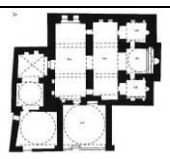
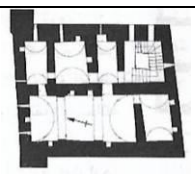
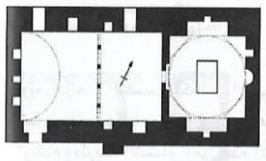
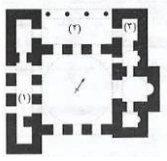
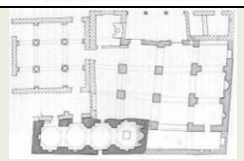
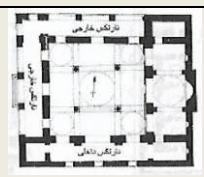
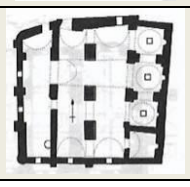
be analyzed using shape grammars as an analytical tool. This information is available in previous researches or can be observed from the plans. Consequently, this research can analyze those plans using shape grammars. Those plans were collected form several researches made by Peter Grossmann, Somars Clarke and Capuani, and were illustrated in the Coptic encyclopedia and UNESCO publications, in addition to more Arabic references like the researches of Professor Samy Sabry, Anba Samual and Anba Hedra.

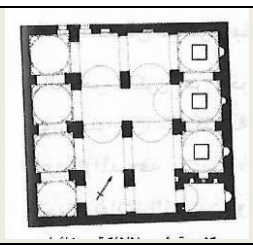
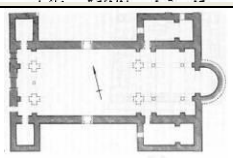
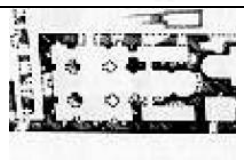
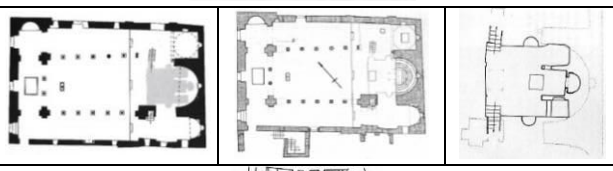
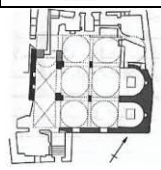
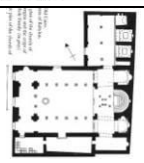
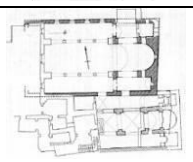
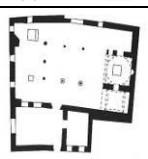
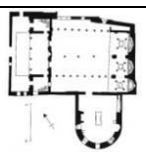
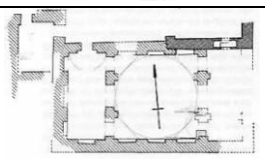
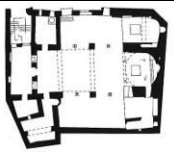
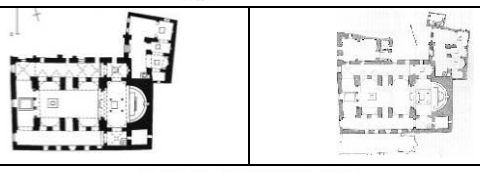
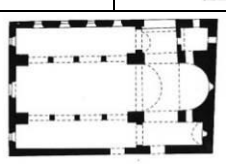
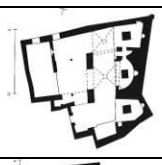
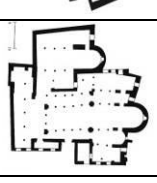
These churches are considered the row material of the research case studies. Hence, the following steps will narrow the selection due to additional information.

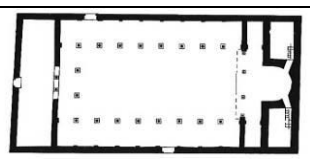
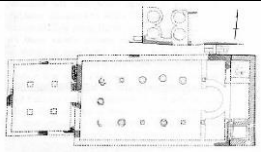
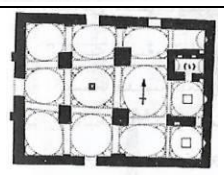
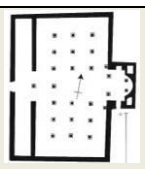
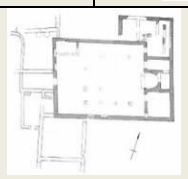
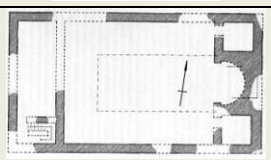
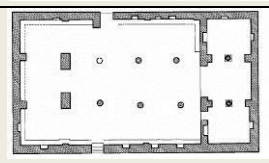
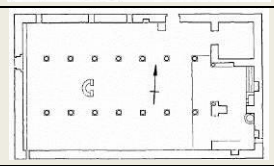
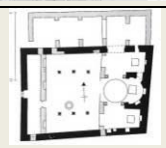
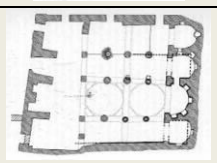
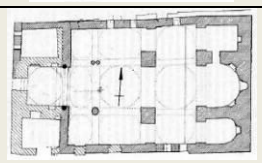
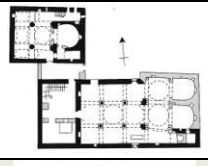
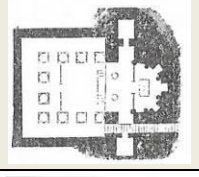
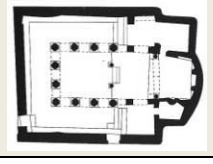
After collecting churches' floor plans, more information is collected for each of them as much as possible. The challenge here was that most of those buildings are too old; many of them were constructed more than a millennium ago. Therefore, getting precise data about old centuries is too hard, especially architectural information. This part lists Coptic churches according to their location and construction time, in addition to their names and plans. (Table 4.1.)

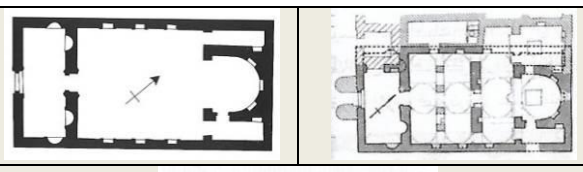
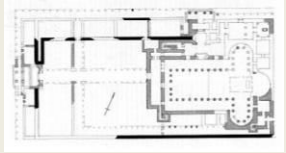
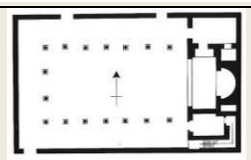
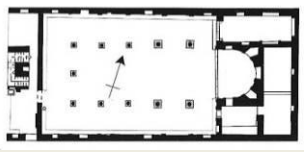
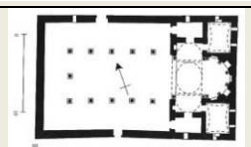
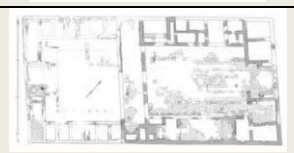
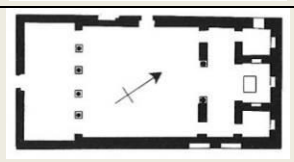
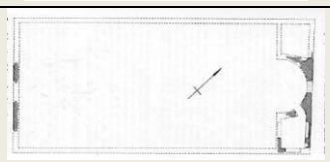
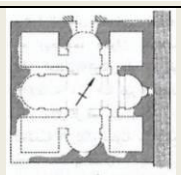
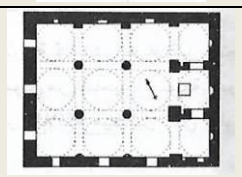
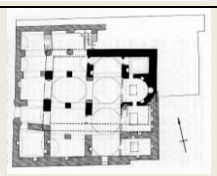
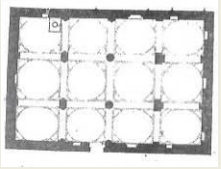
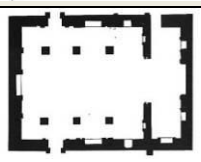
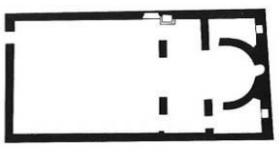
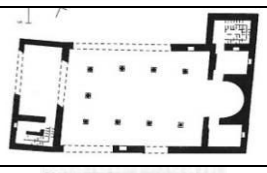
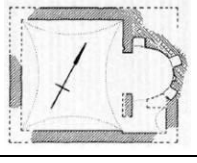
Table 4.1. List of Coptic churches according to their location and construction date:

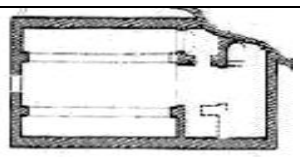
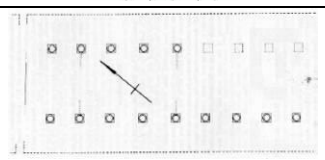
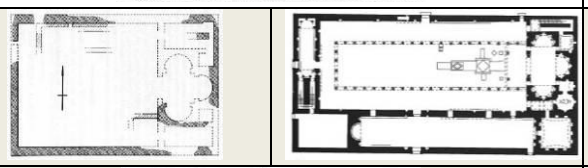
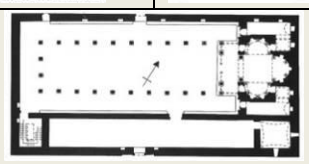
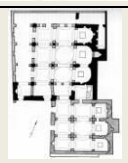
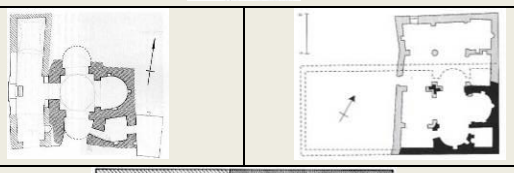
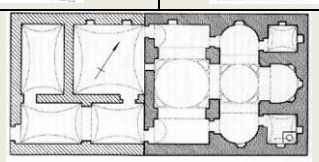
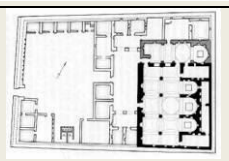
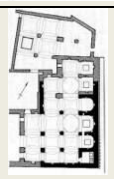
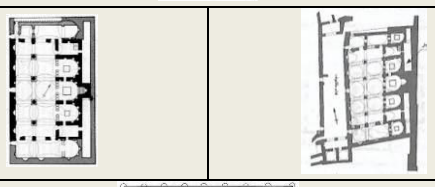
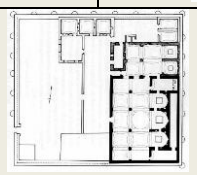
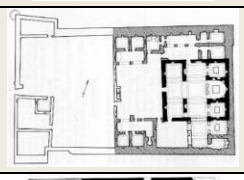
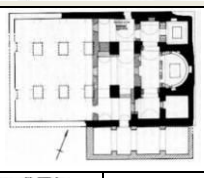
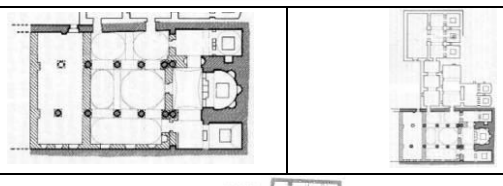
	Churches names	Plans	Construction time	Location
1	St. Marina church		4th Century	Alexandria, North coast
2	Burg El-Arab church		4th -5th Centuries	Alexandria, Southwest Alexandria
3	Sancatury of St. Menas, the large cultic complex		5th Century	Alexandria, Maryout
			6th Century	
			8th Century	
4	Al-Hawariya (Merea)		6th Century	Alexandria
5	Sancatury of St. Menas, east basilica		6th Century	Alexandria, Maryout
6	Sancatury of St. Menas, north basilica		6th Century	Alexandria
7	Sancatury of Abu Mina, North basilica		7th Century	Alexandria
8	The three aisled church		6th Century	Amriyyah
9	The older central Church		unknown	Abusir, Makhurah
10	The western church		unknown	Abusir, Makhurah
11	Ecclesial center of Qusur Isa 1		5th Century 5th Century 7th Century	Kellia
12	Ecclesial center of Qasr Al-Waheida		5th Century 7th Century 7th Century	Kellia

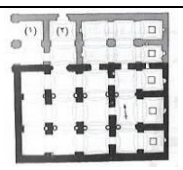
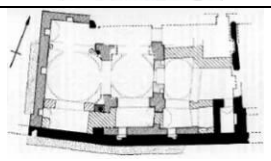
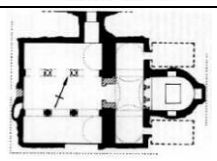
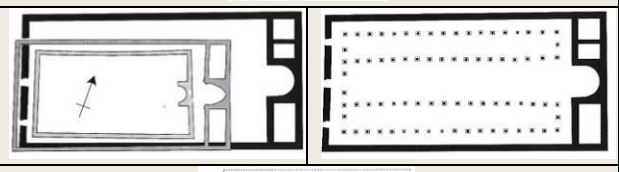
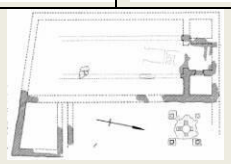
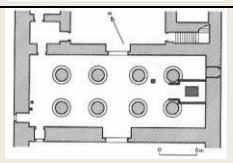
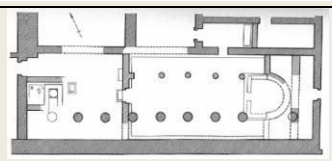
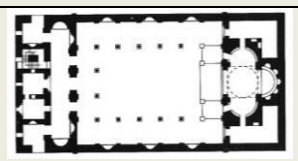
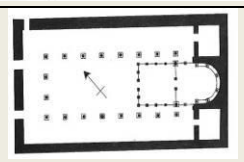
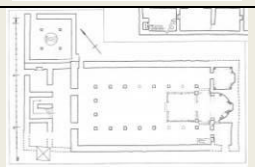
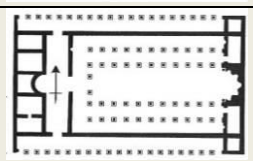
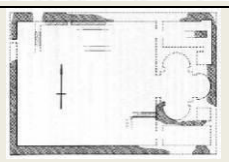
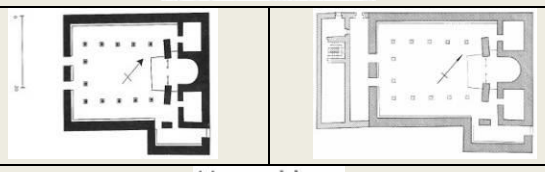
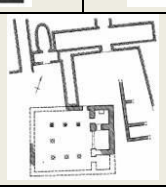
	Churches names	Plans	Construction time	Location
13	Church of hermitage Qusur Al-Izayla		7th Century	Kellia
14	Monastery of St. Macarius, Church of St. Macarius		7th Century	Scetis (Wadi Al-Natrun)
15	Monastery of St. Macarius, Church of St. Iskhirun		7th Century	Scetis (Wadi Al-Natrun)
16	Monastery of Syrians, Church of the Holy Virgin		7th Century	Scetis (Wadi Al-Natrun)
17	Monastery of Baramus, Church of the Holy Virgin		6th-7th Centuries, then 9th Century	Scetis (Wadi Al-Natrun)
18	Church of the monastery of St. Pshoi		9th Century	Scetis (Wadi Al-Natrun)
19	Monastery of Syrians, Church of St. Mary		9th Century	Scetis (Wadi Al-Natrun)
20	Monastery of Syrians, Church of Anba Samual in the keep		9th Century	Scetis (Wadi Al-Natrun)
21	Church El-Malak Mikh'il in the keep or tower of St. Pshoi monastery		11th Century	Scetis (Wadi Al-Natrun)
22	Al-Adra Church		15th Century	Menofyia, Tokh Delka
23	Churches at Dayr Sitt Dimyanah		16th Century	Delta, Dakahlia, Belqas
24	Church of the Holy Virgin		18th -19th Centuries	Delta, Menofyia, Sobk El-Ahad
25	Church of Anba Serabamon		19th Century	Delta, Menofyia, Melig village
26	Church of the Holy Virgin		18th -19th Centuries	Delta, Menofyia, Fisha El-Nasara
27	Mari Girgis church		18th -19th Centuries	Delta, Great Sahragt village
28	Mari Girgis church		18th -19th Centuris	Delta, Dakahlia, Mit Ghamr

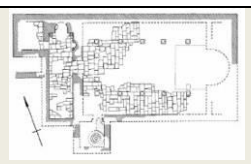
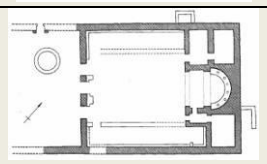
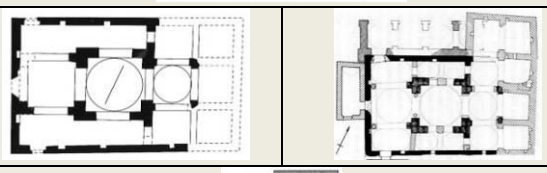
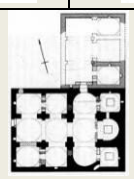
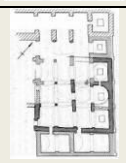
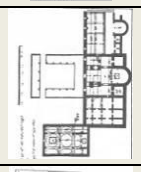
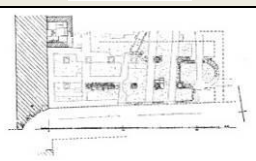
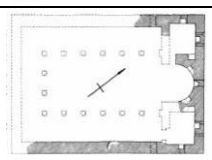
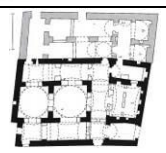
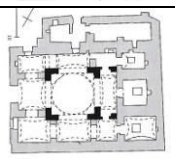
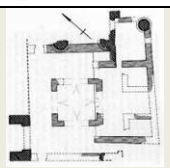
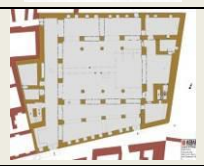
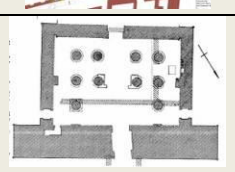
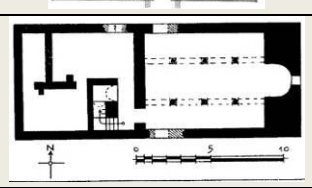
	Churches names	Plans	Construction time	Location
29	Church of Angel Michel		18th -19th Centuris	Delta, Sharkyia, Kafr El-Dair
30	Basilica infront of complex A		7th -8th Centuris	Hilwan
31	Church in complex B		7th -8th Centuries	Hilwan
32	Church of St. Sergius		7th -8th Centuries	Old Cairo, Fortress of Babylon
33	Church of The Prince Tadrus		7th -8th Centuries	Old Cairo, Fortress of Babylon
34	Church of St. Barbara		9th Century	Old Cairo, Fortress of Babylon
35	Church of Mar Mina		8th Century	Old Cairo, out side the fortress
36	Church of St. Shenute		8th Century	Old Cairo, district of St. Mercurius
37	Church of the Holy Virgin (Al-Damshiriya)		8th Century	Old Cairo, district of St. Mercurius
38	Church of the Holy Virgin (Al-Muallaqa)		9th Century	Old Cairo, Fortress of Babylon
39	Church of Dayr Al-Qusayr كنيسة دير أنبا يوحنس القصير		10th Century	Turah, Al-Qusayr
40	Church of the Holy Virgin of Babylon Al-Darag		11th Century	Old Cairo, South district
41	Church of St. Mercurius		pre-muslism-12th Century	Old Cairo, district of St. Mercurius
42	Church of St. Menas		12th Century	Cairo, Fumm Al-Khalig
43	Church of Sts. Cyrus and John		14th Century	Old Cairo, South district
44	Church of the Holy Virgin, and adjacent church of St. Mercurius		14th Century	Cairo, Harat Zuwaila

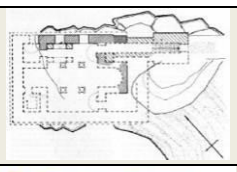
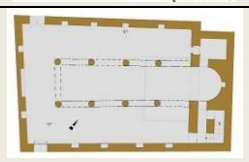
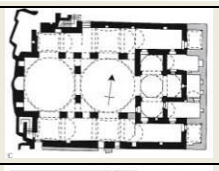
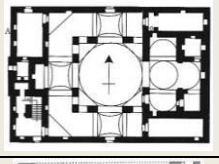
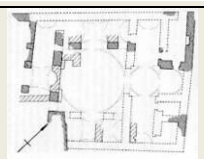
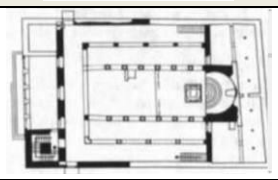
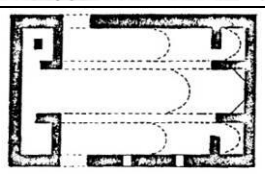
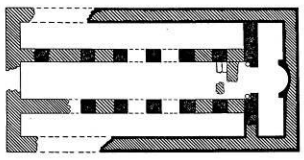
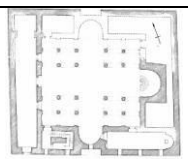
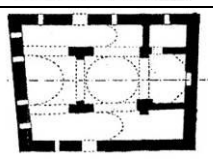
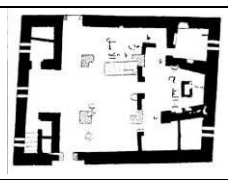
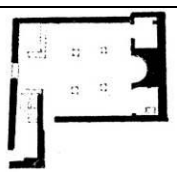
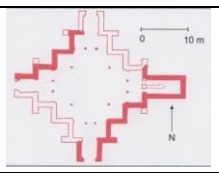
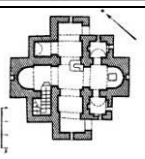
	Churches names	Plans	Construction time	Location
45	Church of monastery of St. Jeremiah		7th Century	Saqqara
46	Main Church at the center of monastery of St. Jeremiah		7th Century	Saqqara
47	Church of Dayr El-Rosol		18th -19th Centuries	Giza, Atfeeh
48	Church with 7 aisles	 	5th -6th Centuries	Al-Fayyum, Madinat Madi (Narmuthis)
49	Church CH 87 D		5th -6th -7th Centuries	Al-Fayyum, Madinat Madi (Narmuthis)
50	Church CH 87 E		5th -6th -7th Centuries	Al-Fayyum, Madinat Madi (Narmuthis)
51	Church located near the pyramid at Hawwarah		7th Century	Al-Fayyum, Hawwarah
52	Church A		7th Century	Al-Fayyum, Umm Al-Barakat or Umm Al-Burigat (Tebtunis)
53	Church C		7th Century	Al-Fayyum, Umm Al-Barakat
54	Plan of the Church		10th -11th Centuries	Al-Fayyum, monastery of the archangel Gabriel (Deir Al-Naqlun)
55	Church of the Holy Virgin at Dayr Al-Azab		13th or 12th Century	Al-Fayyum
56	Church of Dayr Al-Hammam		12th -14th Centuries	Al-Fayyum
57	Church of Deir Al-Banat		unknown	Al-Fayyum
58	Churches of St. Anthony and St. Mercurius		15th Century	Beni Suef, Deir Al-Maimun
59	Dayr Al-Sakyia		4th Century	Al-Minya, Gebel Al-Tair
60	Church of the Holy Virgin		4th Century	Al-Minya, Gebel Al-Tair

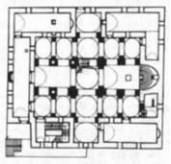
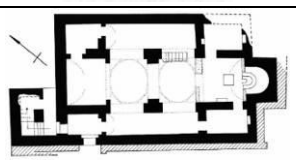
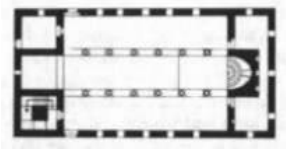
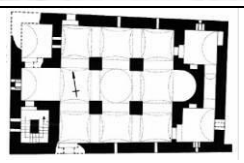
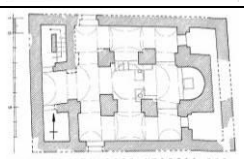
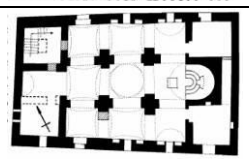
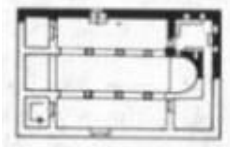
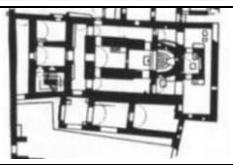
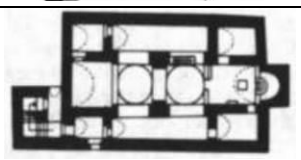
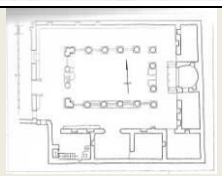
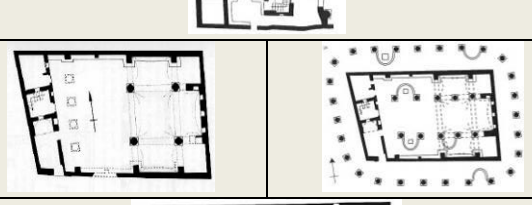
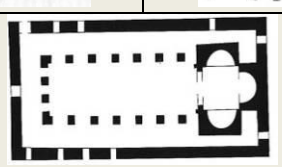
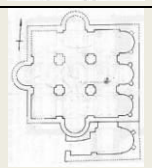
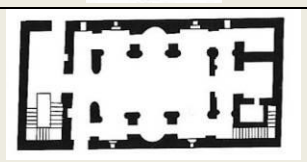
	Churches names	Plans	Construction time	Location
61	Church of St. John the Abbot		5th Century	Al-Minya, Dayr Abu Hinnis
62	The Basilica		5th Century	Al-Minya, Hermopolis (Al-Ashmunein)
63	Church of the monastic complex		6th Century	Al-Minya, Kom Namrud
64	Monastery of Apa Bane, the funerary church		6th Century	Al-Minya, Monastery of Apa Bane
65	Monastery of Apa Bane, the sanctuary church (Abu Fana)		6th Century	Al-Minya, Monastery of Apa Bane
66	Church D3 of Antinoopolis		6th Century	Al-Minya, Antinoopolis
67	Presbytery and plan of a church		6th Century	Al-Minya, Antinoopolis (Antinoe)
68	The medieval cenobite monastery		unknown maybe 6th Century	Al-Minya, Antinoopolis
69	Dayr Al-Dik		7th Century	Al-Minya, Ansana أنصنا
70	Church of Mar Girgis		12th Century	Al-Minya, Ishneen El-Nasara, Maghagha
71	Chrch of Anba Bishoi, Dayr Al-Barshah		12th -13th Centuries	Al-Minya
72	Churchof Anba Bagol Batla		18th -19th Centuries	Al-Minya
73	The south church		6th Century	Asut, Bawit, Monastery of St. Apollo
74	Church		6th Century	Asut, Manqabad
75	The main Church		6th Century	Asut, Monastery of Balayza
76	St. Barbara's Chapel		7th -8th Centuries	Asut, Dayr Al-Jabrawi

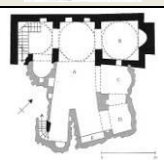
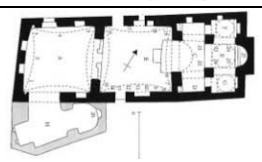
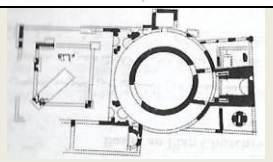
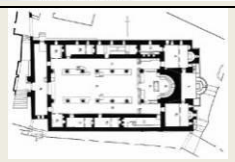
	Churches names	Plans	Construction time	Location
77	Church of Dayr Al-Izam		8th Century	Asut
78	Church of Dayr Al-Muharraq		13th Century	Asut, Qusyyah
79	The Basilica		unknown	Asut, Dayr Al-Jabrawi
80	Church of St. Shenute		5th Century	Sohag, the White monastery
81	Church of St. Pshoi		5th Century	Sohag, the Red monastery
82	Dayr Sitt Dimyanah		4th /6th Century	Akhmim
83	church of monastery of St. Pachomios		7th Century	Akhmim, monastery of St. Pachomios
84	Church of St. Thomas		11th then 16th Century	Akhmim, Dayr Mar Tumas
85	Church of Dayr Al-Malak Mikha'il		13th Century	Akhmim, Dayr Al-Malak Mikha'il
86	Church of Dayr Al-Malak Mikha'il		16th Century	Akhmim, Dayr Al-Malak Mikha'il
87	Church of Dayr Mar Jirjis Al-Hadidi		16th -17th Centuries	Akhmim, Dayr Mar Jirjis Al-Hadidi
88	Deir Al-Adhra		17th Century	Akhmim
89	The church at monastery of the Martyrs (Deir Al-Shuhada)		17th Century	Akhmim
90	Church of St. Jirjis		11th Century	Upper Egypt, Qina, Dayr Al-Majma'
91	Church of Dayr Al-Salib		4th and 12th Centuries	Upper Egypt, Qina, Dayr Al-Salib
92	Dair Bidaba		14th -15th Centuries	Upper Egypt, Qina, Nag' Hammadi

	Churches names	Plans	Construction time	Location
93	Dayr Al-Salib		19th Century	Upper Egypt, Naqadah
94	Church of St. John		unknown	Upper Egypt, Qina, Dayr Al-Majma'
95	Al-Adra' Church		unknown	Upper Egypt, Qina, Dayr Al-Majma'
96	The Roman temple known as Dayr Al-Shalwit		2nd Century	Armant
97	Church of the monastery of Pbow		4th -5th Centuries	Thebaid
98	Church in the old city Qift		5th Century	Luxor, Qift
99	remains of the church in the hypostyle hall of temple of Khonsu		5th Century	Luxor, Karnak
100	Church of Dayr Al-Adhra'		5th -6th Centuries	Armant, Al-Ruzayqat
101	Three aisled basilican chamberib in the south court of Madamud		6th Century	Luxor, Madamud
102	Church of Dandara		6th Century	Thebaid
103	Church close to the main pylon of Luxor temple		6th Century	Luxor
104	St. Thekla Church		6th Century	Luxor, infornt of Ammon Temple
105	The Basilica of Armant		6th Century	Armant (Hermonthis)
106	Church of Dayr Al-Marmar		6th Century	Armant
107	Church in front of the east gate at Madinat Habu		7th Century	Luxor, Madinat Habu
108	Church of 'Abd Al-Qurnah		7th Century	West Thebes

	Churches names	Plans	Construction time	Location
109	Church located amid the remains of houses at Madamud		7th Century	Luxor, Madamud
110	Church at Tud		8th Century	Luxor, Tud
111	Church of manstery of St. Victor (Mar Buqtur)		8th -9th Centuries	Luxor, Naqada
112	Church of Dayr Al-Malak Mikha'il		14th Century	Upper Egypt, Luxor, Qamulah
113	Church of Dayr Al-Shahid Tadrus Al-Muharib		old unknown, 15th Century	Luxor, Habu
114	St. Pachomius monastery		17th -18th Centuries	Luxor
115	Dayr Al-Malak Mikha'il		Unknown	Luxor, Naqada
116	Church at Qurnat Mar'i		Unknown	Luxor, Qurnat Mar'i
117	Church at Naj' Al-Hajar		5th -6th Centuries	Upper Egypt, Naj' El-Hajar
118	Church at Qal'at Al-Babayn		10th Century	Upper Egypt, Edfu
119	Two churches of monastery of the Martyrs (Deir Al-Shuhada)		11th -12th Centuries	Upper Egypt, Esna
120	Church of monastery of the Potter (Deir Al-Fakhuri)		12th Century	Upper Egypt, Esna
121	Ruins of Elephantine معبد خنوم		6th Century	Upper Egypt, Aswan
122	Eastern church of Philae		6th Century	Aswan, Philae
123	The temple of Isis		6th Century	Aswan, Philae
124	Sitteh Kasmar church كنيسة الست جسمة		7th -8th Centuries	Aswan, south Tafa

	Churches names	Plans	Construction time	Location
125	Church of St. Psote كنيسة الأنبا بسادة		7th -8th Centuries	Upper Egypt, Aswan
126	A small church, the western church		8th Century	Aswan, Philae
127	Church of monastery of St. Simeon		10th -11th Centuries	Upper Egypt, Aswan
128	Church of monastery of Al-Kubbaniya		10th -11th Centuries	Upper Egypt, Aswan
129	Church in tomb of Khune		10th -12th Centuries	Upper Egypt, Aswan, Dayr Qubbat Al-Hawa
130	The Great Cathedral, Kasr Ibrim		6th Century	Nubia
131	Sabagura church		6th -8th Centuries	Nubia, Qirsh
132	Church at Gebel Addeh		7th Century	Gebel Addeh
133	Basilicat at old Dongola		7th Century	Nubia
134	The northen church, Kasr Ibrim		7th Century	Nubia
135	Nag' El-Okba Church		7th Century	Nubia
136	Akhmandy Church كنيسة أخمندي		7th -8th Centuries	Nubia, Ofendineh
137	The central Church of Abdallah Nirki		8th Century	Nubia
138	Church inside the temple of Wadi El-Sebo' وادي السبوع		8th Century	Nubia
139	The Cruciform Church, Old Dongola		9th Century	Nubia
140	Church of Angels كنيسة الملاك بيتاميت		9th Century	Tamit (Abu Simbel)

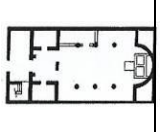
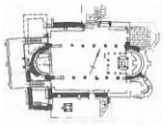
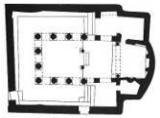
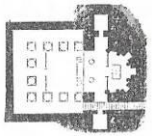
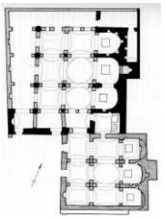
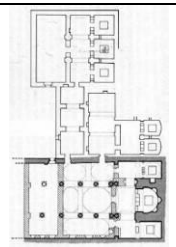
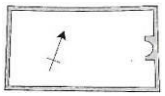
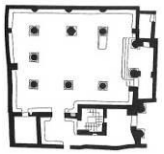
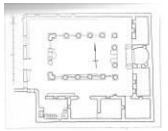
	Churches names	Plans	Construction time	Location
141	Faras Cathedral		10th Century	Nubia
142	Barrel vaulted pillared Basilica		10th Century	Nubia
143	Monastery Church in Ghazali		10th Century	Nubia
144	Four-pillar Basilica		11th Century	Nubia
145	The small north Church of Abdallah Nirki		11th Century	Nubia
146	Church of St. Raphael		11th Century	Tamit (Abu Simbel)
147	Church on the south slope of Kom Faras		unknown	Nubia
148	Monastery Church in Kasr Al-Wizz		unknown	Nubia
149	Basilica at Tamit		unknown	Tamit (Abu Simbel)
150	Church of Kellis		4th Century	Oases, oasis of Al-Dakhla
151	Church of Ain Shams Al-Din		4th Century	Oases, oasis of Baris
152	Necropolis of Bagawat, the funerary church		5th Century	Oases, oasis of Al-Kharga
153	Church of Deir Abu Matta		6th Century	Oases, oasis of Al-Dakhla
154	The complex in the northern area		6th Century	Oases, Bagawat
155	Church of Dayr Al-Malak		6th /7th Century	Oases, oasis of Al-Dakhla
156	Church of Al-Hayz		7th -8th Centuries	Oases, south of the oasis Al-Bahariya

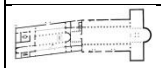
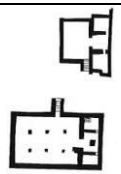
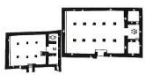
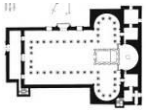
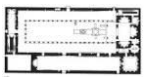
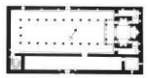
	Churches names	Plans	Construction time	Location
157	Church of monastery of Ain Saaf		unknown	Oases, oasis of Al-Kharga
158	Monastery of St. Paul		5th Century	Eastern Desert
159	Monastery of St. Anthony, Church of St. Anthony		12th Century	Eastern Desert
160	The circular Church		5th Century	Sinai, Plusium villiage, Farma
161	Church of St. Catherine		6th Century	Sinai, mount Sinai

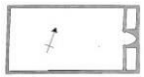
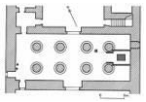
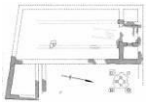
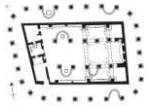
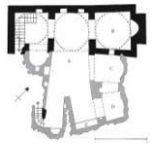
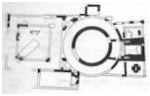
The previous table gives the first glace of the relation between the architectural form of the Coptic churches and their dates of construction, in addition to their location in Egypt. Here, we can find that churches built in the same construction time have similar architectural features; however, every location had its own characteristics and its way of developing the church.

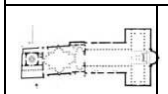
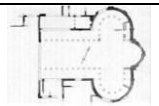
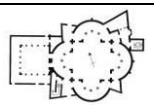
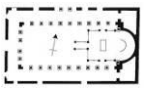
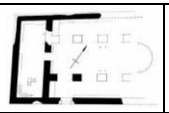
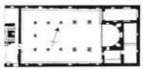
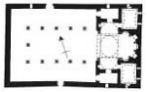
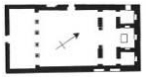
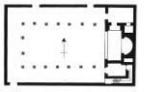
4.3.4.2. Chronological Order of Selected Coptic Churches and Specifying Their Architectural Features

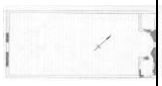
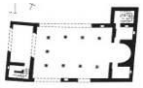
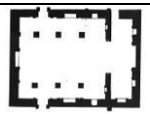
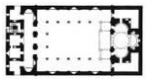
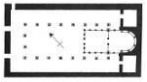
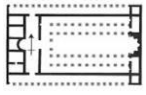
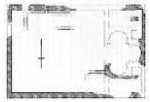
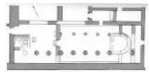
By taking the first steps in tracing the Coptic architecture characteristics, this part put Coptic churches in chronological groups for each century in the studying period. Each group of them is put in a separate table highlighting its main elements.

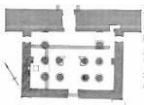
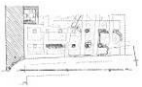
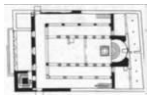
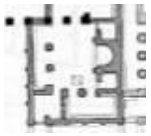
		4th Century								
9/9										
Main Hall	Basilica	√	√	√	√	-	√	√	√	√
	Coptic	-	-	-	-	√	-	-	-	-
	Central	-	-	-	-	-	-	-	-	-
Bays	No. of bays	4	7	3	3	2	5	unknown	3	5
	Transept	×	×	×	×	×	×	×	×	×
	Return Aisle	×	×	√	√	×	×	unknown	√	√
	Choir	×	×	√	√	×	√	unknown	×	√
Columns	bays	2	2	2	2	2	2	unknown	2	2
	Return aisle	×	×	4	4	×	×	unknown	4	4
	transept	×	×	×	×	×	×	×	×	×
	Choir	×	×	2	2	×	2	unknown	×	4
	Entrances	×	×	×	×	×	×	Unknown	×	×
Pilasters	Front walls	×	√	√	×	√	√	Unknown	√	×
	Lateral walls	×	√	√	×	√	√	Unknown	√	√
	Entrances	×	√	×	×	×	×	Unknown	√	×
Sanctuary		Circular	Circular	Semi Circular	Circular	Circular	Circular	Circular	rectangular	Circular
Aux.spaces	Flanking rooms	√	√	√	×	√	√	×	√	√
	Stairs			×	×	×	×	×	√	
	Choir	×	×	×	√	×	×	×	×	×
	I. narthex	×	×	×	×	√	×	Unknown	×	×
	Portico	×	√	×	×	×	×	×	×	×
	ضفير	×	×	×	×	√	×	×	×	×
	Doksar	×	×	×	×	×	×	Unknown	√	×
Doors	Main Hall	2	2	2	1	2	3	Unknown	1	3
	Aux.spaces	√	√	√	√	√	√	Unknown	√	√
	Main entrances	1	2	2	1	2	3	Unknown	1	3
Windows		×	×	×	× (Rock-cut)	×	×	Unknown	×	×
Niches	Alter	×	×	√	√	√	√	×	√	√
	Main hall	×	×	√	√	×	√	×	√	√
	Aux.spaces	×	×	×	√	×	√	×	√	√
Orientation		unknown	+22° ↑	+33° ↗	Unknown	+23° ↗	unknown	+20° ↑	+/- Zero ↑	-3° ↑
Location		Alexandria		Al-Minyia		Sohag	Qina	Thebaid	Baris Oasis	Al-Dakhla Oasis

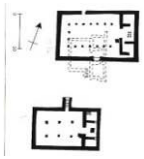
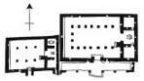
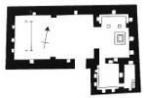
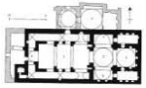
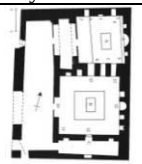
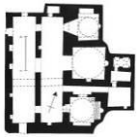
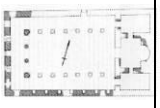
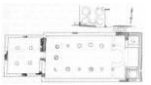
10/18		5th Century									
											
Main Hall	Basilica	√	√	√	√	√	√ ((askew))	√	√	√	√
	Coptic	-	-	-	-	-	-	-	-	-	-
	Central	-	-	-	-	-	-	-	-	-	-
Bays	No. of Bays	15	0-4	4-6	3	5	4	2	10	18	10
	Transept	0	×	×	×	×	×	×	3	×	×
	Return Aisle	×	×	×	√	√	×	×	√	√	√
	Choir	×	×	×	×	×	×	√	×	2	√
Columns	bays	2	2	2	6	2	4	4	2	2	2
	Return aisle	×	×	×	7	×	4	×	6	6	4
	transept	2	×	×	×	×	×	×	2	×	×
	Choir	×	×	×	×	×	×	√	×	4	4
	Entrances	√	×	×	×	×	×	×	×	×	×
	Ambulatory	×	×	×	×	×	×	×	√	×	×
Pilasters	Front walls	√	×	×	√	×	×	×	×	×	×
	Lateral walls	√	×	×	×	×	×	×	×	×	×
	Entrances	×	×	×	×	×	×	√	×	×	×
Sanctuary		circular	Rectangular	rectangular	circular	rectangular	Circular	circular	circular	Tri-conch	Tri-conch
Aux. spaces	Flanking rooms	×	√	√	√	√	√	√	√	√	√
	Stairs	×	×	×	×	×	×	×	√	√	√
	Choir	×	×	×	×	×	×	√	×	×	×
	I. Narthex	×	×	×	√	×	×	√	√	√	×
	Doksar	×	×	×	×	×	×	×	×	√	√
Doors	Main Hall	7	1	1	1	2	1	1	4	5	2
	Aux. spaces	√	√	√	√	√	√	√	√	√	√
	M. enternces	1	1	1	1	2	1	1	2	2	2
Windows		×	×	×	×	×	×	×	√	×	√
Niches	Alter	×	×	√	√	√	×	√	×	√	√
	Main hall	×	×	√	×	×	√	√	×	√	√
	Aux. spaces	×	×	√	×	×	×	√	×	√	√
Orientation		-13°	+20°	+/-Zero°	+10°	+20°	+20°	+50°	+22°	+37°	+32°
Location		Alexandria	Kellia		Al-Fayyoum			Al-Minyia		Sohag	

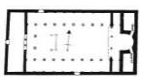
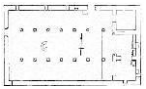
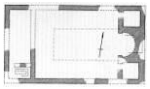
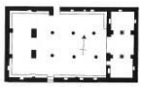
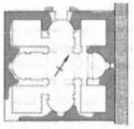
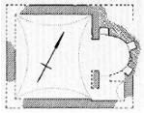
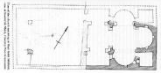
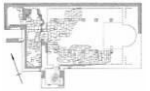
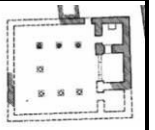
		5th Century							
	8/18								
Main Hall	Basilica	√	√	√	√	√	√	-	-
	Coptic	-	-	-	-	-	-	-	-
	Central	-	-	-	-	-	-	-	√
Bays	No. of bays	unknown	17	×	4	Unknown	5	×	×
	Transept	×	×	×	×	×	×	×	×
	Return Aisle	√	√	×	×	Unknown	×	×	Circular aisle
Columns	Between bays	4	4	×	2	2	2	×	×
	Return aisle	unknown	8	×	×	Unknown	×	×	×
	transept	×	×	×	×	×	×	×	×
	Choir	×	×	×	×	×	√	×	×
	Entrances	×	×	×	×	Unknown	×	×	×
	ambulatory	√	√	×	×	×	×	×	×
	Outer narthex	×	×	×	×	×	around	×	×
Pilasters	Front walls	√	×	×	×	√	×	×	×
	Lateral walls	×	×	×	×	×	√	×	×
	Entrances	×	×	×	×	Unknown	×	×	×
Sanctuary		circular	Circular	circular	Rectangular	Rectangular	Rectangular	circular	Rectangular
Aux. spaces	Flanking rooms	√	√	√	√	√	√	√	√
	Choir	×	×	√	×	×	√	×	√
	Inner narthex	×	×	×	×	×	×	×	×
	Doksar	×	×	×	×	×	√	√	×
Doors	Main Hall	unknown	3	1	4	Unknown	1	1	Unknown
	Aux. spaces	unknown	Unknown	unknown	√	√	√	√	√
	M. entrances	unknown	3	1	2	Unknown	1	1	Unknown
Windows		unknown	Unknown	unknown	×	Unknown	×	× (Rock-cut)	×
Niches	Alter	×	×	×	×	×	√	×	×
	Main hall	×	×	√	×	×	√	√	×
	Aux. spaces	×	×	×	×	×	×	√	×
Orientation		+20°	+20°	+10°	-26°	+103°	-7°	+45°	Unknown
Location		Thebaid		Luxor, Armant	Luxor		Al-Kharga Oasis	East Desert	Sinai

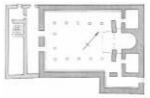
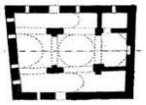
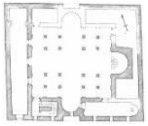
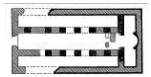
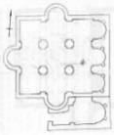
		6th Century									
10/29											
Main Hall	Basilica	√	√	-	√	√	√	√	√	√	√
	Coptic	-	-	-	-	-	-	-	-	-	-
	Central	-	-	√ tetra conch	-	-	-	-	-	-	-
Bays	No. of bays	15	10	×	10	3	5	5	×	7	9
	Transept	5	3	×	×	×	×	×	×	×	×
	ambulatory	√	√	√	×	×	×	×	×	×	×
	Return Aisle	×	×	×	√	×	√	√	×	√	√
	I. narthex	×	×	×	×	×	×	×	√	×	×
Columns	Bays	2	2	×	2	2	2	2	×	2	2
	Return aisle	×	×	×	6	×	3	3	×	4	3
	I. narthex	×	×	×	×	×	×	×	4	×	×
	transept	2	2	×	×	×	×	×	×	×	×
	ambulatory	4	6 semicircular	3	×	×	×	×	×	×	×
	Choir	×	×	×	×	×	×	×	×	×	×
	Doors	√	×	×	√	×	×	√	√	×	×
	Apse	×	×	×	×	×	×	√	×	×	×
Pilasters	Front walls	√	√		√	√	√	×	×	×	√
	Lateral walls	√	×		×	×	√	×	√	×	√
	Entrances	×	×		×	×	×	×	×	×	√
Sanctuary		Circular	Circular		Circular	Circular	Circular	Tri-conch	Rectangular	Circular	Circular
Aux. spaces	Flanking rooms	×	×	√	√	√	√	√	√	√	√
	Stairs	×	×	√	×	×	√	×	×		×
	Choir	×	×		×	×	×	×	√	×	√
	I. narthex	×	×		×	√	×	×	×	×	√
	Doksar	×	×		×	×	√	×	×	×	×
Doors	Main Hall	11	2		11	2	1	2	2	3	Unknown
	Aux. spaces	×	Unknown		√	√	√	√	√	√	Unknown
	M. entrances	1	1		2	1	1	1	1	3	Unknown
Windows		×	×		√	×	×	√	√	×	Unknown
Niches	Alter	×	×		×	×	√	√	√	×	×
	Main hall	√	×		×	×	√	×	×	×	×
	Aux. spaces	×	×		×	×	√	×	√	×	×
Orientation		-13°	+30°	-21°	+10°	-36°	+17°	-20°	+56°	+/-Zero°	+43°
Location		Alexandria					Al-Minyia				

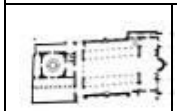
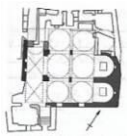
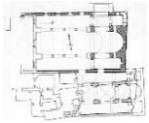
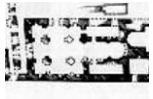
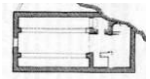
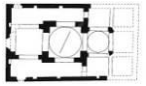
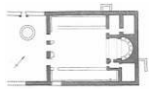
		6th Century									
10/29											
Main Hall	Basilica	√	√	√	√	√	√	√	√	√	√
	Coptic	-	-	-	-	-	-	-	-	-	-
	Central	-	-	-	-	-	-	-	-	-	-
Bays	No. of bays	Unknown	4	4	×	5	7		×	5	7
	Transept	×	×	×	×	×	×	×	×	×	×
	Choir	×	×	×	√	4	×	×	×	×	√
	Return Aisle	×	√	×	×	√	√	√	×	×	√
Columns	Bays	Unknown	4	2	×	2	2	11	unknown	2	2
	Return aisle	×	3	×	×	4	4	6	×	×	4
	I. narthex	×	×	×	×	×	×	×	×	×	×
	Transept	×	×	×	×	×	×	×	×	×	×
	ambulatory	×	×	×	×	×	×	×	×	×	×
	Choir	×	×	×	×	4	√	×	×	×	4
	Doors	×	×	×	×	×	×	√	×	×	×
	Apse	×	×	×	×	×	√	×	×	×	√
	Outer narthex	×	×	×	×	×	×	√	×	×	×
	Aux. spaces	×	×	×	×	×	×	×	×	×	√
Pilasters	Front walls	×	×	√	×	√	√	√	×	√	×
	Lateral walls	×	×	√	×	√	×	×	×	×	×
	Entrances	×	×	√	×	×	×	×	×	×	×
Sanctuary		Circular	Circular	Rectangular	×	Tri-conch	Circular	Circular	Tri-conch	Circular	Circular
Aux. spaces	Flanking rooms	√	√	√	√	√	√	√	√	√	√
	Stairs	×	√	×	×	√	×	×	×	×	√
	Choir	×	×	×	√	×	×	×	×	×	×
	I. narthex	×	√ (askew)	×	×	√	×	√	×	√	√
	Doksar	×	×	×	×	√	×	√	×	×	√
	Portico	×	×	×	×	×	×	√	×	×	×
	ضفير	×	×	×	×	×	×	×	×	√	×
Doors	Main Hall	Unknown	Unknown	2	1	3	3	1	1	2	3
	Aux. spaces	Unknown	×	√	√	√	√	√	√	√	√
	M. entrances	Unknown	Unknown	2	1	2	2	2	1	1	1
Windows		×	×	×	×	√	×	×	×	×	×
Niches	Alter	×	×	√	√	√	×	√	×	×	√
	Main hall	×	√	√	√	√	×	√	×	×	×
	Aux. spaces	×	√	√	√	√	×	×	√	×	×
Orientation		+48°	-24°	+/- Zero	+23°	-21°	-45°	+/-Zero°	+/-Zero°	-26°	-40°
Location		Al-Menyia			Asut		Dandara			Luxor	

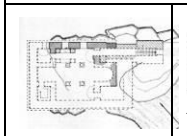
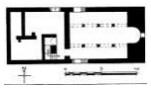
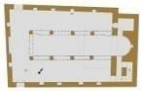
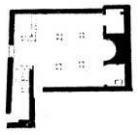
		6th Century								
9/29										
Main Hall	Basilica	√ (askew)	√	√	√	√	√	√	√	√
	Coptic	-	-	-	-	-	-	-	-	-
	Central	-	-	-	-	-	-	-	-	-
Dividing main hall		×	√	×	×	×	×	×	√	×
Bays	No. of bays	4	-	4	6	7 in 4	×	7	×	6
	Transept	×	×	×	×	×	×	×	×	×
	Return Aisle	×	√	×	×	√	×	√	√	×
	Choir	×	√	×	×	√	×	×	√	√
	I.narthex	√	×	√	×	√	√	×	√	√
Columns	Between bays	4	-	2	2	4	×	2	-	2
	Return aisle	×	-	×	×	4	×	4	-	×
	transept	×	×	×	×	×	×	×	-	×
	I.narthex	4	-	×	×	×	2	×	-	×
	ambulatory	×	-	×	×	×	×	×	-	×
	Choir	×	-	×	×	×	×	×	-	2
	Doors	×	-	×	Unknown	×	×	×	-	×
	Apse	×	-	×	×	×	×	×	-	×
	Outer narthex	×	-	×	×	×	×	×	-	×
	Aux. spaces	×	-	×	×	×	×	×	-	×
Pilasters	Front walls	√	×	√	×	√	×	√	-	√
	Lateral walls	√	×	√	×	×	√	×	-	×
	Entrances	×	×	×	×	×	√	×	-	×
	Outer pilasters	×	×	×	×	×	√	×	-	×
Sanctuary		Rectangular	Rectangular	Rectangular	Circular	Circular	Circular	Tri-conch	Rectangular	Circular
Aux. spaces	Flanking rooms	√	√	√	√	√	√	√	√	√
	Stairs	√	×	×	×	√	×	×	√	×
	Choir	×	×	√	×	×	×	×	√	×
	I. narthex	×	×	×	×	×	-	×	√	√
	Doksar	×	×	×	×	√	√	×	×	×
	Portico/concha	×	×	×	×	×	×	×	√	×
	ضفير	×	×	×	×	√	×	×	×	×
	Return aisle	×	×	×	×	×	×	×	√	×
Doors	Main Hall	4	4	3	Unknown	4	3	1	2	3
	Aux. spaces	√	√	√	√	√	√	√	√	√
	Main entrances	2	2	1	Unknown	3	1	1	2	1
Windows		×	×	×	×	×	×	√	√	√
Niches	Alter	×	×	√	√	×	×	×	×	×
	Main hall	√	×	×	×	×	×	×	√	×
	Aux. spaces	√	×	×	×	×	×	×	√	√
Orientation		+14°	-50°	+147°	-10°	Unknown	-4°	+21°	+20°	+/- Zero
Location		Aswan			Naj' Al-Hajar	Nubia	Al-Bagawat	Al-Dakhla	Al-Baharyia	Sinai

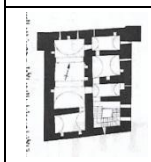
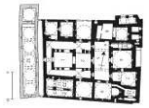
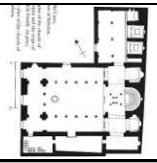
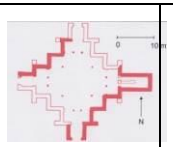
		7th Century									
10/27											
Main Hall	Basilica	√	√	√	√	√	-	-	√	√	√
	Coptic	-	-	-	-	-	-	√	-	-	-
	Central	-	-	-	-	-	-	-	-	-	-
Dividing main hall		×	×	×	√	√	√	√	×	×	×
Bays	No. of bays/sections	10	7 | 4	4 | 7	2	3	2	2	7	6	5
	Transept	×	×	×	×	×	×	×	×	×	×
	Return Aisle	√	√ | ×	× | √	×	√	×	×	√	√	√
	Choir	×	×	×	×	√	×	√	×	√	√
	I.narthex	×	×	×	×	×	√	×	×	×	√
Columns	Between bays	2	2	2	-	-	-	-	2	2	2
	Return aisle	6	4 | -	- | √	-	-	-	-	4	2	3
	transept	-	-	-	-	-	-	-	-	-	-
	I.narthex	-	-	-	-	-	-	-	-	-	√
	ambulatory	×	×	×	×	×	×	×	×	×	×
	Choir	-	-	-	-	-	-	-	-	2	2
	Doors	√	×	×	×	×	×	×	×	×	×
	Apse	×	×	×	×	×	×	×	×	×	×
	Outer narthex	atrium	×	√	×	×	×	×	×	×	×
	Aux. spaces	√	×	×	×	×	×	×	×	×	×
Pilasters	Front walls	√	√	√	×	×	×	×	×	×	×
	Lateral walls	×	×	×	√	×	×	×	×	×	×
	Entrances	×	×	×	×	×	×	×	×	×	×
	Outer narthex	×	×	√	×	×	×	×	×	×	×
	Doors	×	×	√	×	√	×	×	×	×	×
Sanctuary		circular	Rectangular	Rectangular	Rectangular	Rectangular	circular	Rectangular	Circular	Circular	Rectangular
Aux. spaces	Flanking rooms	√	√	√	√	√	×	√	√	√	√
	Stairs	√	×	-	×	×	×	×	×	√	√
	Choir	×	-	-	×	√	×	√	×	×	×
	I. narthex	×	-	-	×	×	√	-	×	×	√
	Doksar	×	-	-	×	×	×	×	×	×	×
	Portico/concha	×	×	×	×	×	√	×	×	√	×
	ضفير	×	×	×	×	×	×	×	×	×	×
	Return aisle	×	-	-	×	√	×	-	×	√	×
Doors	Main Hall	3	2 | 1	1	1	2	1 | 1	3	2	1	1
	Aux. spaces	√	√	√	√	√	√	√	√	√	√
	Main entrances	1	1	1	1	1	4	3	1	1	Unknown
Windows		×	×	×	×	×	×	×	×	√	×
Niches	Alter	×	×	√	√	√	√	√	×	√	×
	Main hall	×	×	√	√	√	√	√	√	√	×
	Aux. spaces	×	×	√	√	√	√	√	×	√	×
Orientation		+11°	+20°	+/-Zero°	+10°	+/-Zero°	+16°	+20°	+17°	-29°	+5°
Location		Alexandria	Kellia			Wadi Al-Natrun				Cairo	Saqqara

	10/27	7th Century									
											
Main Hall	Basilica	√	√	√	√	√ (askew)	-	√	√	√	√
	Coptic	-	-	-	-	-	-	-	-	-	-
	Central	-	-	-	-	-	√ (Tetraconch)	-	-	-	-
Dividing main hall		×	×	×	×	×	×	×	×	×	×
Bays	No. of bays/sections	8	7	Unknown	4	4	1	1	1	4	3
	Transept	×	×	×	×	×	×	×	×	×	×
	Return Aisle	√	×	Unknown	√	×	×	×	√	√	√
	Choir	√	√	×	×	√	×	×	√	√	×
	I.narthex	√	×	√	×	√	×	×	×	√	×
Columns	Between bays	2	2	Unknown	2	2	×	×	-	2	2
	Return aisle	4	-	Unknown	×	-	×	-	2	4	3
	transept	-	-	-	-	-	×	-	-	-	-
	I.narthex	×	-	×	×	×	×	×	-	-	-
	ambulatory	×	×	×	×	×	×	×	×	×	×
	Choir	-	2	-	-	2	×	-	2	2	-
	Doors	√	√	×	√	√	×	×	×	×	×
	Apse	×	×	×	×	×	×	×	×	×	×
	Outer narthex	×	×	×	×	×	×	×	×	×	×
	Aux. spaces	×	×	×	×	×	×	×	×	×	×
Pilasters	Front walls	√	×	×	√	×	√	×	×	×	×
	Lateral walls	√	×	×	×	×	×	×	×	×	×
	Entrances	×	×	×	√	×	×	×	×	×	×
	Outer narthex	×	×	×	×	×	×	×	×	×	×
	Doors	×	×	×	×	×	×	×	×	×	×
Sanctuary		circular	Rectangular	Circular	Rectangular	Circular	Circular	Circular	Triconch	Circular	Rectangular
Aux. spaces	Flanking rooms	√	√	√	√	√	√	√	√	√	√
	Stairs	√	×	√	×	√	×	×	×	×	×
	Choir	√	-	-	×	-	×	-	-	-	×
	I. narthex	√	×	√	×	√	×	-	-	√	×
	Doksar	×	×	×	×	×	×	×	×	×	×
	Portico/concha	×	×	×	×	×	√	×	×	×	×
	ضفير	×	×	×	×	×	×	×	×	×	×
	Return aisle	-	-	-	√	-	×	-	-	-	-
Doors	Main Hall	3	2	Unknown	2	1	1	Unknown	Unknown	1	
	Aux. spaces	√	√	√	√	√	√	√	√	√	√
	Main entrances	1	2	Unknown	2	1	1	Unknown	Unknown	Unknown	
Windows		×	√	×	√ (haykal)	√ (haykal)	×	×	×	×	×
Niches	Alter	×	√	×	×	√	√	√	√	×	×
	Main hall	×	√	×	√	√	×	×	×	×	×
	Aux. spaces	√	√	×	√	√	×	×	×	√ (narthex)	×
Orientation		+6°	+2°	+8°	+3°	+2°	+34°	+20°	+30°	-20°	+20°
Location		Saqqara	Al-Fayyoum				Al-Minyia	Asut	Sohag	Luxor	

		7th Century									
7/27											
Main Hall	Basilica	√	√	√	√	-	√	-			
	Coptic	-	-	-	-	-	-	-			
	Central	-	-	-	-	√	-	√			
Dividing main hall		×	×	√	√	√	×	√			
Bays	No. of bays/sections	4	Unknown	3	2	5	7	3			
	Transept	×	×	×	×	×	×	×			
	Return Aisle	√	×	√	×	×	×	×			
	Choir	√	×	√	×	×	×	×			
	Inner narthex	√	×	×	×	√	×	×			
Columns	Between bays	2	Unknown	2	×	4	2	×			
	Return aisle	4	-	2	×	-	-	-			
	Transept	-	-	-	×	×	×	×			
	Inner narthex	-	-	-	-	-	-	-			
	ambulatory	×	×	×	×	×	×	×			
	Choir	2	-	-	×	-	-	-			
	Doors	×	×	×	-	×	√	×			
	Apse	×	×	×	×	×	×	×			
	Outer narthex	×	×	×	×	×	×	×			
	Aux. spaces	×	×	×	×	×	×	×			
Pilasters	Front walls	×	×	×	×	√	×	×			
	Lateral walls	×	×	×	×	√	×	×			
	Entrances	×	×	×	×	×	×	×			
	Outer narthex	×	×	×	×	×	×	×			
	Doors	×	×	√	×	×	×	×			
Sanctuary		Circular	Rectangular	Quad	Rectangular	Circular	Circular	Circular			
Aux. spaces	Flanking rooms	√	√	√	√	√	√	√			
	Stairs	√	√	√	×	√	×	×			
	Choir	-	-	√	×	-	-	-			
	Inner narthex	√	-	-	-	√	-	-			
	Doksar	×	×	×	×	×	×	×			
	Portico/concha	×	×	×	×	√	×	√			
	ضفير	×	×	×	×	√	×	×			
	Return aisle	-	-	-	-	-	-	-			
Doors	Main Hall	2	2	2	2	3	1	Unknown			
	Aux. spaces	√	√	√	√	√	√	√			
	Main entrances	1	2	2	2	1	1	Unknown			
Windows		√ (aux.)	√	√	√	√	×	×			
Niches	Alter	×	×	×	√	×	×	√			
	Main hall	×	×	×	×	×	×	×			
	Aux. spaces	×	×	√	×	×	×	√			
Orientation		+20°	+/- Zero°	unknown	Unknown	-20°	unknown	+5°			
Location		Luxor	Nubia					Al-Dakhla Oasis			

		8th Century									
10/16											
Main Hall	Basilica	√ (quad)	-	√ (quad)	√ (quad)	√	√	√	√	√	√
	Coptic	-	√	-	-	-	-	-	-	-	-
	Central	-	-	-	-	-	-	-	-	-	-
Dividing main hall		×	×	×	×	×	×	√	×	√	×
Bays	No. of bays/sections		2	7	3	4+	1	3	unknown	2	Unknown
	Transept	×	×	×	×	×	×	×	×	×	×
	Return Aisle	×	×	√	√	Unknown	×	×	×	×	Unknown
	Choir	√	×	√	×	√	√	×	√	√	×
	Inner narthex	√	√	×	×	Unknown	√	×	×	×	√
Columns	Between bays	4	2	2	2	2	-	-	Unknown	×	Unknown
	Return aisle	-	-	4	3	-	-	-	-	-	-
	Transept	-	-	-	-	-	-	-	-	-	-
	Inner narthex	-	-	-	-	-	√	-	-	-	-
	ambulatory	×	×	×	×	×	×	×	×	×	×
	Choir	-	-	√	-	-	-	-	-	-	-
	Doors	√	×	×	×	×	×	×	×	×	×
	Apse	×	×	×	×	×	×	×	×	×	√
	Outer narthex	×	×	×	×	×	×	×	×	×	×
	Aux. spaces	×	×	×	×	×	√	×	×	×	×
Pilasters	Front walls	√	√	√	×	Unknown	√	×	√	×	×
	Lateral walls	×	×	√	×	×	×	×	×	×	×
	Entrances	×	×	×	×	Unknown	×	×	×	×	×
	Outer narthex	×	×	×	×	×	×	×	×	×	atrium
	Doors	×	×	×	×	×	×	×	×	×	×
Sanctuary		Circular	Circular	Circular	Rectangular	Circular	Circular (prot.)	Circular	Rectangular	Rectangular	Circular
Aux. spaces	Flanking rooms	×	√	√	√	√	√	√	√	√	√
	Stairs	√	√ (entrance)	√ (choir)	×	×	×	×	×	×	×
	Choir	√	-	-	×	√	√	-	√	√	-
	Inner narthex	√	√	-	-	-	√	-	-	-	-
	Doksar	×	√	√	√	×	×	×	×	×	×
	Portico/concha	×	×	×	×	×	×	×	×	×	×
	ضفير	×	×	×	×	×	×	×	×	×	×
	Return aisle	×	×	√	-	-	-	-	-	-	-
Doors	Main Hall	3	2	4	1	Unknown	5	1	1	3	3
	Aux. spaces	√	√	√	√	√	√	√	√	×	√
	Main entrances	2	1	4	1	Unknown	1	1	1	1	Unknown
Windows		×	√	√	√	√	Unknown	×	×	×	×
Niches	Alter	×	√	√	√	√	×	√	×	Unknown	×
	Main hall	√	×	×	×	×	×	√	×	√	×
	Aux. spaces	×	√	√	×	√	×	√	×	Unknown	×
Orientation		-13°	+35°	-15°	-16°	-10°	-12°	+/-Zero°	+/- Zero	+26°	+42°
Location		Alexandria	Cairo					Hilwan	Asut		Luxor

		8th Century									
6/16											
Main Hall	Basilica	√	√	√	√	-	√				
	Coptic	-	-	-	-	√	-				
	Central	-	-	-	-	-	-				
Dividing main hall		×	×	×	×	×	×				
Bays	No. of bays/sections	3	4	4	3	2	2				
	Transept	×	×	×	×	×	×				
	Return Aisle	×	×		×	×	×				
	Choir	×	×	×	×	×					
	Inner narthex	×	×	×	×	×	×				
Columns	Between bays	2	2	2	2	4	2				
	Return aisle	-	-	2	-	-	-				
	Transept	×	×	×	×	×	×				
	Inner narthex	-	-	-	-	-	-				
	ambulatory	×	×	×	×	×	×				
	Choir	-	-	-	-	-	-				
	Doors	×	×	×	×	×	×				
	Apse	×	×	×	×	×	×				
	Outer narthex	×	×	×	×	×	×				
	Aux. spaces	×	×	×	×	×	×				
Pilasters	Front walls	×	×	×	×	×					
	Lateral walls	×	×	×	×	×	×				
	Entrances	×	×	×	×	×	×				
	Outer narthex	×	×	×	×	×	×				
	Doors	×	×	×	×	×	×				
Sanctuary		circular	Circular	circular	circular	circular	circular				
Aux. spaces	Flanking rooms	√	√	√	√	√	√				
	Stairs	√	√	√	×	×	√				
	Choir	-	-	-	-	-	√				
	Inner narthex	-	-	-	-	-	-				
	Doksar	×	×	×	√	×	√				
	Portico/concha	×	×	×	×	×	√				
	ضفير	×	×	×	×	×	×				
	Return aisle	-	-	-	-	-	-				
Doors	Main Hall	1	3	2	2	2	1				
	Aux. spaces	√	√	√	√	√	√				
	Main entrances	1	Unknown	2	1	2	1				
Windows		×	×	×	×	×	×				
Niches	Alter	×	×	√	×	×	×				
	Main hall	×	×	√	×	×	×				
	Aux. spaces	×	×	×	×	×	√				
Orientation		-43°	+/-Zero°	+38°	unknown	unknown	+20°				
Location		Aswan			Nubia						

		9th Century									
6/6											
Main Hall	Basilica	-	-	√	√	-	-				
	Coptic	√	√	-	-	-	-				
	Central	-	-	-	-	Nubian	Nubian				
Dividing main hall		√	√	√	×	×	√				
Bays	No. of bays/sections	1	2	2	6	3	1				
	Transept	×	×	×	×	×	×				
	Return Aisle	×	×	×	√	×	×				
	Choir	×	×	√	√	×	×				
	Inner narthex	×	×	×	×	×	×				
Columns	Between bays	-	-	-	2	2	-				
	Return aisle	-	-	-	-	-	-				
	Transept	-	-	-	-	-	-				
	Inner narthex	-	-	-	-	-	-				
	ambulatory	×	×	×	×	×	×				
	Choir	-	-	-	-	-	-				
	Doors	×	×	×	√	√	×				
	Apse	×	×	×	×	×	×				
	Outer narthex	×	×	×	×	×	×				
	Aux. spaces	×	×	×	×	×	×				
Pilasters	Front walls	×	×	×	×	×	×				
	Lateral walls	×	×	×	×	×	×				
	Entrances	×	×	×	×	×	×				
	Outer narthex	×	×	×	×	×	×				
	Doors	×	×	×	×	×	×				
Sanctuary		×	Rectangular	Rectangular	Circular	Rectangular	Circular				
Aux. spaces	Flanking rooms	×	√	√	√	×	×				
	Stairs	×	×	×	√	×	√				
	Choir	×	×	√	√	×	×				
	Inner narthex	-	-	-	-	-	-				
	Doksar	×	√	√	×	×	×				
	Portico/concha	×	×	×	×	√	√				
	ضفير	×	×	×	×	×	×				
	Return aisle	-	-	√	√	-	-				
Doors	Main Hall	2	1	2	3	3	2				
	Aux. spaces	×	√	√	√	√	√				
	Main entrances	2	1	1	3	3	2				
Windows		√	×	√	×	×	√				
Niches	Alter	-	√	√	√	×	√ (outer)				
	Main hall	√	√	√	×	×	×				
	Aux. spaces	-	√	√	√	×	×				
Orientation		+17°	-9°	+10°	-30°	+/-Zero°	-50°				
Location		Wadi Al-Natrun			Cairo	Nubia					

From this table we can observe that from the early beginning of officially building churches in Egypt normal basilica plan was the most common, nevertheless, Copts used the Coptic plan at Akhmim, Sohag since the 4th century. Other types did not appear during that time. However, we have to shed light on some points in the 4th century:

- Copts used rock-cut churches consistent to ancient Egyptian rock-cut temples and tombs.
- Copts used to hide the sanctuary space. They believed that this place is the most sacred in the church, such as the Holy of Holies in the ancient Egyptian temples that was hidden and secured. For that, the structure of the church should hide such areas from outside. Whatever the shape of the apse, semicircular or rectangular, its outer wall must continue that of the eastern side of the church's outline. An exception of that was church of Burg El-Arab at Alexandria. In the fourth century, it had a protruding apse from the eastern side of the church, that can be recognized from outside. That was a Roman influence. Additionally, it was the only church, back then, which used a western portico as a place set for the king.
- The return aisle is an Egyptian feature in the Coptic Church. Its function is to allow the prayers to exit from the main hall, usually from the western side, without giving their backs to the east side, where they believe it is the direction of returning Jesus.
- The sanctuary was always flanked by two rooms in Coptic churches. This feature was for many reasons. First, it helps to hide the sanctuary area. Also, during the first centuries of Christianity, Copts were forbidden from building churches, so they used to practice their rituals in the old and unused ancient Egyptian temples. Whenever they used any part in the temple like the hypostyle hall, they inserted the sanctuary in the middle of the eastern side and used the adjacent columns to build those side rooms. Consequently, it is an ancient Egyptian influence. Finally, and functionally, they were either used in preparing prayers and storing the used materials or as secondary sanctuaries, like those of Dayr Sitt Dimyanah Church.
- Internationally, and from the early Christianity, churches entrances are located on the western side, and usually on the north or south sides and never on the east side of the sanctuary place. Church of Dayr Al-Saqqyia is one of those rare churches that have their main entrances from the east side instead of one of the side rooms beside the sanctuary. It is one of the few rock-cut churches.

At the end of the 4th century paganism was banned in Egypt, and Christianity became an official religion in Egypt. The major part of Egyptian population, which was Christian, was growing. By the middle of the 5th century the Council of Chalcedon was held. Accordingly, Christianity became a specifically Egyptian Christian world-view and the Egyptian past was cast in an utterly negative light. In the 5th century, Copts kept using the common basilican plans for their churches. However, that time witnessed a tremendous development of building Coptic churches represented in:

- The appearance of basilican plan with transept in the Sanctuary of St. Menas, the large cultic complex in Alexandria, and the basilica at Hermopolis (Al-Ashmunein) in El-Minyia. This type can be considered a very brave building. It had huge dimensions, and Copts began to use protruding apse showing obviously the religious feature of the building and its crucified plan. The appearance of this basilican type was also a roman influence. However, that one at El-Minyia kept some Egyptian features, such as the hidden sanctuary with two rooms flanking around it and the return aisle.
- Since churches during that period were allowed to be built in huge scale, four aisled basilicas were built and ambulatories (see page 68) appeared as they appeared in one of those with transept.

- Coptic plans were still in use like that at Kellia. Moreover, they used rectangular plans to function as Coptic plans by dividing the naos with transversal walls, like Church of St. John the Abbot in Dayr Abu Hinnis in El-Minyia.
- During that period of time, the Byzantine style was adopted in Sinai. It was rarely used.
- Copts were able to adapt irregular spaces to satisfy their religious needs. The cave wherein St. Paul lived, in the eastern desert of Egypt, is a good example of that. It was turned into a church to keep his memory and narrate his great story for all generations until now.
- Using triconch sanctuaries was a Roman influence back then. It had a significant spatial effect. Originally, it was used in the architecture of palaces. White and red monasteries at sohag are good examples of this new feature in the fifth century.
- One of the Coptic significant features was the outer colonnade narthexes. Although the Romans refused to reuse their old temples as churches, Copts borrowed that feature from those buildings. At Al-Kharga Oasis, Necropolis of Bagawat, the funerary church is surrounded by outer colonnade narthex.

No significant events took place in the 6th century. Consequently, no important changes took place in the architecture of churches. The normal basilica plan is still enormously used in building churches. However, few elements were developed or introduced, such as:

- The north and south sides of the transept plans took semicircular shapes, forming a triconch plan, like the great basilica of El-Minyia for example.
- The Byzantine plans also used more than one portico to form a tetra-conch plan.
- Copts began to divide the main hall of the church using walls instead of columns, like that which was built in Khnom temple in Aswan.
- Although they were allowed to build churches, they continued to reuse old ancient Egyptian temples especially in Awan. That was important because they experienced how to adapt irregular spaces to be a clear basilican plan. The Eastern Church in Philea is a good example of that.
- Al-Defir is an important element which appeared back then and continued further on. It is a small narrow space lying on the eastern side of the sanctuary area. Originally, it was for securing purposes. However, later on, it was turned to a storage area.

The seventh century was crucial in the history of Egypt. It witnessed the Islamic conquest in Egypt in 641 C.E. Christianity became a minority religion. However, during that time the majority of Egyptian population became Christians. Islamic influence was still largely limited to the main administrative areas. Muslims passed a number of laws concerning the official used language, taxation and also building regulations. They did not ban Egyptians form building their churches; nevertheless, constructing laws did not cause fundamental changes in the language of building Coptic churches. From the last table we can notice that:

- Copts stopped building churches using basilican plans with transept following the Byzantine style. However, they continued building central squared plans.
- They used crucified plans that were explicit in many locations in Egypt between El-Minyia, Oasis and Nubia.
- They shyly used free lines for naos spaces like those in Al-Fayyum in the Church of Monastery of the Archangel Gabriel (Deir Al-Naqlun). However, Nubia Nag' El-Okba Church has a free quadrilateral sanctuary.

There were no important events in the 8th century that could cause critical change for Copts. They kept building churches using the common basilica plan for most of them, as they also used the Coptic transversal plan. They did not use basilican plan with transept. However, in Hilwan, the Basilica in front of complex A has a transept outline, but it cannot be classified

as transept because its two sides are actually side chambers for the use of the church clergy. In the same basilica they used a protruding apse, which was still rarely used back then. In old Cairo more free quadrilateral naos were used like that of the Holy Virgin and St. Shenute in the district of St. Mercurius. Also, in Alexandria, the plan of developed Sancatury of St. Menas with its large cultic complex has free quadrilateral naos. In Aswan and Nubia Copts kept using old temples to reuse them as churches.

Not many churches were built in the 9th century, and that is logical because the number of Copts began to decrease back then. Types of plans varied between Coptic transversal plans, basilican plans and the developed unique crucified plan at Nubia.

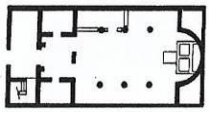
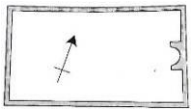
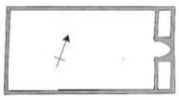
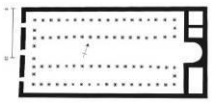
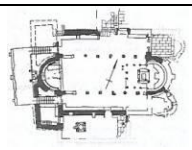
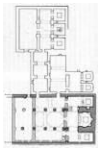
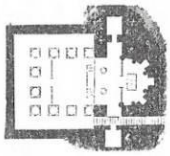
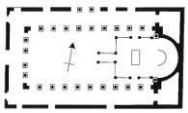
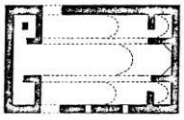
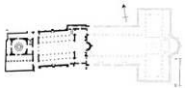
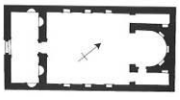
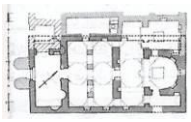
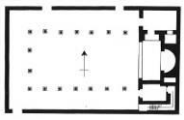
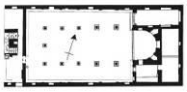
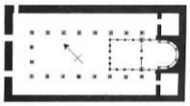
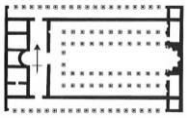
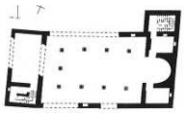
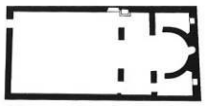
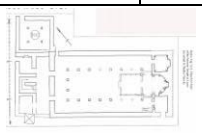
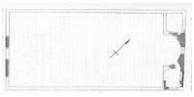
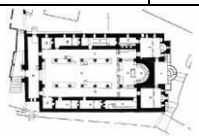
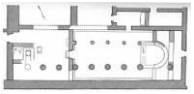
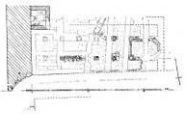
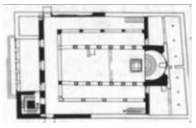
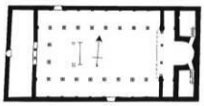
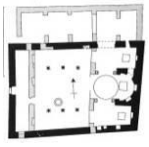
4.3.4.3. Grouping of Selected Coptic Churches According to their Architectural Features

This step depends only on the physical features of the Coptic churches, excluding any architectural design aspects, time or location. The researcher here puts the collected plans of Coptic churches into architectural groups according to their plan types whether they are basilican plan, Coptic, byzantine, or otherwise according to architectural similarities between them. This way helps in applying the shape grammars' theory to analyze them. Hence, finding out the grammatical shape rules that figure out the architectural form of each group is easier. Also, getting the common shape rules between groups facilitates mapping the Coptic architecture and tracing its developing line throughout the studying period. At the end of this step, exceptional cases of Coptic churches will emerge.

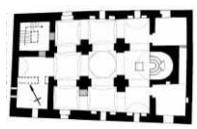
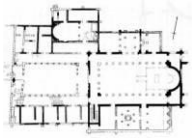
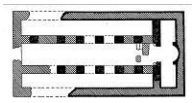
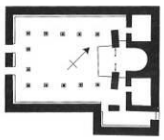
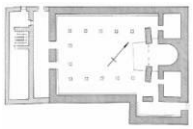
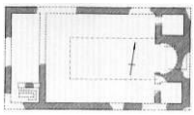
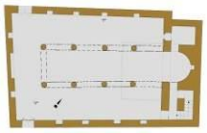
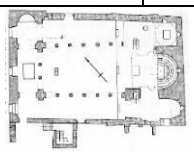
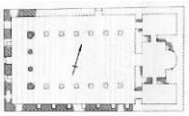
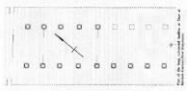
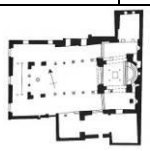
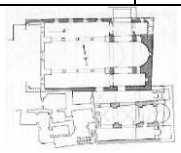
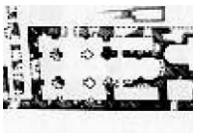
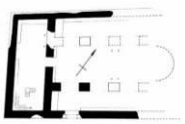
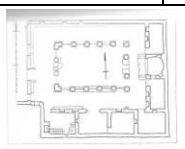
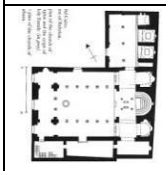
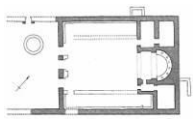
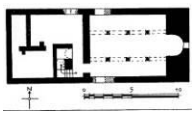
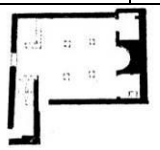
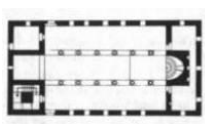
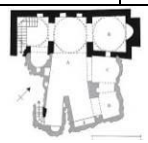
- Basilican plan

According to the collected Coptic churches, this type is the most common between Coptic churches. However, it took different forms, and, according to Dr. Samy's classification of Coptic churches [5], the basilican plan has more than one style. Hence, here, it is divided into the following subgroups.

Group A: Basilican plan churches with semicircular sanctuary

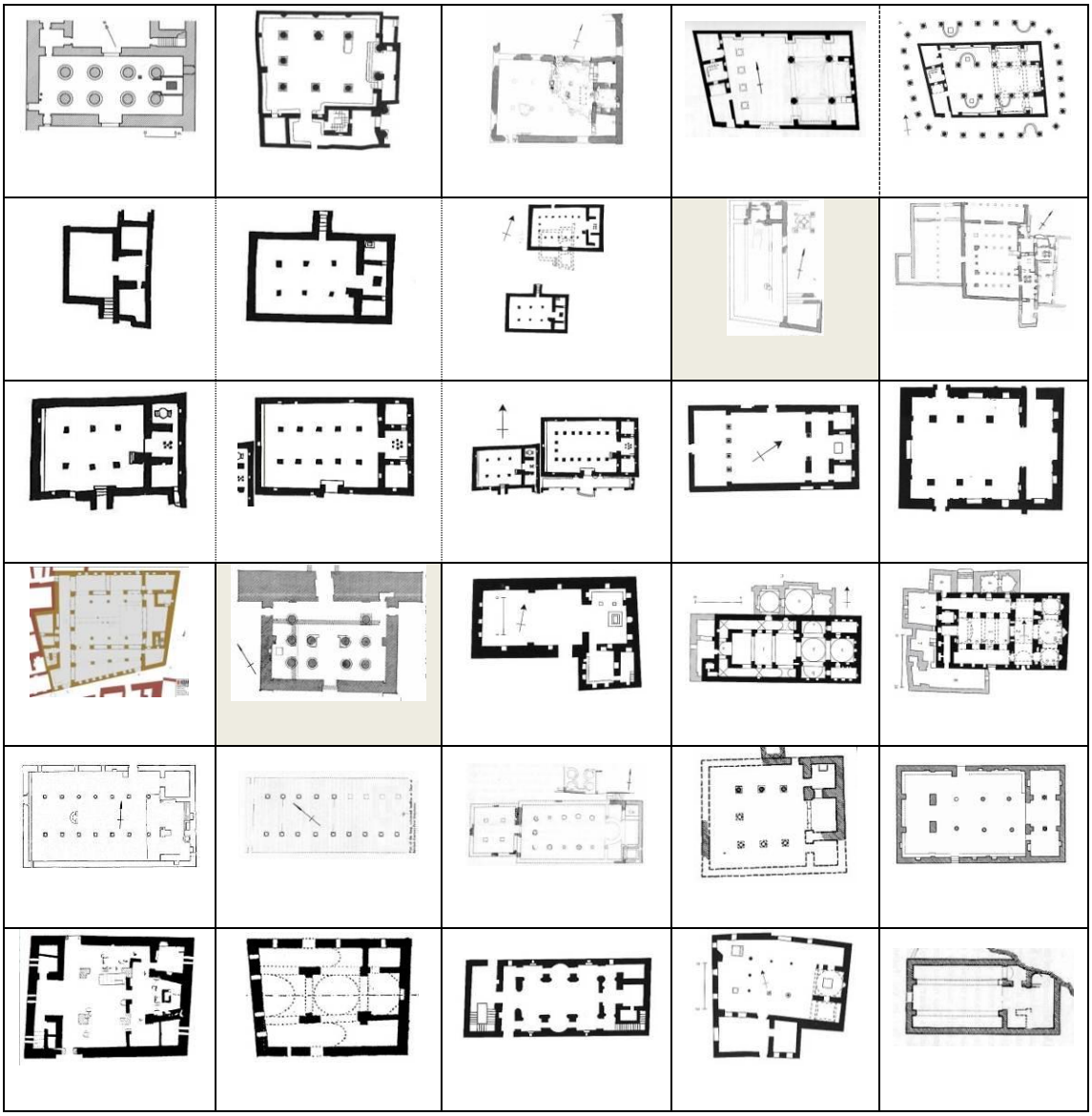
									
St. Marina Church	4th C	Church of Pbow monastery	4th C	Church of Pbow monastery	5th C	Church of Pbow monastery	7th C	Burg El-Arab Church	4th C
									
Church of Dayr El-Salib	4th C	Dayr El-Sakyia	4th C	Church of Dayr Al-Abra'	5th C	Church CH 87 D	5th C	St. Menas, north basilica	6th C
									
Church at houses of Madamud	7th C	Sabagura church	6th – 8th C	St. Menas, large cultic complex	8th C	Church of St. John the Abbot	5th C	Church of St. John the Abbot	5th C
									
Church of the monastic complex	6th C	Apa Bane, funerary church	6th C	Church at main pylon of Luxor temple	6th C	The Basilica of Armant	6th C	Monastery of Balayza, main church	6th C
									
Manqabad	6th C	St. Thekla Church	6th C	Church D3 of Antinoopolis		Medieval cenobite monastery	6th C	Church of St. Catherine	6th C
									
Basilica at south court of Madamud	6th C	Church at Naj' Al-Hajar	6th C	Great Cathedral, Kasr Ibrim	6th C	Church of monastery of St. J Jeremiah	7th C	Deir Al-Naqlun	7th/10th

▲ Figure 4.32: Group A: Basilican plan churches with semicircular sanctuary *(continue)*

									
Church of St. Raphael	11th C	St. Menas, north basilica	6th C	Church at Gebel Addeh	7th C	Church in front of the east gate at Madinat Habu		7th C	
									
Church at pyramid of Hawwarah	7th C	Western church at Philae	8th C	Church of St. Sergius	7th/8th	Baramus, Church of the Holy Virgin	6th C	Basilica at Dayr Al-Jabrawi	x
									
Church of St. Shenute	8th C	Church of Mar Mina	8th C	Church in complex B, Hilwan	8th C	Three aisled church, Amriyyah	6th C	Church of Kellis, Al-Dakhla Oasis	4th C
									
Church of the Holy Virgin (Al-Damshiriya)	9th C	Church at Tud	8th C	Sitteh Kasmar church	8th C	Akhmandy Church	8th C	Monastery Church in Ghazali	10th C
									
Monastery of St. Paul	5th C								

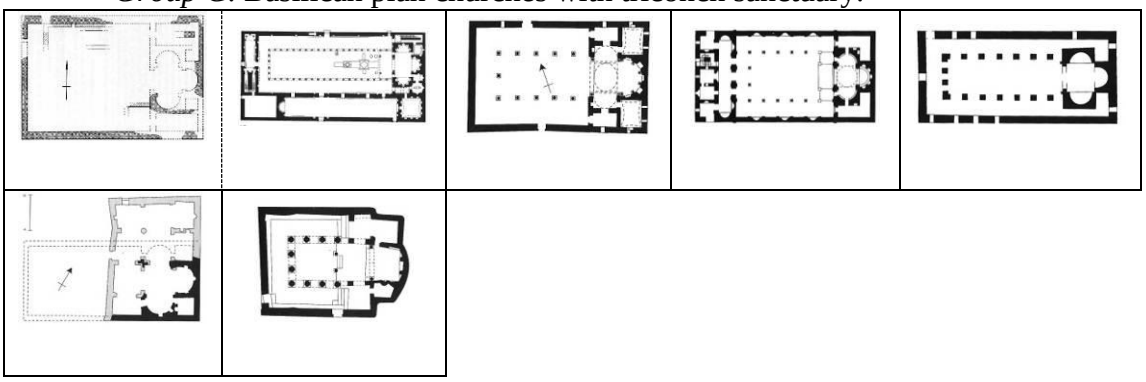
▲ Figure 4.32.: Group A

Group B: Basilican plan churches with quadrate sanctuary:



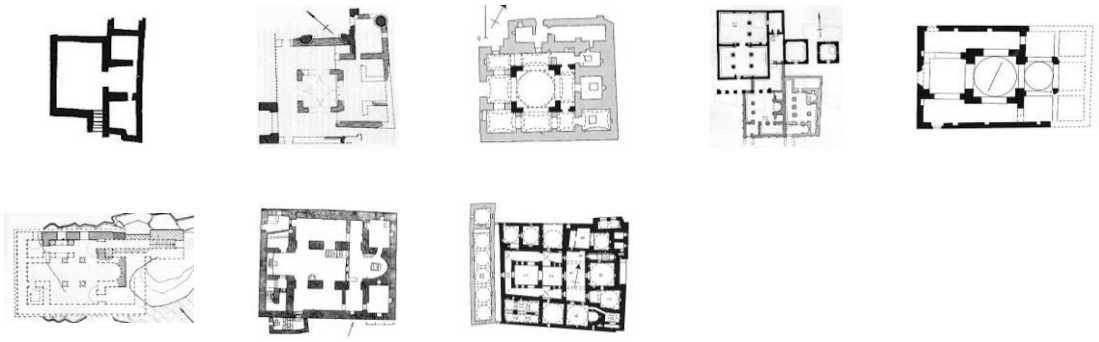
▲ Figure 4. 33. Group B: Basilican plan churches with quadrate sanctuary

Group C: Basilican plan churches with triconch sanctuary:



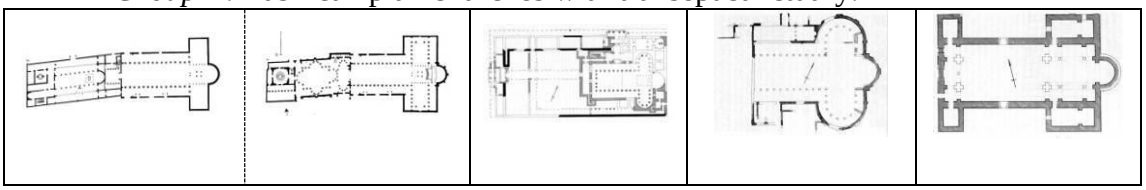
▲ Figure 4.34. Group C Basilican plan churches with triconch sanctuary

Group D: Basilican plan churches with quadrate nave:



▲ Figure. 4.35. Group D Basilican plan churches with quadrate nave

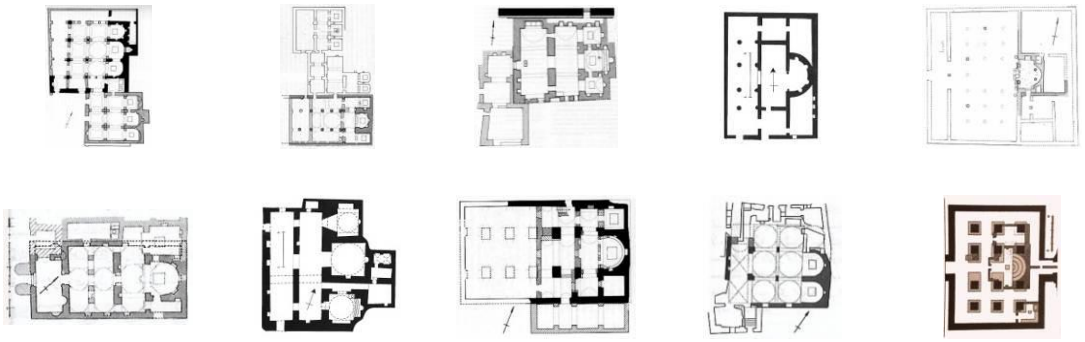
Group E: Basilican plan churches with transept sanctuary:



▲ Figure 4.36. Group E Basilican plan churches with transept sanctuary

- *Coptic plan churches*

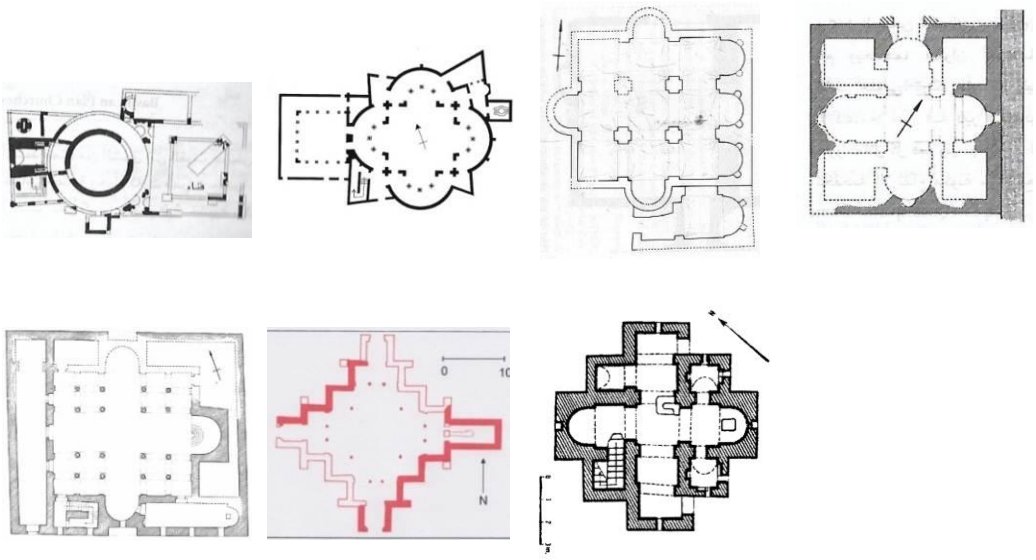
This type takes a transversal nave direction. Somars Clarke classified it as Coptic style.



▲ Figure 4.37. Group F Coptic plan churches

- *Central plan churches*

It is not a common style in Coptic churches. It includes, what is called by many authors, the Byzantine style. Nevertheless, Coptic architects were able to use it in a different way.

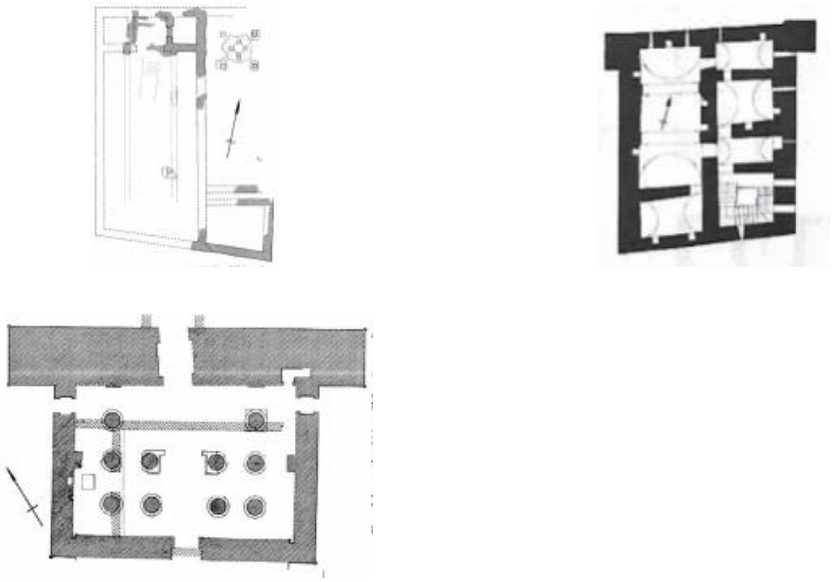


▲ Figure 4.38. Group G: Central plan churches

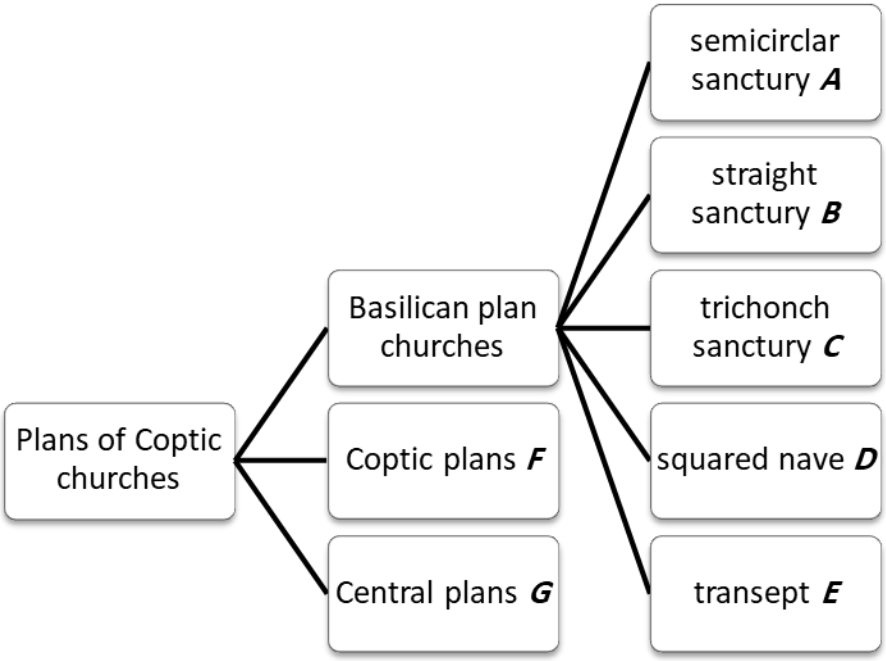
The previous illustrated groups can be summarized into 3 main groups: groups from A:E belong to basilican plan, whereas group F represents the Coptic plan type (transversal nave), and, finally, Group G represents central plan type.

4.3.5. Exceptional Churches

From the previous study, the first group of exceptional cases of churches emerged. All case studies took the east-west orientation, in which the sanctuary of the church lies on the eastern side. However, the next cases take the reverse orientation.



▲ Figure 4.39. Exceptional group: counter orientation



▲ Figure 4.40 Diagram shows the groups of Coptic churches

4.4. Conclusion

'Shape Grammars' theory helps to recognize architecture as a language. Each architectural language has its own vocabularies and grammatical rules. By using those vocabularies and rules academics are able to teach their students of architecture how to understand and design or develop any architectural language, and how to build up and develop their own language. In addition, professional architects can use or develop any architectural language in their designs according to the needs of their projects. Finally, researchers can analyze any architectural style or the architectural product of any architect to use the results in their dissertations.

This chapter then turns to discuss Coptic architecture in its second part. After reviewing its history throughout two millennia, the researcher settled a reasonable methodology of choosing the case studies suitable to the research, which represents the study period; from the fourth to the ninth centuries. One of the most important results of this chapter is while filtering the case studies to use the most representative ones, few plans of the churches emerged as exceptions. Those churches have odd features, in contrast with a settled grammatical rule. The following chapter may reveal more exceptional cases. The reasons of that behavior will be discussed in chapter six; the discussion chapter.

Chapter 5 Language Of Coptic Churches In Preference To: Time, Form And Shape Grammars

5.1. Introduction

5.2. The shape Grammars

5.3. Shape-Rule Schemata

5.3.1. Stage 1: To Outline the Main Hall

5.3.2. Stage 2: To Divide the Main Hall into Bays

5.3.3. Stage 3: To Dispose Pilasters and Columns and to Protrude Walls

5.3.4. Stage 4: To Add Auxiliary Zones

5.3.5. Stage 5: To Insert Doors

5.3.6. Stage 6: To Insert Windows and to End the Derivation

5.4. The Language of Designs

5.4.1. Derivations

5.4.2. Three Simple Types

5.5. Mapping of Coptic Churches

5.6. Conclusion

5.1. Introduction

This chapter is the core of this thesis. By the analyses of Coptic Churches throughout several centuries – from the fourth to the eighth centuries – using shape grammars as an analytical tool. This tool helps to extract the main grammatical rules of the Coptic architecture shape language. Hence, that can help to reach the DNA of Coptic churches at that time.

After grouping the selected case studies in the previous chapter, the theory of 'Shape grammars' is applied here as an analytical tool. This process will stand on the shape-rule schemata of Coptic churches in six stages. In light of a previous experience of applying this theory on Churches plans [8], and beginning with the analysis of the available and selected plans of Coptic churches representing the fourth century, a base of rule schemata is illustrated. Then comes the analysis of the plans of Coptic churches representing the successive centuries; from the fifth to the ninth centuries, and more rules are added to complete the whole grammatical rule picture for the study period. Those rules are applied, later, on a selected church from each group to show how this derivation works. Based on those grammatical rules of Coptic architecture, churches can be regrouped explicitly in a form map illustrating their development. In addition, to extracting a small group of churches were not subjected to any of those groups, and they are considered as exceptions.

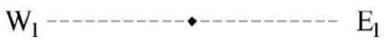
This is a pure architectural form analysis, abstracted from any aspects of design. However, its product can help in the following discussion chapter to swag in the space between the dynamic transformations of Coptic architecture and the social multicultural influence.

5.2. The Shape Grammar

Parametric shape grammar consists of an initial shape and a set of rule schemata. In the sequel, each one of them is defined explicitly.

The initial shape

The initial shape of the grammar is illustrated in figure 5.1. It consists of a symmetry axis—represented with a dashed line—coincident with one of the orthogonal axes in a two-dimensional coordinate system. The symmetry axis is defined formally by two labeled points at an equal distance from the origin (labeled ♦). The W_1, and E_1, symbols are chosen in reference to the mainly west-east orientation of the churches.



▲ Figure 5.1. The initial shape

Transitions between stages are controlled by the values of the indices of the W_1 and E_1 labels. If a stage contains a rule in which these labels are associated with an empty shape then the application of any one of the rules in that stage is optional. If a

stage contains only rules in which these labels are associated with a nonempty shape then the application of rule in that stage is mandatory.

5.3. Shape-Rule Schemata

The generation of Coptic Church plan develops over several stages. For each stage, a specific set of shape-rule schemata shows how:

To outline the main hall,
To dispose the sanctuary,
To divide the hall into bays,
To insert pilasters, columns and to protrude walls,
To add auxiliary spaces,
To insert doors,
To insert windows and to end the derivation, and
To insert roofing system.

In this chapter, the previous process is applied on Coptic churches chronologically, beginning with those dating back to the fourth century till the ninth century, according to the groups of churches illustrated before.

Copts began building their churches using Basilica plan whether with semicircular or straight sanctuary, as they used their Coptic plan from the very beginning. There is no clear information that they knew or used triconch sanctuaries, basilica plans with transept or with squared nave. Also, they did not build central plan churches yet at that time. This section handles the shapes rules of each group represented during fourth century in details.

Symbols of rule schemata

Rules schemata are controlled by a list of labels. Those labels help to take the rule to the following applications. Table 5.1. illustrates the meaning of the used labels that enables to recognize the rules.

Table 5.1. Used labels and their meaning

♦	The origin
W – E	West-East
C	Associated with each vertex of the interior quadrilateral, and to locate doors
Θ	At wall segments to label openings and niches
►	To control the sequence of rule application
c, *b*	To locate windows
A	Labels of corners of symmetrical addends
Δ	To control accessibility of auxiliary spaces
x, y	To distinguish the sides to be hollowed further

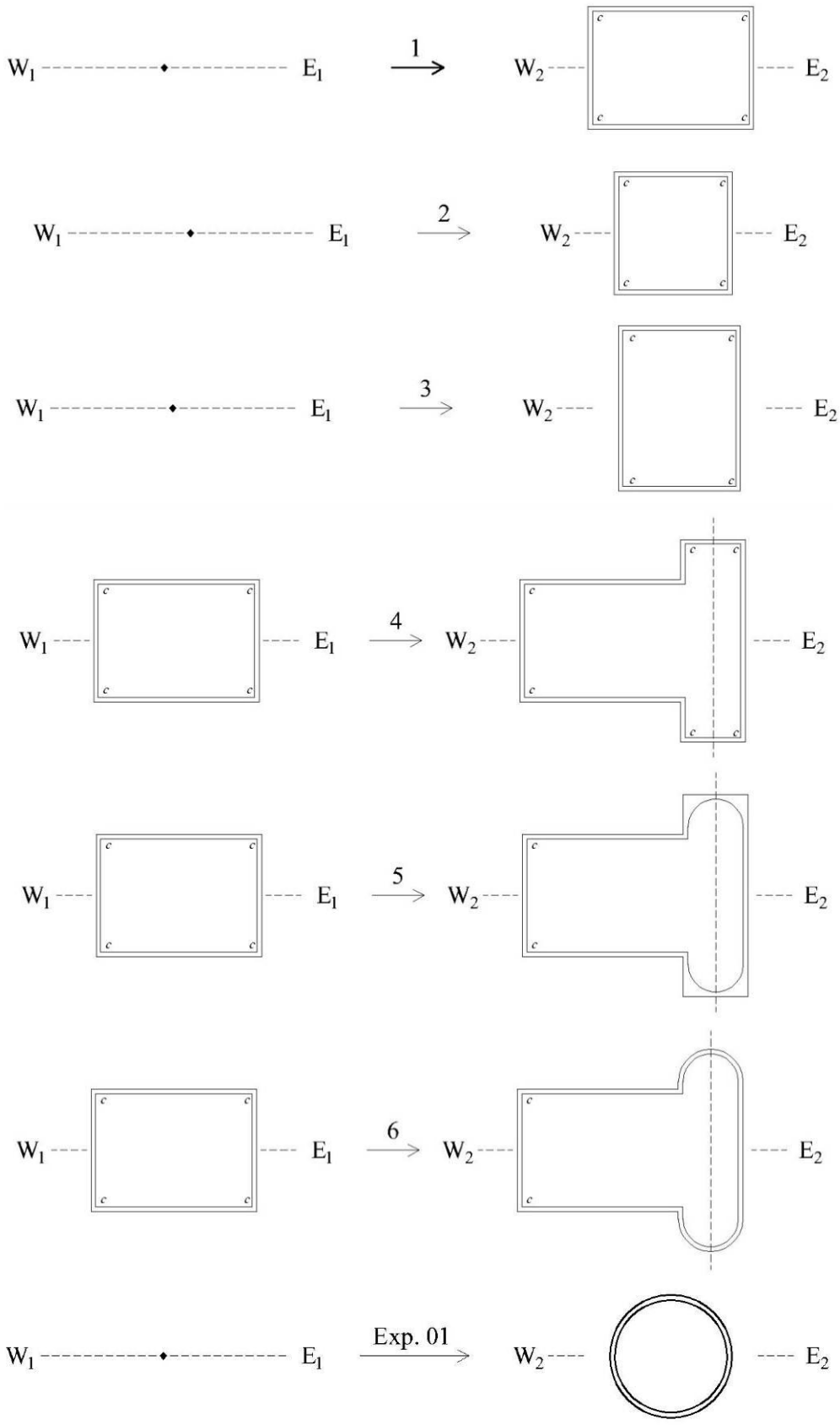
5.3.1. Stage 1: To Outline the Main Hall

Rule schema 1 is illustrated in Figure 5.2. This first schema specifies how to outline the main hall along the west-east axis. The outline of the main hall has an important role in classifying the church type. In rule 1, the main hall is represented as a longitudinal quadrilateral. The shape of foundations was approximated rectangles. The ratio of width to length of those rectangles is usually equal to or more than 1:2. This represents the basilican plan type. Rule 2, the main hall is represented as a squared quadrilateral. The ratio of width to length of those quads is 1:1.Rule 3, the main hall takes a transversal rectangular shape. The ratio of width to length of those rectangles is usually equal to or less than and 2:1. This represents the Coptic plan type. However, it is used in the following stages to generate squared nave basilican plan. As for rules 4, 5 and 6, the main hall is represented as a longitudinal quadrilateral intersected by a transversal one on the east side. Ends of those transversal rectangles take various shapes, whether start line (rule 4), or hidden semicircle (rule 5), or protruding semicircle (rule 6). Those rules add a second symmetry axis which is perpendicular to the first and has both of its end points labeled as W_2 Rules exp.01 and exp. 02 represented radial main halls, which are applied for Byzantine churches main halls. Rule exp.01 takes a circular hall, while rule exp.02 takes the tetra conch hall. The derivation of the Byzantine churches stops at this stage, because this type is rare in Egypt back then; the documented byzantine plans are just two, thus lack of suitable information to distinguish the rest of rules concerning this type.

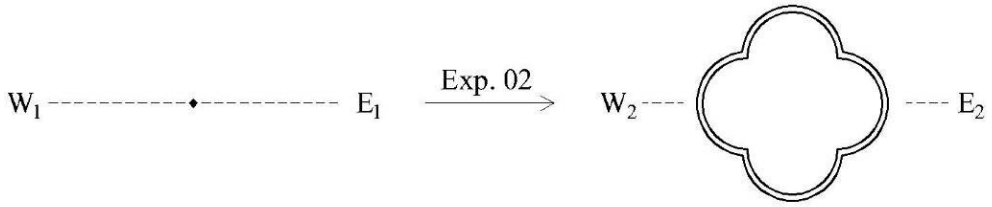
All represented shapes of main hall are surrounded by another one at a distance, depending on the building material whether rock or bricks, from the beginning. The distance between the two quadrilaterals corresponds to the thickness of the outside walls. Using one of those rules is mandatory.

Defined as a parametric schema, the quadrilateral can take on values in correspondence with the irregular shapes of these boundaries. Explicit parameterization will be omitted in the future, but for this first schema the following conditions based on dimensional analysis of the data—have to be satisfied. The quadrilateral has to be convex, and the ratio of the maximal distances—one being measured parallel to the axis and the other perpendicular to it. The parameters of this first schema may adopt any values within the mentioned constraints. Once the parameters of the quadrilateral are instantiated they remain unchanged for the rest of the derivation and constrain the parameters of the subsequent rule schemata.

To distinguish the interior corners of the main hall a *c* symbol is associated with each vertex of the interior quadrilateral. These labels will be used in later stages. The application of rule schema 1 transforms W_1, and E_1, into W_2 and E_2, respectively, and carries the derivation into stage 2.



▲ Figure 5.2. Stage 1 rule schema to outline the main hall. ***(Continue)***



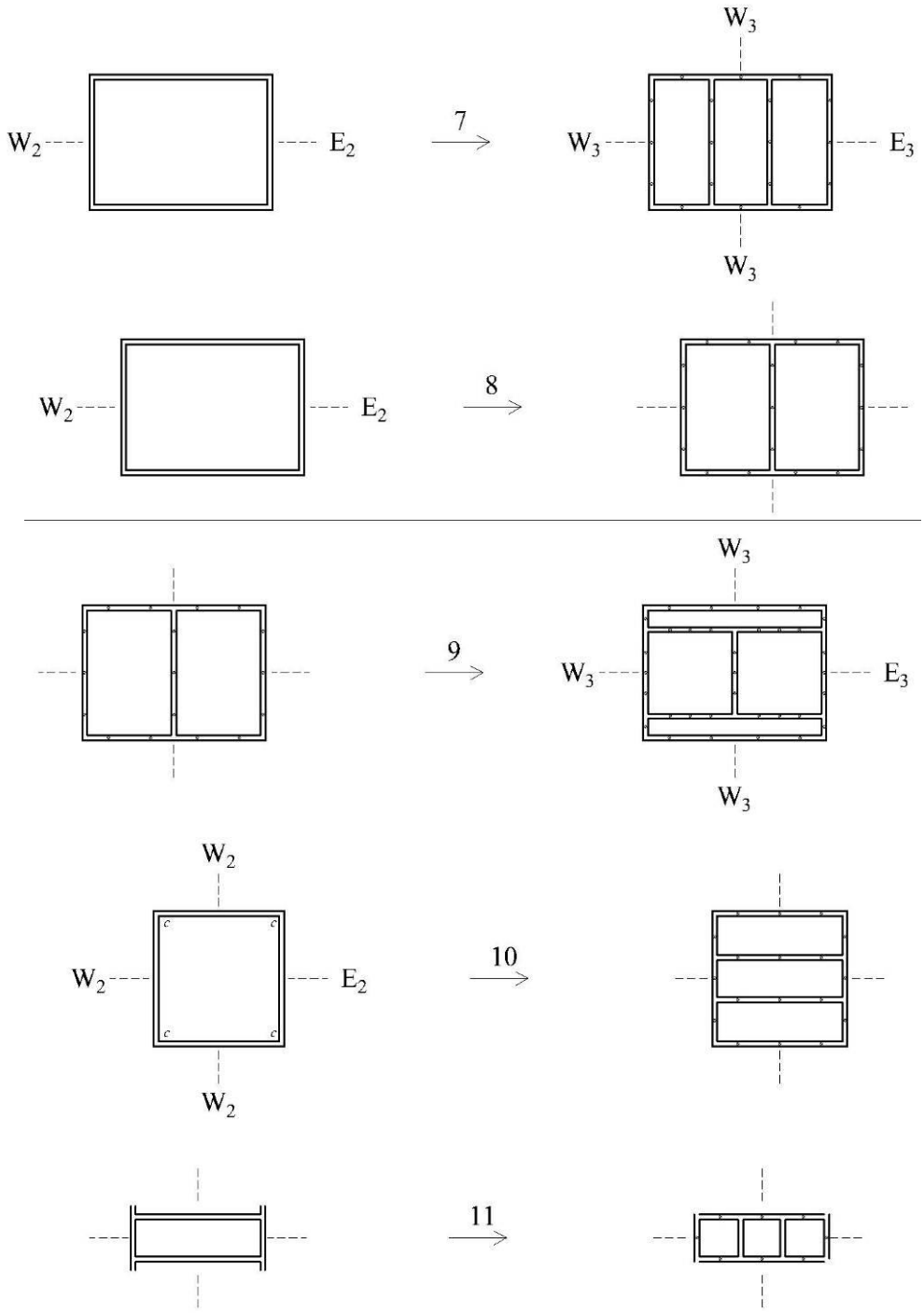
▲ Figure 5.2. Stage 1 rule schema to outline the main hall.

5.3.2. Stage 2: To Divide the Main Hall into Bays

The rule schemata of stage 2 are illustrated in Figure 5.3. It is divided into two groups. The first group (rules from 7 to 11) includes dividing schemata rules that divide the main hall into nave and aisles. The second group includes deriving rules. Rule 12, drives the first bay of the main hall. It lies on the most west side. Rule 13 is a repetitive rule to generate the intermediate bays. While repeating this rule, the central one can be replaced by rule 14 to insert central wider bay. Rule 15 represents the last bay on most of the east side on the main hall. Those rules are mandatory for basilican plan and Coptic plan churches. In the Coptic plan churches, the main halls are usually divided into four bays. Functionally, those bays are used to divide the church visitors into four sections respectively: weepers, catechumens, crouchings and believers.

In the basilican plan with transept, rule 15 is replaced by rules from 16 to 19. They divide both sides of the transept into bays. Rule 16 represents the first bay of the transept from the main hall side. Rule 17 is a repetitive rule for intermediate bays of the transept. Rule 18 and19 represent dividing the last bay of the transept plan on the most western part side of the main hall, they divide the sides of the transept into bays. One of them is mandatory for this type. Rules 20 and 21 are to insert bays of return aisle or inner narthex and choir or ambulatory. Those bays are optional and could be of different in size than the main hall bays; smaller or wider, but never smaller than a space that allows a person to pass through, and not more than double a bay. Rule 20 is to insert return aisle or inner narthex. Rule 21 is to insert choir or ambulatory bay only.

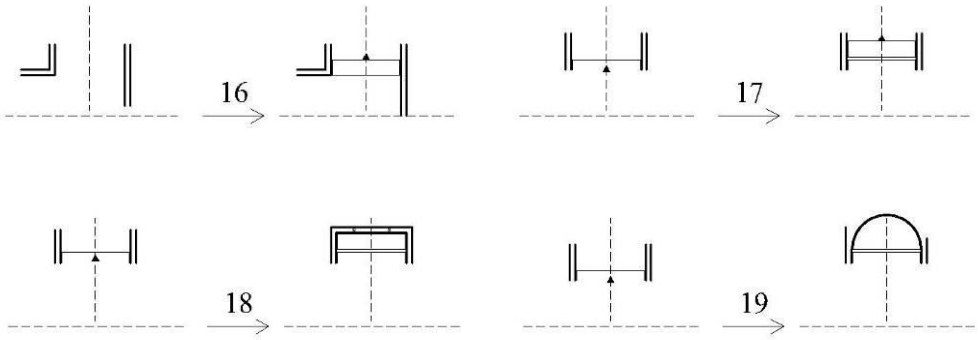
Besides inserting bay-rectangles, the application of any one of rules 7 to 21 also introduces Θ symbols in the outside walls and dividing walls of squared nave type. These Θ symbols label the midpoints of each wall segment and will be used to control the location of openings, a problem dealt with from stage 5 onwards. Shape rule 22 can be applied, without any spatial restrictions, to transform W_2 and E_2 into W_3 and E_3, carrying the derivation into the next stage.



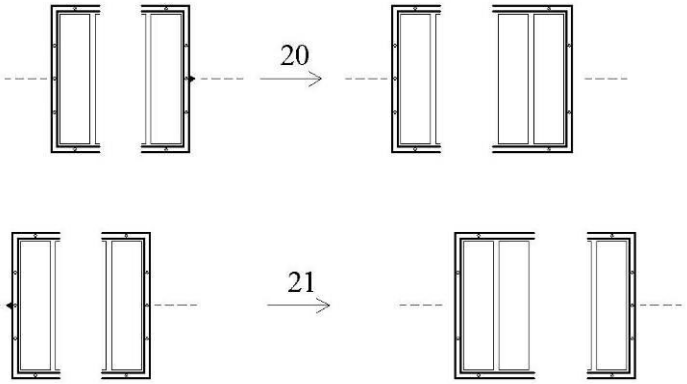
From rule 7 to rule 11 to divide the main hall by walls

▲ Figure 5.3. Stage 2 rule schemata to divide the hall into bays, transept return aisle and ambulatory or choir *(continue)*

From rule 12 to rule 15 to insert bays



Rules from rule 16 to rule 19 to insert tarnsept bays on both sides



From rule 20 and rule 21 to insert return aisle and choir/ambulatory

(S_{∞},W_2), (S_{∞},E_2) $\xrightarrow{22}$ (S_{∞},W_3), (S_{∞},E_3)

▲ Figure 5.3. Stage 2 rule schemata to divide the hall into bays, transept return aisle and ambulatory or choir

5.3.3. Stage 3: To Dispose Pilasters and Columns and to Protrude Walls

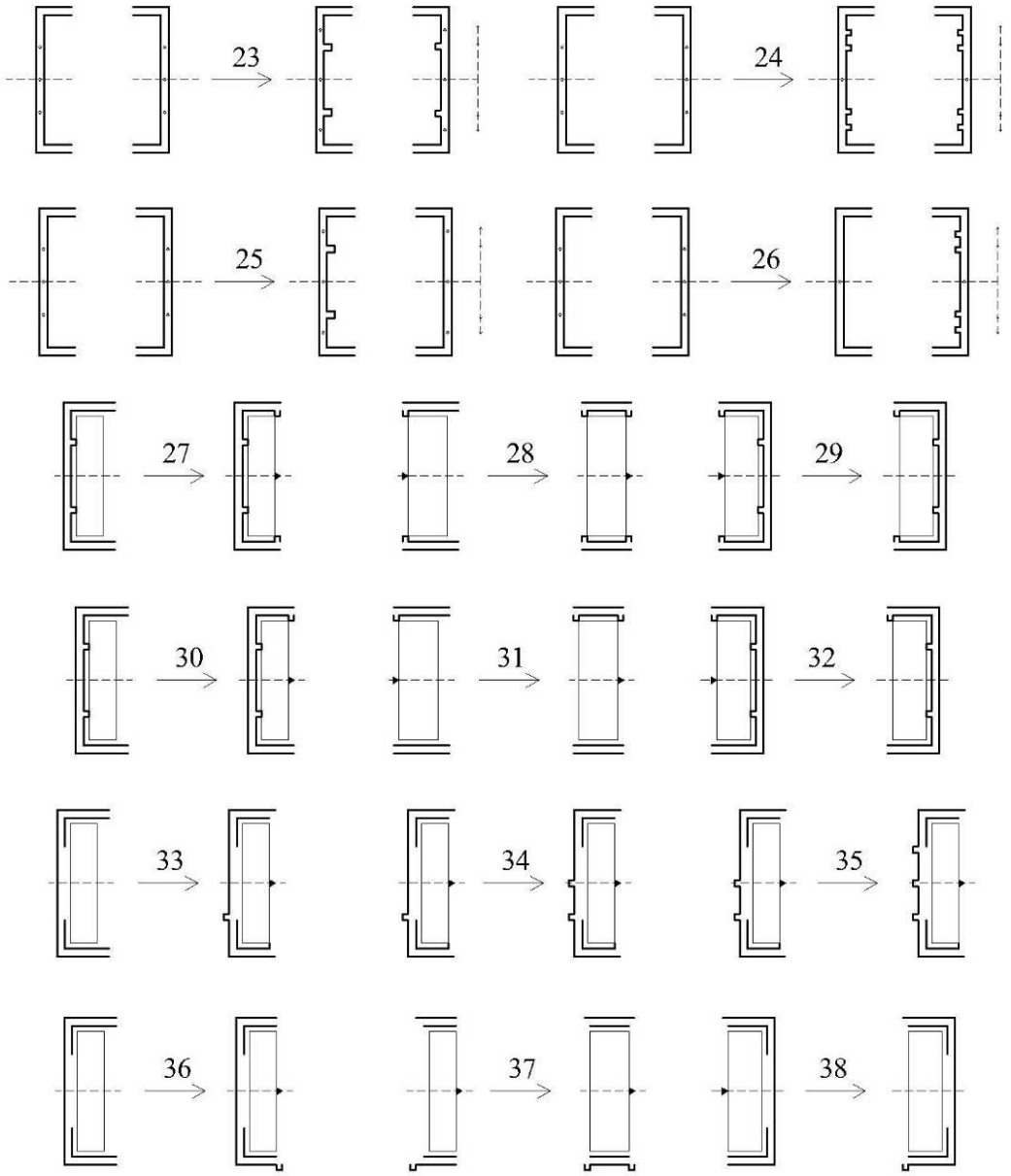
The rule schemata are illustrated in Figure 5.4. The rule schemata in this stage specify how to elaborate the interior of the main hall. In particular, they specify how to dispose pilasters and columns, and to protrude lateral walls.

Rules 23 to 38 define how to dispose pilasters. Pilasters may be placed along walls that are either perpendicular or parallel to the symmetry axis. The perpendicular ones are referred to as front walls and the others as lateral walls. Along front walls, four pilasters can be disposed at once (see rule 23). Also, four pilasters can be disposed on each side especially in four aisled churches (rule 24). Rules 25 and 26 are

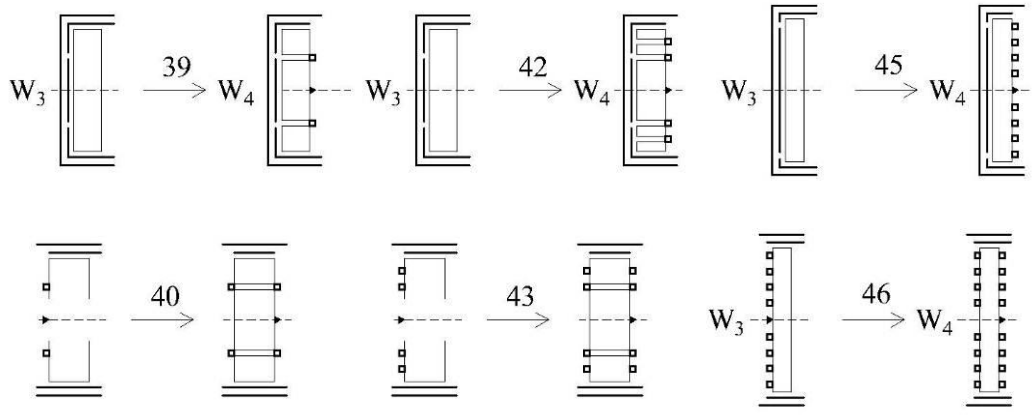
for inserting pilasters to front walls in one side, east or west only along lateral walls, pilasters are disposed along two sides (rules from 27 to 29), or along one side (rules from 30 to 32). Pilasters have to be inserted in sequence, starting at one end (rule 27 or 30), proceeding over each bay intersection (rule 28 or 31), and ending at the other end (rule 29 or 32). This sequence of rule application is controlled with a ► label. Applying rule 27 or 30 introduces the ► label and forces the application of rule 28 or 31; and applying rule 29 or 32 erases the ► label at the opposite end of the hall. Note that in these rules the axial labels W_3 and E_3 are omitted. This means that their application is optional. Similarly, rules from 33 to 38 are for inserting pilasters in the outside body of the church. Rules from 33 to 35 are for disposing them in the front walls, east or west side, while rules from 36 to 38 are for disposing them in the lateral walls beginning with rule 36 and ends with 38.

Rules 39 to 47 specify how to dispose columns between two bay-rectangles. Application of rules 39, 40 and 41 simultaneously disposes two symmetrical columns about a symmetry axis and divides the bay-rectangle longitudinally in three smaller rectangles. The width of the middle rectangle may be equal or anywhere between one to two times that of the outer rectangles. In case of four aisled churches, rules from 42 to 44 work to generate two rows of columns on both of the north and south sides parallel to the axe line. Nevertheless, in cases of Coptic plan churches the number of column rows generated on north and south sides can reach five (rules 45 to 47). However, if the first bay acts as a return aisle, then it may be separated from the prayer space by more than two columns (rule 48). For the last bay, it may be separated from the prayer space by more than two columns (rule 49) or by duplicating columns to (rule 50) form the Choir. Rule 51 is applied to those churches with four aisles, it inserts a middle column at the end of the two rows of columns at the north and south sides. The application of these rules in sequence (see the ► label) creates two rows of columns and divides the hall into a nave with an aisle on each side in addition to a return aisle and transept. The application changes the W_3 and E_3 into W_4 and E_4 and thus carries the derivation into the next stage. Rules from 52 to 58 insert columns on the transept, while rules from 59 to 61 protrude its pilasters. Rules 62 to 64 specify how to protrude a side wall. Shape rule 62 applies starting from the south-west corner. The application of rule 63 starts the process of unilaterally enlarging the main hall, if it is applied from one side, and introduces a ► label to force the application of the next rule. Rule 64 applies to a bay-rectangle that is ► labeled; and its application protrudes the wall segment, and traces a new aisle square. The application of rule 62 can be repeated to generate a unilateral aisle. The aisle can be ended either in elongation of the east front (rule 63) or at the last bay intersection (rule 64). The application of either of these rules erases the last Θ label.

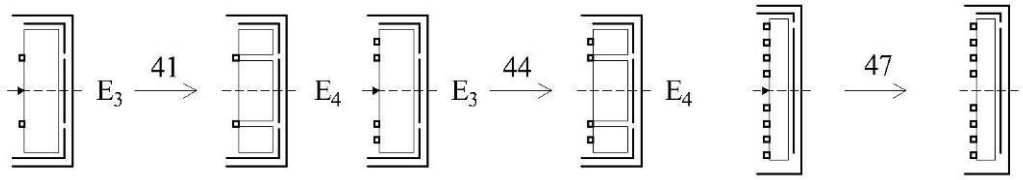
Note, applying rule 63 and 64 adds the c label to distinguish the inner corners of the aisle. The c label will help to locate doors, whereas rule 65 can be applied, without any spatial restriction, to transform W_3 and E_3 into W_4 and E_4, carrying the derivation into the next stage.



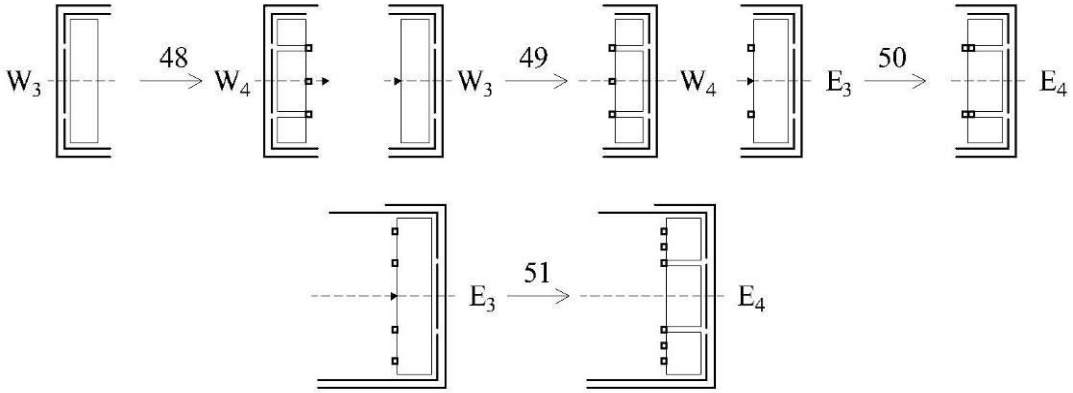
Rules from 23 to 38 to insert pilasters on front walls and lateral walls



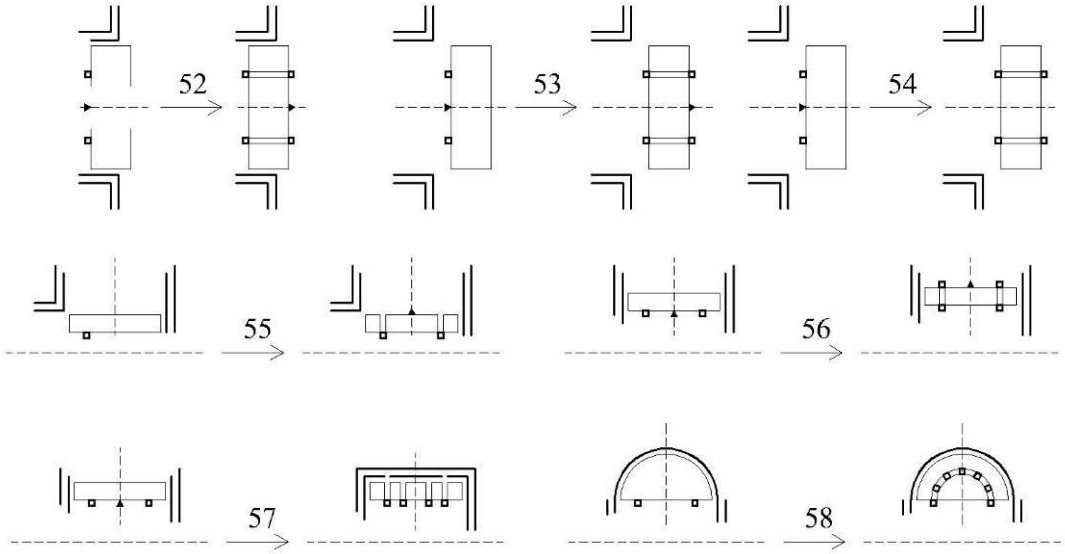
▲ Figure 5.4. Stage 3: To Dispose Pilasters and Columns *(continue)*



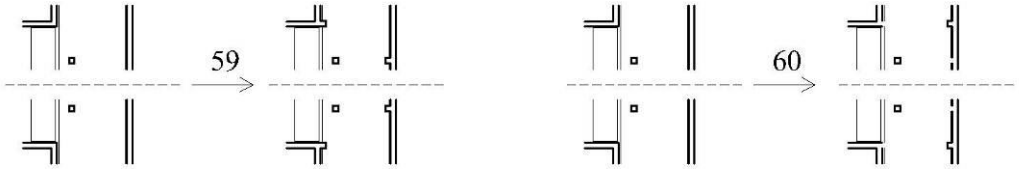
Rules from 39 to 47 to insert columns



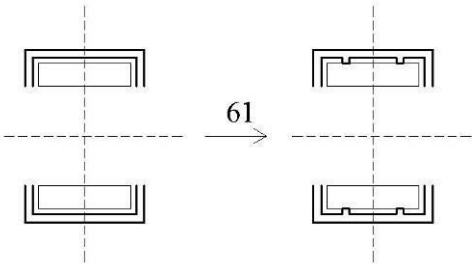
Rules from 48 to 50 for return aisle and amulatory columns



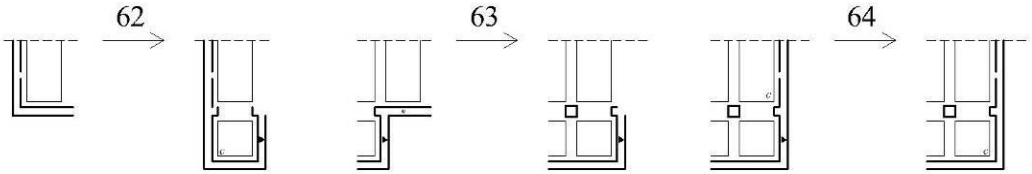
Rules from 52 to 58 to insert columns for Basilica churches with transept



▲ Figure 5.4. Stage 3: To Dispose Pilasters and Columns *(continue)*



Rules from 59 to 61 to dispose pilasters in basilican plan with transept



Rules from 62 to 64 to protride side walls

$(S_\infty,W_3), (S_\infty,E_3) \xrightarrow{65} (S_\infty,W_4), (S_\infty,E_4)$

▲ Figure 5.4. Stage 3: To Dispose Pilasters and Columns and to Protrude Walls

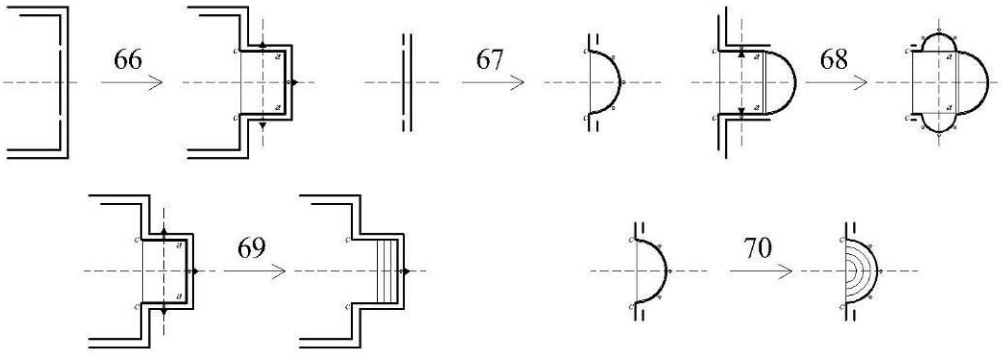
5.3.4. Stage 4: To Add Auxiliary Zones

The stage 4 shape-rule schemata are illustrated in Figure 5.5. Rule schemata 60 to 121 fix how to add auxiliary spaces that may either function as vestibules or vestries, or may host an altar, a baptismal font, or staircases to the balconies or narthex or presbytery or tress. Auxiliary spaces are typically located on the axial fronts and lateral walls are created by either protruding the wall or by filling up the external convex corner(s).

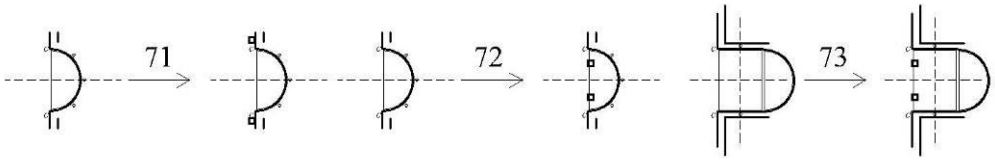
Applying rules from 60 adds a longitudinal space on the western front wall, which can create the inner narthex. Rules from 61 to 63 dispose the options of that space.

Rules from 66 to 73 derive different shapes of sanctuary space. Rule 66 represents a quadrilateral sanctuary or a presbytery that forces to use any rue of the following two rules to create the church sanctuary. Rule 67 represents a semicircular recess. This rule can also be used to create portico or concha on the sides of the main hall. Such an axial recess may be created on either the east or the west front in uniaxial schemes, or on any of the four fronts in biaxial scheme. The depth of the protrusion creates a distinguished interior space. An axial recess on the east front is used to place the altar, whereas on other fronts it functions as a portico. Rule 68 adds more side recess that most probably creates the tri-conch sanctuary. Rules 69 and 70 also concern the apse in the sanctuary. They add stairs in the apse whether it takes rectangular shape (rule 69) or semicircular shape (rule 70). Rules from 71 to 73 concern inserting columns for the semicircular sanctuary, rule 71 adds to columns in front of it, rule 72 adds them at its entrance, where rule 73 adds two columns at its quadrilateral entrance. Rules 74 and 75 add flanking spaces at the corners of the semicircular apse.

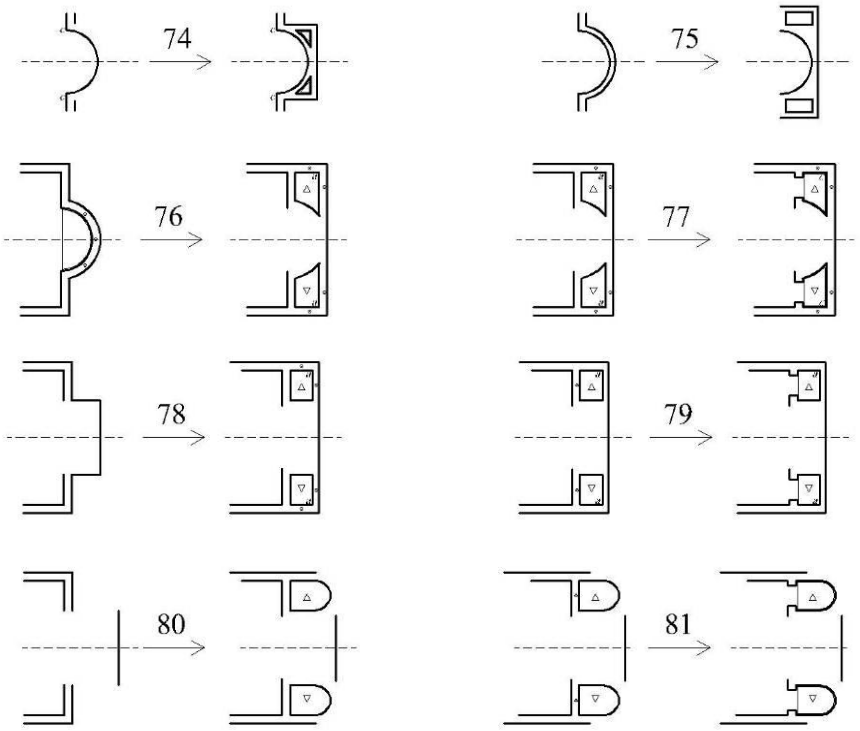
Rules from 76 to 83 define how to add an auxiliary space by filling up the external concave corner(s). Two concave corners may be filled up on each side of an axial recess or an on-axis (rule 76, 78, 80). Only one concave corner may flank the axial recess (rule 82). In both cases, filling the corner(s) creates symmetrical addends. These auxiliary spaces may either function as vestibules or vestries, or host



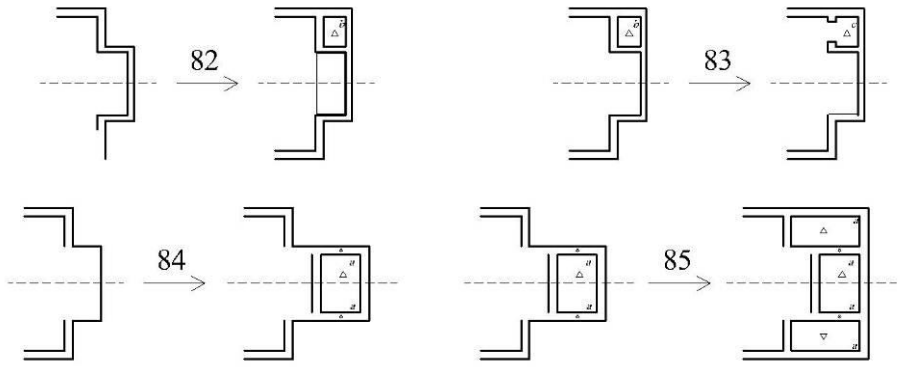
Rules from 60 to 63 to dispose inner narthex



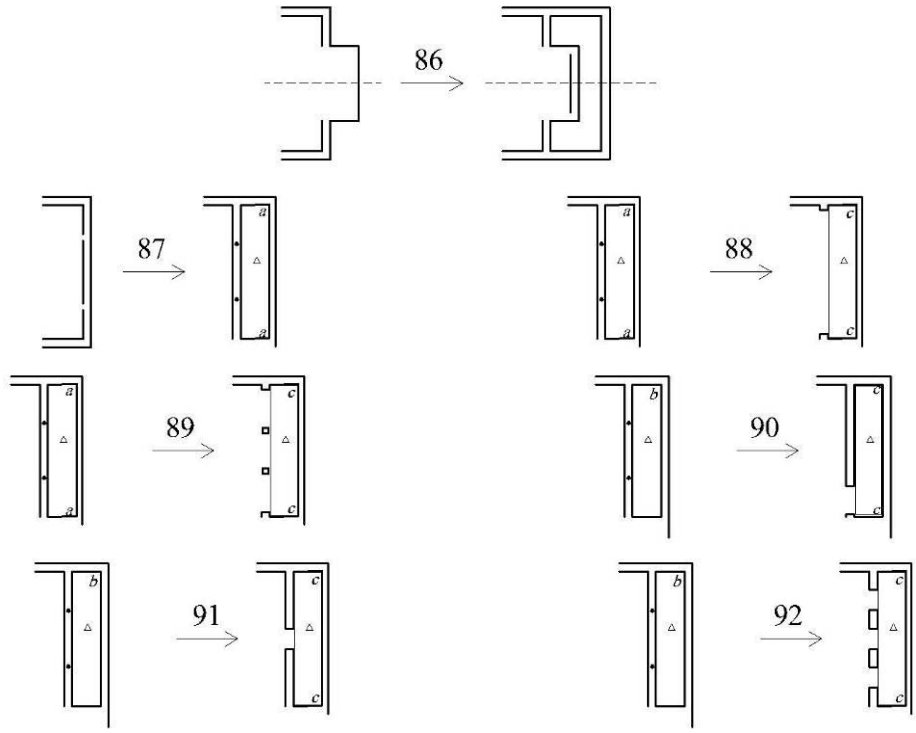
Rules form 66 to 73 to insert apse



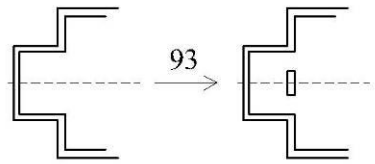
▲ Figure 5.5. Stage 4: To add auxiliary zones *(Continue)*



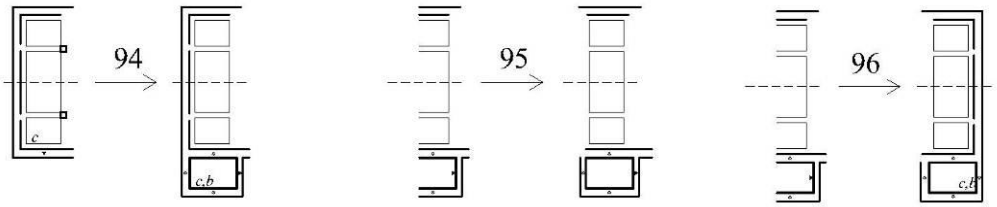
Rules from 74 to 85 to despose side rooms from walls perpendecular on the axe



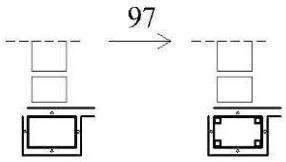
Rules from 86 to 92 to dispose longitudinal spaces perpendicular on the main axe



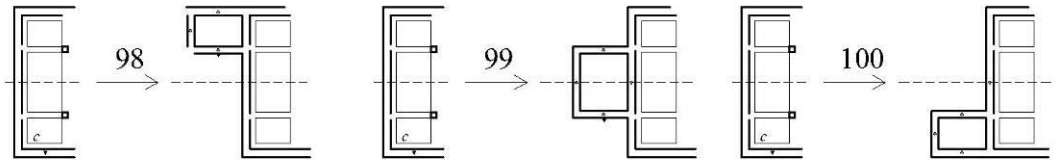
Rules from 86 to dispose a central space perpendicular to the main axe



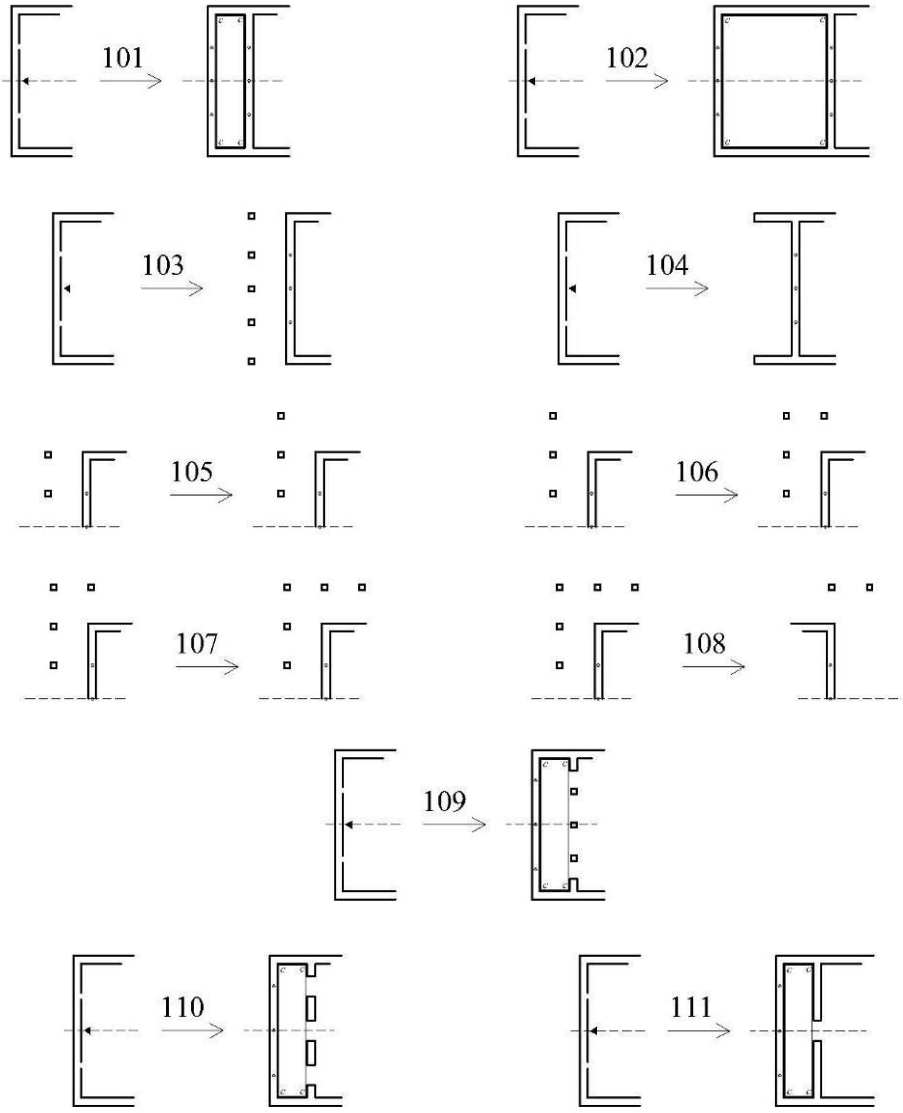
▲ Figure 5.5. Stage 4: To add auxiliary zones *(Continue*)



Rules from 94 to 97 to despose side rooms on the lateral walls

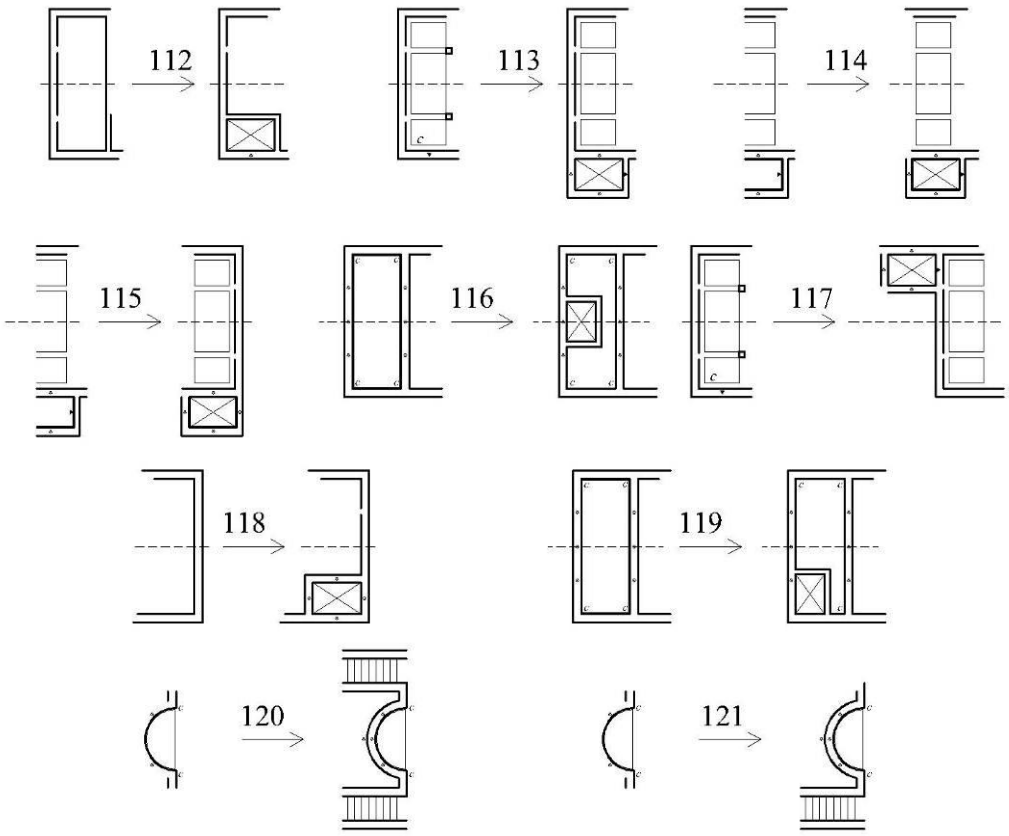


Rules from 98 to 100 to despose side rooms on the front walls



Rules from 101 to 111 to dispose spaces that represents inner and outer narthex or atrium

▲ Figure 5.5. Stage 4: To add auxiliary zones *(Continue)*



Rules from 112 to 121 are to dispose stairs

(S_{∞},W_4), (S_{∞},E_4) $\xrightarrow{122}$ (S_{∞},W_5), (S_{∞},E_5)

▲ Figure 5.5. Stage 4: To add auxiliary zones

the baptismal font or staircases to the balconies. Although the sizes of these corner additions are variable, they never project beyond the external walls already present. Interior corners of symmetrical addends are labeled with *a* symbols, whereas the interior corner of an asymmetrical addend is labeled with a *b* symbol. The center of each one of these addends is labeled with a Δ and will help to control their accessibility. An auxiliary space created by filling an external corner is conceived of as an autonomous space. However, it is separated from the main hall with just one wall segment. Merely removing this common wall-segment allows the auxiliary space to be integrated spatially with the main hall. Rules 77, 79 and 81 allow the removal of the common wall-segment. Rule 82 adds one auxiliary space in one of the four corners. Rule 83 removes its wall segment. Rule 84 adds another space behind the sanctuary area or the portico, while rule 85 adds to both of them two flanking rooms.

Applying rules from 86 to 92 generates a longitudinal auxiliary space perpendicular on the axe. Rule 86 generates the space. Applying rules from 87 to 92 replaces the *b* label with both a label and a *c* label after making the space opening. Rule 93 protrudes the middle point of the front wall to create a central space which can represent an approach or portico to the main hall. Rules from 94 to 96 fixes side spaces on lateral walls. These rules can be applied on any side. Rule 97 disposes four columns to any of the created auxiliary spaces.

Applying rules from 101 to 111 creates a longitudinal space on the front walls on the western front wall. Rule 101 creates an inner space that may be considered the choir if located before the sanctuary space or Dhefir if located after it on the east side. Rules from 109 to 111 dispose the options of that space's opening segments. Rule 102 applies for the outer atrium of the church, and rules from 103 to 108 create the outer colonnade narthex except rule 104 that creates the outer narthex without any columns.

Applying rules from 112 to 119 disposes the location of the stair cases inside the church, on any of the lateral walls, front walls or the narthex space. Rules 120 and 121 are applied to insert stairs of the church entrances that can be designed around the portico or rarely beside the sanctuary area on the east, from one side or on the two sides.

So far in this stage, no rule includes the W_4 and E_4 symbols, so the application of any of rules 60 to 82 is optional, except rules from 64 to 66 as one of them is mandatory for deriving the alter space. Rule 122 can be applied without any spatial restriction to transform W_4 and E_4 into W_5 and E_5, and to carry the derivation into the next stage.

5.3.5. Stage 5: To Insert Doors

The Θ labels introduced during previous stages are associated with the midpoint of each distinct wall-segment. In stages 5 and 6, shape rules show either how to replace these Θ labels with doors, windows and niches, or how to merely erase them.

The rule schemata in stage 5 are illustrated in Figure 5.6 (See over). Rule schemata 123 to 148 define how to insert doors. The main purpose of disposing doors is to provide access. This raises two problems. The first problem is to assure the minimal accessibility of each distinct space. Among the distinct spaces a design may contain are the main hall, and possibly the auxiliary addends. Each one of these distinct spaces has a different label associated with its center. In particular, the main hall is labeled with a ♦ symbol, and each separate addend with a Δ symbol. To assure minimal accessibility, the process of inserting doors is combined with the process of erasing these labels.

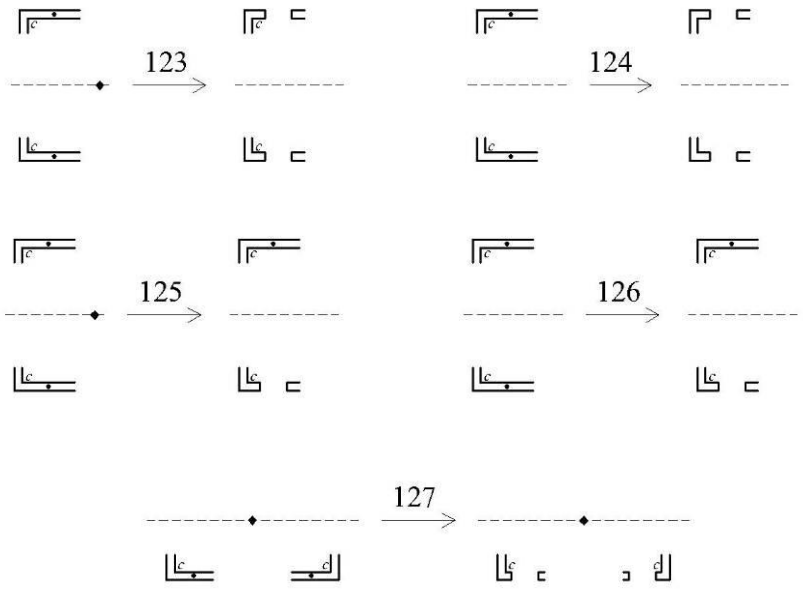
The second problem is to assure the proper connection between various access paths. The main hall has to be accessible from the outside. This access may be directly to the outside via a door located in one of the hall's exterior walls, or may pass through a vestibule located in either one or more auxiliary space(s). To control the overall accessibility, the process of inserting doors starts in the main hall, and continues in the auxiliary additions. Disposing doors in the main hall first determines if connections via vestibules have to be established and hence constrains the possible doors in the auxiliary space(s).

Access to the main hall is specified by rule schemata 123 to 134. The main hall can be accessed in multiple ways. To distinguish minimal from additional accesses, two nearly similar sets of shape rules are defined. The rules in the first set are defined in terms of the ♦ label associated with the center of the hall, and the application of at least one of them is mandatory as this is the only way to erase this label (See rules 123, 125, 127, 129, 131, and 133). The rules in the second set are not defined in terms of these labels, and their application is optional (See rules 124, 126, 128, 130, 132, and 134). Apart from these label differences, the rules in both sets are identical and specify how a Θ label associated with the midpoint of a wall segment can be replaced with a door.

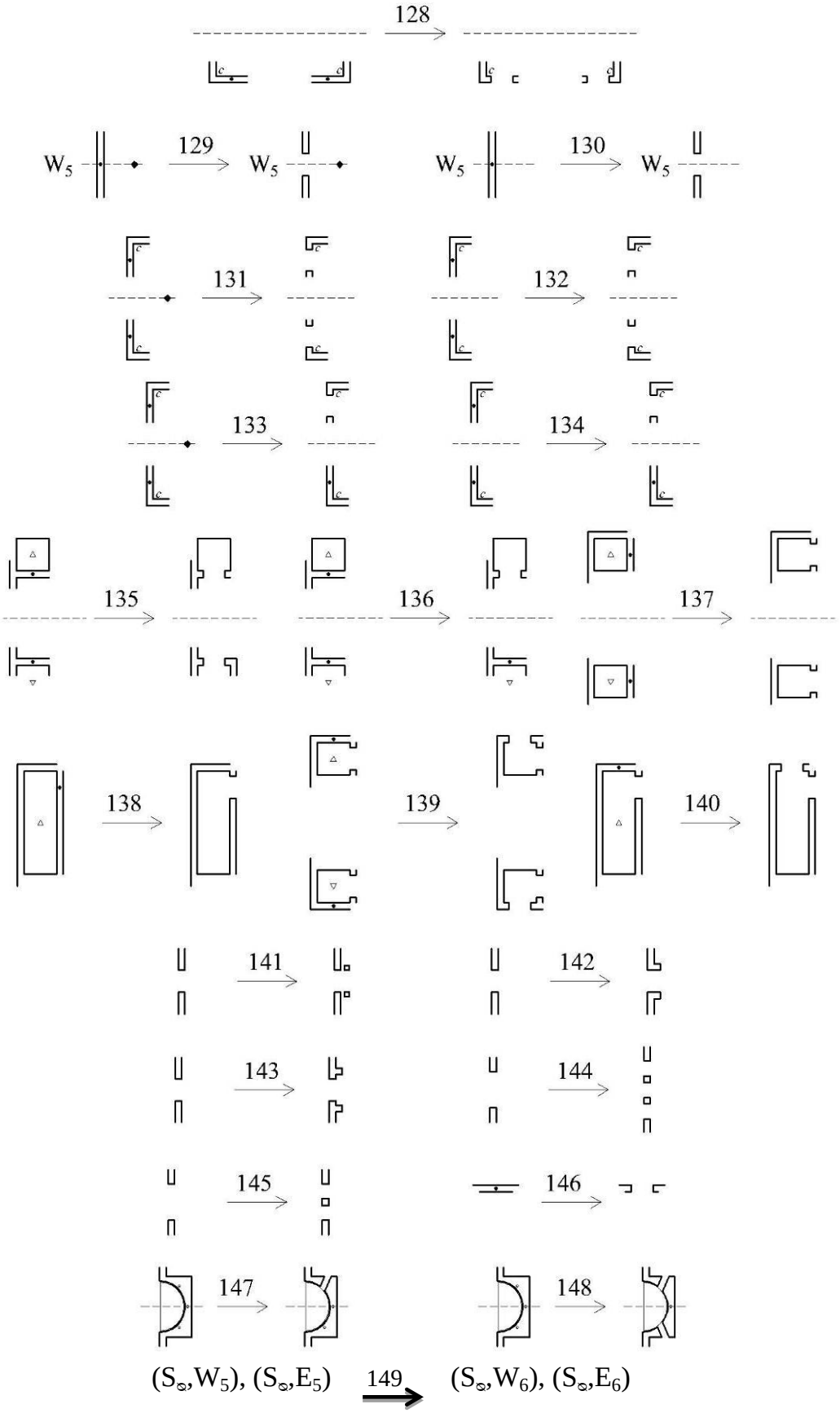
Doors can only be disposed in wall segments at the corners of the main hall (See the c symbols). These segments belong either to lateral walls or to front walls. The main hall may be accessed via lateral walls from two opposite sides (Rules 123 and 124) or from just one side (Rules 125 and 126). The main hall may also be accessed from both ends of the same side at once (Rules 127 and 128). The main hall can be accessed via a front either on axis (Rules 129 and 130) or symmetric about this axis at aisle-heights (Rules 131 to 132). Note that a church can never be entered via the east front on axis because this place is reserved for the altar (this is controlled by the W_5 label in Rules 133 and 134).

Access to auxiliary spaces is specified by rules 135 to 140. If autonomous, each one of these zones has a Δ label located at its center. Minimal access to each one of the symmetrical additions can be provided by inserting a door in each wall segment parallel to the symmetry axis (rule 135). Rule 136 is the same as rule 135 but for one side, or in each wall segment perpendicular to the symmetry axis (Rule 137). Applying one of these rules erases the Δ label located in each addition. Minimal access to an asymmetrical addition can be provided by entering it from the main hall (Rule 138). Applying this rule replaces the Θ label with a door and erases the Δ label.

Although before the occurrence of the label linked to the center of a space could only mean that a minimal access had to be provided, in auxiliary spaces the Δ label may occur when a door is already present. The occurrence of this label when a door is already present means that a connection to the outside has to be established. To connect the main hall with the outside, a second door has to be inserted in the auxiliary space (shape rules 139 or 140). Applying any one of these rules also erases the Δ symbol. Rules from 141 to 144 are to insert columns at the doors, especially the main ones, except rule 142 and 143 which add pilasters at those doors. Applying rules 147 is to remove a segment from the apse to create an opening between the sanctuary area and the flanked two rooms. Rule 148 is the same as 147 but to create one opening to access one of the flanked two rooms. This stage of the derivation can be left by transforming W_5 and E_5 into W_6 and E_6 with rule 149.



▲ Figure 5.6. Stage 5: To insert doors *(Continue)*



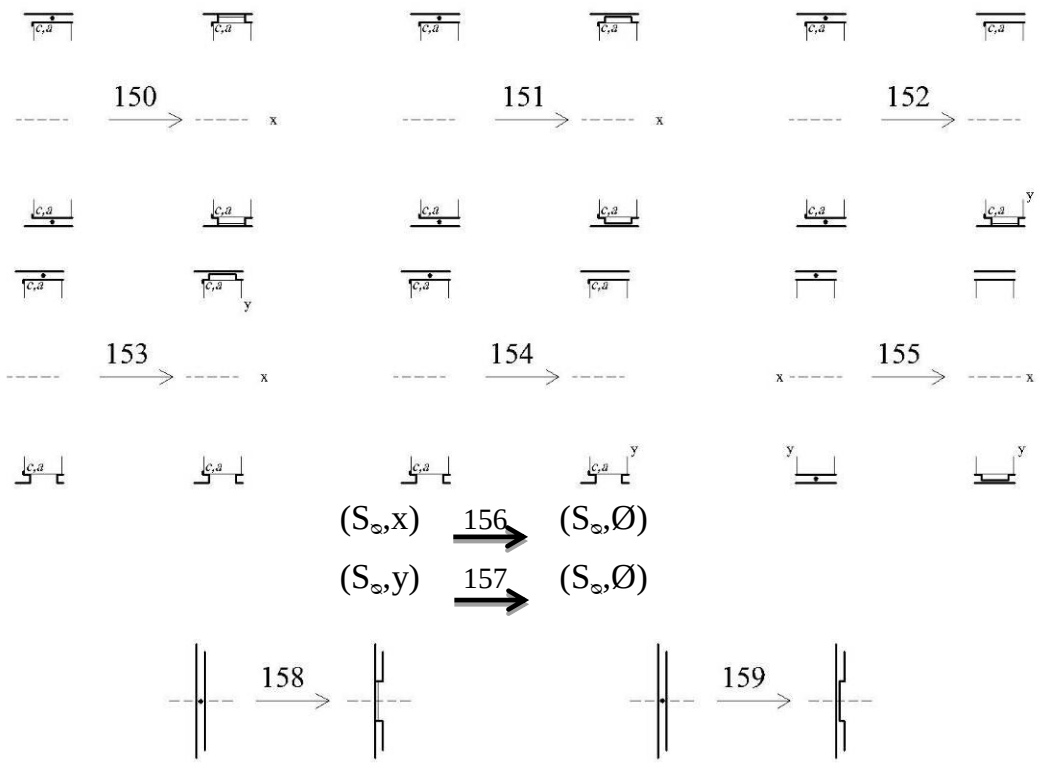
▲ Figure 5.6. Stage 5: To insert doors

5.3.6. Stage 6: To Insert Windows and to End the Derivation

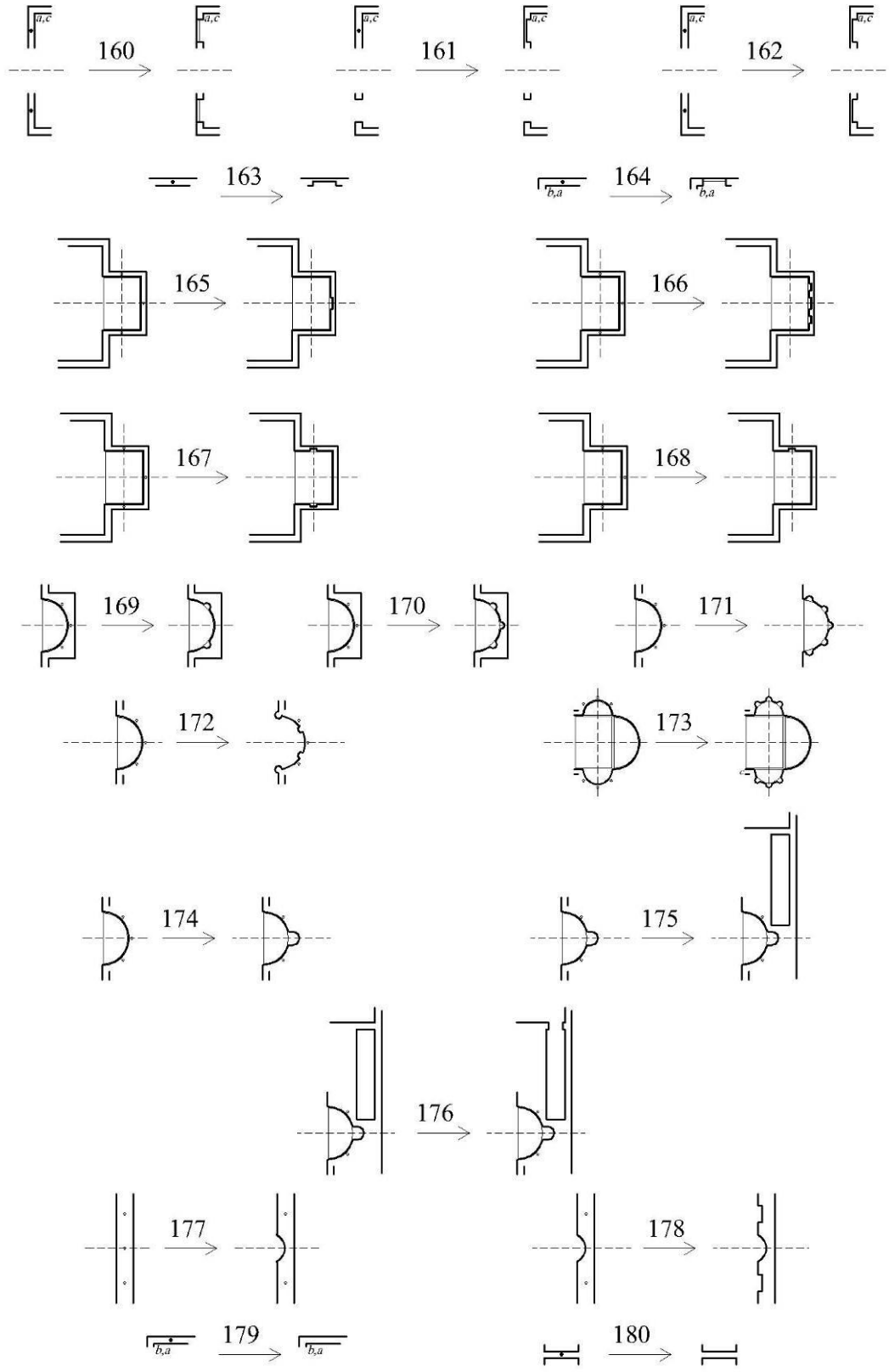
The rule schemata of stage 6 are illustrated in Figure 5.7. Rule schemata 150 to 180 specify how all remaining Θ labels can either be replaced with a window or a niche, or be erased. Such labels remain in lateral walls, front walls, walls of asymmetrical additions, tower walls, and interior walls.

In lateral walls, remaining Θ labels can be replaced by means of rules 150 to 155. To replace all Θ labels with windows in the lateral walls, one may start at one end of the main hall, proceed over each bay rectangle, and end at the opposite end of the hall. Or one may start at both ends at once and terminate in the middle. These two ways of proceeding allow one to hollow either of both sides, just one side, or any combination of these. These various combinations reflect and are based on analysis of the Coptic churches. If given the choice, Copts would undoubtedly have opted to hollow both sides; local conditions, however, sometimes obliged them to leave a whole or part of one side plain.

To start with the lateral walls, any one of shape rules 150, 151, 153, or 155 may be applied at either end of the main hall. Rules 151 and 152 apply if a Θ label remains in each one of two opposite wall-segments. The application of rule 150 replaces each Θ label with a window and introduces an *x* label on the symmetry axis. The application of rule 151 replaces one Θ label with a window, erases the other Θ label, and locates a *y* label on the side in which the window was inserted. Rules 153 and 154 apply if a door is already present. Application of rule 155 replaces the Θ label with a window and adds the *x* on the symmetry axis and the *y* label on one side of the window.



▲ Figure 5.7. Stage 5: To insert windows and niches *(Continue)*



▲ Figure 5.7. Stage 5: To insert windows and niches *(continue)*

$(S_\infty,a) \xrightarrow{181} (S_\infty,Ø)$

$(S_\infty,b) \xrightarrow{182} (S_\infty,Ø)$

$(S_\infty,c) \xrightarrow{183} (S_\infty,Ø)$

$(S_\infty,W_6) \xrightarrow{184} (S_\infty,Ø)$

$(S_\infty,E_6) \xrightarrow{185} (S_\infty,Ø)$

▲ Figure 5.7. Stage 5: To insert windows and niches

To end with the lateral walls, shape rules 156 and 157 apply without any spatial restriction and provide for *x* and *y* labels to be erased.

In front elevations, remaining Θ labels occur either coincidently with a symmetry axis (Rules 158 and 159) or symmetrically about this axis at aisle height (Rules 160 to 162). If coincident with the symmetry axis, the Θ label can be replaced with either a large window (Rule 158) or a niche (Rule 159). At aisle height, both Θ labels can be replaced with either two windows (Rule 160), a door and a window (Rule 161), or two niches (Rule 162).

In front elevations, remaining Θ labels occur in corner wall-segments that are either labeled *a* or *b*. The Θ label can either be replaced with a window (Rule 163) or be erased (Rule 164).

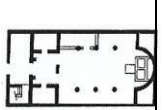
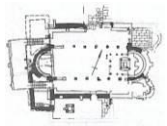
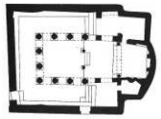
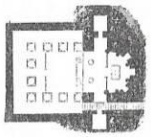
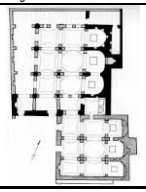
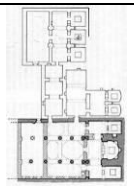
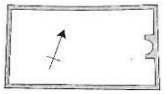
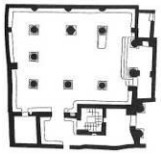
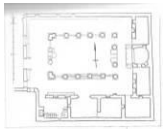
Rules from 165 to 173 fix niches in the sanctuary area, while rule 174 disposes a deep recess in the middle of the apse that was costumed for priests. Rules from 165 to 168 dispose niches in a quadrilateral sanctuary area. Rules 165 and 166 dispose niches on the front wall of that sanctuary, whether one niche (Rule 165), or three niches (Rule 166). Rules 167 and 168 dispose niches on the lateral walls of the sanctuary, where rule 167 dispose niches on both sides of lateral walls, while rule 168 adds one niche on one of both sides. Rules from 169 to 171 dispose niches on semicircular apses. Rule 169 dispose two niches on the diagonals toward the corners of the space, while rules 170 add to them another middle one on the axe. Rule 171 disposes niches on the circumference of the semicircle. Rule 172 adds columns or protrudes ones on the circumference of the apse. For tri-conch sanctuaries rule 173 disposes niches on the circumference of the two side conches.

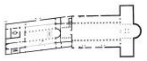
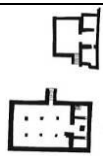
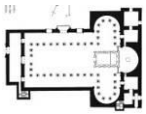
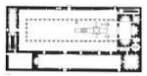
Rule 174 disposes a deep niche on the axe in the middle of a semicircular apse, and this niche is called 'the bosom of the Father'. Rule 175 provides a chance to add an auxiliary space to act as Dhefir, and rule 176 to remove a segmental wall for its access.

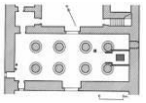
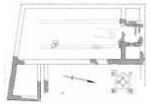
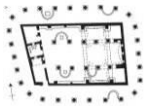
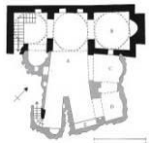
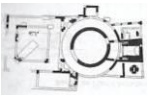
The last walls in which Θ labels may remain are those which are common to two spaces in the design. These labels may be erased with rules 179 and 180.

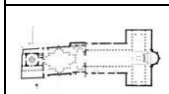
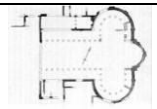
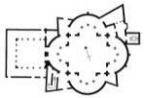
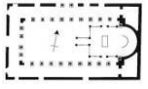
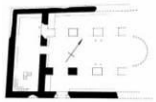
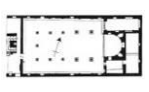
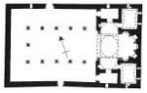
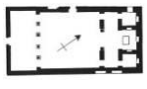
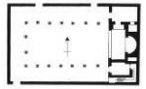
Rules 181 to 185 specify how only labels with a letter symbol can be erased without any spatial restriction. Remaining *a*, *b*, and *c* labels can be erased with rules 181, 182, and 183, respectively. Symbols W_6 and E_6, labeling the symmetry axis, can be erased with rules 184 and 185. Applying these rules permits a proper end to a derivation and produces a final design. Only if this design contains no labels does it belong to the language defined by the grammar.

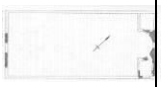
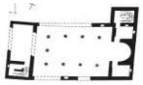
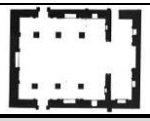
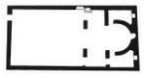
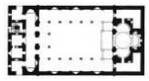
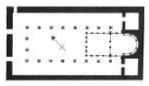
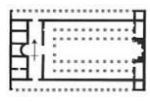
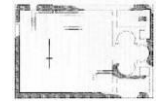
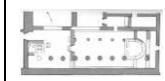
Table 5.2. shows the application of the above rule schemata on the selected case studies throughout the six centuries, from the fourth to the ninth centuries.

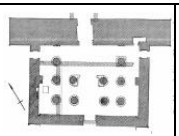
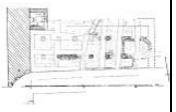
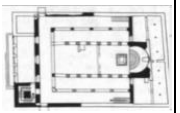
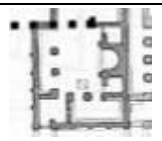
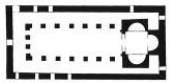
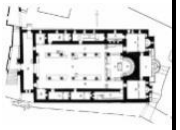
4th Century										
9/9										
Main Hall	Basilica	1	2	2	3		1	1	1	1
	B. Transept									
	Coptic					3				
	Central									
Bays	No. of bays	12,13*2,15	12,13*5,15	12,13*1,15	12,13*1,15	12,13*1,15	12,13*3,15	Unknown	12,13*1,15	12,13*3,15
	Transept									
	Choir			20			20			20
	Return Aisle			21	21				21	21
	I. Narthex									
Pilasters	Front walls			23			25		23	
	Lateral walls			27,28,29			30		30,31,32	
	Outer pilasters									
Columns	bays	40,41,42	40,41,42	40,41,42	40,41,42	40,42	40,41,42		40,41,42	40,41,42
	Return aisle									48
	transept									
	Choir						50			49
	Ambulatory									
	I. Narthex									
Sanctuary		67	67	66,67	67	67	67	67	66	67
Aux.spaces	Flanking rooms	76	80,81	78,79	78	80,81	78,79	78,79	78,83	78,79
	Choir			87,89	87,78		87,88			
	Aux.	66,93,78				94,(95,96)*2				95,96
	I. narthex	102,112	87,91 (s)			87				
	Portico		67,78,79							
	Outer Narthex									
	Atrium									
	Dhefir									
	Doksar					94			87	
	Stairs	112	120		121 (e)				115	114
Doors	Main Hall	129+143	124	126	134 (e)	129,131	125,126(n)	126	126	130
	Aux.spaces	135	135	135	135	136			136	146
	Main entrances	129		134		125,126			143	132
Windows										
Niches	Lateral wall								155	151,153,156
	Front wall									162,163
	Alter			175	176,177	179,180,181	175		163	174
	Aux.spaces					162			163	163
Orientation		unknown	+22°	+33°	Unknown	+23°	Unknown	+20°	+/- Zero	-3°
Location		Alexandria		Al-Minyia		Sohag	Qina	Thebaid	Baris Oasis	Al-Dakhla Oasis

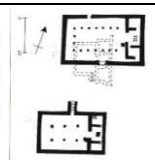
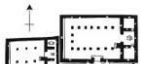
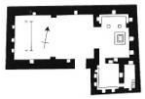
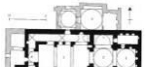
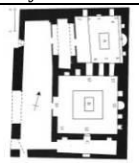
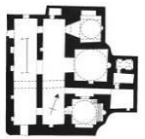
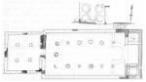
10/18		5th Century									
											
Main Hall	Basilica		1	1		1	1	1		1	1
	Coptic				3						
	B. Transept	**4**							**5**		
	Central										
Bays	No. of Bays	12,13*13,15	12,13*2,15	12,13,15	12,13,15	12,13*3,15	12,13,15	12,15	12,13*8,15	12,13*16,15	12,13*8,15
	Transept								**16,17,19**		
	Return Aisle										
	Choir									20	20
	I. Narthex										
Pilasters	Front walls	25							59,60		
	Lateral walls	27									
	Outer Narthex										
Columns	Bays	39,40,52	39,40,41	39,40,41	45,46,47	39,40,41	39,40,41	42,44	39,40,41	39,40,41	39,40,41
	Return aisle				48				48	48	48
	Transept								52,53,54,55,56		
	Choir									49	49
	Ambulatory								58		
	I. Narthex										
Sanctuary		67	66	66	66,67,71,72,73	66	67	67	67	66,67,68	66,67,68
Aux.spaces	Flanking rooms		78	78	75	78,79	84,85,78	78	75,78,79	75,78,79	78,79
	Choir							86,91			
	Aux						96 (n)			94,96	95
	I. Narthex	85,78			101,111				101,110	101,110(s)	101,110(s)
	Portico										
	Outer Narthex										
	Atrium										
	Dhefir				86		84,85,79				
	Doksar							100		101,110	
	Stairs								113,118	113,118	112
Doors	Main Hall	124,126,(128+141),128(n)			129+145	124		126,129	129,131, 126	124,129	124,126
	Aux. spaces	146	135	135	136,146,146+145	136	146	135	135,139,146	135,137,139,146	138,146
	M. entrances	129+141	126	126+142	129	126	129	129+142	130	129	126
Windows									152	152	168
Niches	Lateral walls			151,155			155	151,161		151	155
	Front walls			159,162			161,163			162	163
	Alter			165	172	165,172		175		176,177,178	176,177,178
	Aux. spaces			163,165				163		182,163,176	163
Orientation		-13°	+20°	+/-Zero°	+10°	+20°	+20°	+50°	+22°	+37°	+32°
Location		Alexandria	Kellia		Al-Fayyoum			Al-Minyia		Sohag	

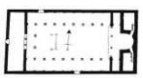
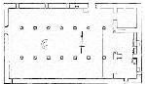
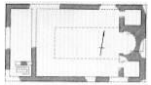
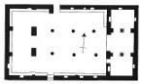
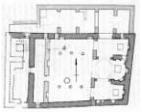
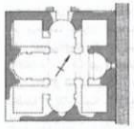
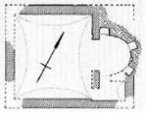
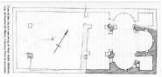
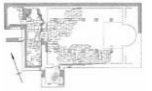
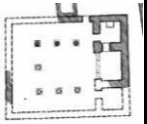
		5th Century							
8/18									
Main Hall	Basilica	1	1	1	1	1	1	3	
	B. Transept								
	Coptic								
	Central								Exc. 01
Bays	No. of bays		12,13,15		12,13,15		12,13,15		
	Transept								
	Choir		20						
	Return Aisle		21						
	I. Narthex								
Pilasters	Front walls					25			
	Lateral walls						26,27,28		
	Entrances								
Columns	Between bays		42,43,44		39,40,41	39,40,41	39,40,41		
	Return aisle		48						
	Transept								
	Choir						40,41		
	Ambulatory		51						
	I. Narthex								
	Outer narthex								
Sanctuary		67	67	67	66	66	66	66,67	66
Aux. spaces	Flanking rooms	78	78	78	78,79	78	78,79	78,79	78
	Choir								
	Aux.					94	98	94,95	
	Inner narthex								
	Portico							67	
	Outer Narthex						103,105:108		
	Atrium			102					
	Dhefir								
	Doksar						100	98	
	Stairs						99		
Doors	Main Hall		131	129	123,134		132	131	
	Aux. spaces					135	135,146	135	
	M. entrances		129		124		125	146	
Windows									
Niches	Lateral walls			151				155	
	Front walls						162	161	
	Alter						170		
	Aux. spaces						163	163,174	
Orientation		+20°	+20°	+10°	-26°	+103°	-7°	+45°	Unknown
Location		Thebaid		Luxor, Armant	Luxor		Al-Kharga Oasis	East Desert	Sinai

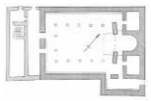
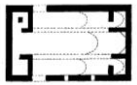
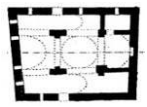
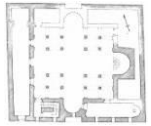
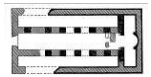
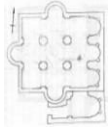
		6th Century									
10/29											
Main Hall	Basilica				1	1	1	1	1	1	1
	B. Transept	4	6								
	Coptic										
	Central			Exp. 02							
Bays	No. of bays	12,13*13,15	12,13*8,15		12,13*8,15	12,13,15	12,13*3,15	12,13*3,15		12,13*5,15	12,13*7,15
	Transept	16,17,18	16,17,19								
	Choir										
	Return Aisle				21		21	21		21	21
	I. narthex										
Pilasters	Front walls	25,59,60	25,59,60		25	25					
	Lateral walls	27,61					27,28,29				
	Entrances										
Columns	Bays	39,40,41	39,40,41		39,40,41	39,40,41	39,40,41	39,40,41		39,40,41	39,40,41
	Return aisle				48		48	48		48	48
	transept	52:56	52:56								
	Choir										
	ambulatory	57	58	58							
	I. narthex										
Sanctuary		67	67	67	67,71	67	67	66, 67,68	66	66, 67	66, 67
Aux. spaces	Flanking rooms				76,77		78,79	78,79	78,79	75,78,79	75,78,79
	Choir								87,92		
	Aux.		95								94,95,96
	I. narthex					101,111	102,104		101,109		101,110
	Portico										
	O. Narthex										
	Atrium			102							103
	Dhefir						85				
	Doksar										86,67
	Stairs	117				112	116			112	
Doors	Main Hall	127,127+141,123			126,128,129,131	129	130	124	126	125,127	
	Aux. spaces						146	135		136	
	M. entrances	128+144	129	129	127+14				129		
Windows								152,164	164		
Niches	Lateral walls						151				
	Front walls						163				
	Alter						165,175		165,171		
	Aux. spaces						163		165		
Orientation		-13°	+30°	-21°	+10°	-36°	+17°	-20°	+56°	+/-Zero°	+43°
Location		Alexandria					Al-Minyia				

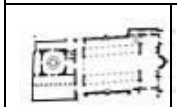
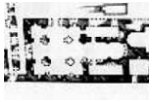
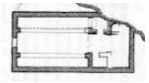
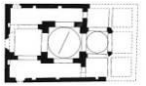
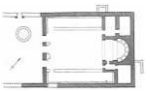
		6th Century									
10/29											
Main Hall	Basilica	1	1	2	1	1	1	1	1	1	1
	B. Transept										
	Coptic										
	Central										
Bays	No. of bays		12,13,15	12,13,15		12,13,15	12,13,15	12,13,15		12,13,15	12,13,15
	Transept										
	Choir					20	20				
	Return Aisle		21			21	21	21			21
	I. Narthex										
Pilasters	Front walls			25		26		26		25	25
	Lateral walls					27,28,29					
	Outer pilasters					36,38					
Columns	Bays		39,40,41	39,40,41		39,40,41	39,40,41	42,43,44		39,40,41	39,40,41
	Return aisle		48			48	48	48			48
	transept										
	Choir					49	49				49
	ambulatory										
	I. narthex										
Sanctuary		67	66,67	66	67	66,67,68,75	66	66,71	66,67,68,75	66,67	66
Aux. spaces	Flanking rooms	76	78	78	78	78,79	78,79	78,79	78,79	76	78,79,98
	Choir				87,92						
	Aux.					98,99,100		98,99,100,96			94+97,100
	I. narthex					101,110,67		101,67			101
	Portico										
	Outer Narthex							106,107			
	Atrium									102, 39,40,41	
	Dhefir									87,91	
	Doksar		101								98
	Stairs		112,115 (n)			116					116
Doors	Main Hall			123		(129,131)+143	133	129		129	132,125
	Aux. spaces		135,146	135,146	135,146	135,146		146			146,137
	M. entrances				134	124	131	124		133	133
Windows						159,160					
Niches	Lateral walls		155	151	155	151					
	Front walls			156,162				161,162			
	Alter			165	179	176	177	178			177
	Aux. spaces		163	162,163	162	162,163					163
Orientation		+48°	-24°	+/- Zero	+23°	-21°	-45°	+/-Zero°	+/-Zero°	-26°	-40°
Location		Al-Menyia			Asut		Dandara			Luxor	

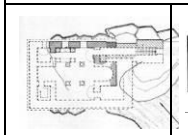
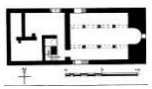
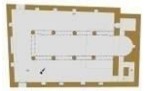
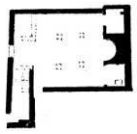
		6th Century								
9/29										
Main Hall	Basilica	1	2	1	1	1	2	1	1	1
	B.transept									
	Coptic									
	Central									
Dividing main hall			7,11							
Bays	No. of bays	12,13,15		12,13,14,15	12,13,14,15	12,13,15		12,13,15	12,13,15	12,13,15
	Transept									
	Choir								20	
	Return Aisle					21		21	21	
	I.narthex	21								
Pilasters	Front walls					25	25		25	23
	Lateral walls									
	Outer pilasters						33:38			
Columns	Between bays	42,43,44		39,40,41	39,40,41	42,(40,43),41		39,40,41		39,40,41
	Return aisle	48				(Arches)		48		
	Transept									
	Choir									
	Ambulatory									
	I.narthex									
	Aux.	62,63,64								
Sanctuary		66*2	66*2	66	67	67,69	67	66,67,68	66	67
Aux. spaces	Flanking rooms	75,78,79	78,79	78,79	76	86	78,79	75,78,79	82,83	78,79
	Choir						96		87,92	
	Aux.	98,99	96		94	98			94,95,96	84,94,95,96
	I. narthex/R. aisle			87,90			101,109		101,110	101,112
	Portico/concha									
	Outer. narthex									
	Atrium									
	Dhefir					96				
	Doksar	100				99	94		98	
	Stairs	116				117			117,118	
Doors	Main Hall	133	133,146	125		129,131	124,145		129,125	
	Aux. spaces	146,135	146	135		146		146	135,136,139,146	135,125
	Main entrances	127	123	133,140		129+145	126	125	126	129+142
Windows								150,152,159	152,154	152,160
Niches	Lateral walls	151							182,183	
	Front walls	162							161	179
	Alter			165						
	Aux. spaces	163							163	163
Orientation		+14°	-50°	+147°	-10°	Unknown	-4°	+21°	+20°	+/- Zero
Location		Aswan			Naj' Al-Hajar	Nubia	Al-Bagawat	Al-Dakhla	Al-Baharyia	Sinai

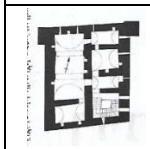
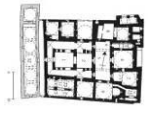
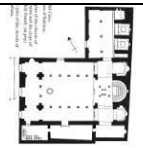
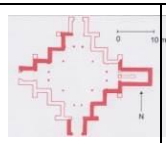
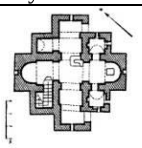
		7th Century									
10/27											
Main Hall	Basilica	1	1	1	1	1	2		1	1	1
	B.Transept										
	Coptic							3			
	Central										
Dividing main hall					9	7,8		9			
Bays	No. of bays	12,13,15	12,13,15	12,13,15					12,13,15	12,13,15	12,13,15
	Transept										
	Choir									20	
	Return Aisle	21	21	21		21			21		21
	I.narthex									21	
Pilasters	Front walls	25									
	Lateral walls				27						
	Outer pilasters										
Columns	Between bays	39,40,41	39,40,41	39,40,41					39,40,41	39,40,41	39,40,41
	Return aisle	48	48	48					48	48	48
	transept										
	choir									50	
	ambulatory										
	I.narthex										
Sanctuary		66	66	66	66	66		66	66,67	67,70	67
Aux. spaces	Flanking rooms	76,77	78	78	78	78,79		78,79	78,79	80,82,79	76
	Choir					87,91		84,82,83			
	Aux.	94,95,96,97		103,104	96	100					
	I. narthex/R.aisle					101,112				100,110	
	Portico/concha										
	Outer narthex										
	Atrium	102									102
	Dhefir										84,79
	Doksar										
	Stairs	113			118					114	
Doors	Main Hall	125,129,131,	124 126	124	126	126,135	126	134,	126	125	
	Aux. spaces	135,14,146,	135,146	135,126	135,146	135,142		146	135		
	Main entrances	131				129		123	129		129
Windows										150,159,160	
Niches	Lateral walls			151,155	151	155			153, 155		
	Front walls			159,162	161,162	161,162		162	162		
	Alter			165	170,167,163	170,167		165		179	
	Aux. spaces	182		169	167	170,171		169,158,167		175,169,167	
Orientation		+11°	+20°	+/-Zero°	+10°	+/-Zero°	+16°	+20°	+17°	-29°	+5°
Location		Alexandria	Kellia			Wadi Al-Natrun				Cairo	Saqqara

		7th Century									
10/27											
Main Hall	Basilica	1	1	1	1	1		2		1	2
	B.Transept										
	Coptic										
	Central						3				
Dividing main hall											
Bays	No. of bays/sections	12,13.15	12,13,15		12,13,15	12,13,15				12,13,15	12,13,15
	Transept										
	Choir	20			20				20		
	Return Aisle	21							21		
	I.narthex										
Pilasters	Front walls	23			25		23				
	Lateral walls	27,28,29			27,28,29						
	Outer pilasters										
Columns	Between bays	39,40,41	39,40,41		39,40,41	39,40,41				39,40,41	39,40,41
	Return aisle	48							48		48
	Transept										
	Choir								49		
	ambulatory										
	I.narthex										
	Aux										
Sanctuary		67	66,69	67	66	67	67	67	66,67,68	67	66
Aux. spaces	Flanking rooms	78	78,79	78,79	78	78,79	78	82,83	75,79	78	78,79
	Choir	87,91									
	Aux						78			94,98	
	I. narthex/R.aisle	101,111			101,111					101,111	
	Portico/concha						67				
	Outer nathex										
	Atrium										
	Dhefir										
	Doksar			98							
	Stairs			112							
Doors	Main Hall	129+144,125,126	126		124	127					
	Aux. spaces	148,144	136		135+144	147	135,137	136	137	146	136
	Main entrances	129	134			129	126				126
Windows											
Niches	Lareal walls				151						
	Front walls				163						
	Alter		165			175	179	174	175,178		
	Aux. spaces	163	165,163		165	165	179			179	
Orientation		+6°	+2°	+8°	+3°	+2°	+34°	+20°	+30°	-20°	+20°
Location		Saqqara	Al-Fayyoum				Al-Minyia	Asut	Sohag	Luxor	

		7th Century									
7/27											
Main Hall	Basilica	1	1	2	1		1				
	B.Transept										
	Coptic										
	Central					2		2			
Dividing main hall				10,11	8,9			10,11			
Bays	No. of bays/sections	12,13,15				12,13,1,15	12,13,15				
	Transept										
	Choir	20									
	Return Aisle	21									
	Inner narthex					21					
Pilasters	Front walls					26					
	Lateral walls					27,28,29					
	Outer pilasters										
Columns	Between bays	39,40,41				42,43,44	39,40,41				
	Return aisle	48									
	Transept										
	Choir										
	ambulatory										
	Inner narthex										
	Ex. spaces										
Sanctuary		67	66	66	66	67,70	67,71	67			
Aux. spaces	Flanking rooms	78,79	78,79	78,79	78	78	78	80,81			
	Choir	87,92		87,92							
	Aux. spaces	96				96		96			
	Inner narthex					101					
	Portico/concha					67,78					
	Outer narhtex										
	Atrium										
	Dhefir					86					
	Doksar										
	Stairs		112	112		113					
Doors	Main Hall			146		129,131		146			
	Aux. spaces	146+145	135	135	136	137,146	135	146			
	Main entrances	131	123	123	124	125	129				
Windows			154		152,160						
Niches	Lateral walls										
	Front walls										
	Alter				165			174			
	Aux. spaces			163		179		174			
Orientation		+20°	+/- Zero°	unknown	Unknown	-20°	unknown	+5°			
Location		Luxor	Nubia					Al-Dakhla Oasis			

10/16		8th Century									
											
Main Hall	Basilica	1		1	1	1	1	2	1	1	1
	B.Transept										
	Coptic		2								
	Central										
Dividing main hall								10,11		8,9	
Bays	No. of bays/sections	12,13,15	12,15	12,13,15	12,13,15	12,13,15					
	Transept										
	Choir	20		20		20	20		2	20,11	
	Return Aisle			21	21	21					
	Inner narthex		21				21				
Pilasters	Front walls	24	25				23	23	23		
	Lateral walls							27,28,29			
	Outer Pilasters										
Columns	Between bays	42,43,44	39,41	39,40,41	39,40,41	39,40,41					
	Return aisle			48	48						
	Transept										
	Choir					49					
	Ambulatory										
	Inner narthex										
	Ex. spaces										
Sanctuary		67	67	66,67,74	66	67	67	67	66	66	67,
Aux. spaces	Flanking rooms		80,81	78,79	78,79	78,79		78,79	78	78	78,79
	Choir	87,92		87,92			78	66	66,78,79	66,78,79	66,78,79
	Aux. spaces		94	95,96	95		87,89,97				
	I. narthex/R.aisle	101,110	101,109				101,109,11				
	Portico/concha										
	Outer narthex										
	Atrium										102
	Dhefir										
	Doksar			95	94						
	Stairs	115									
Doors	Main Hall	144		128	126	128	124	126		123	126,134
	Aux. spaces	146		135,139,146	135,146	135	135,146	135,146	135		
	Main entrances	123	125	126	126		133	129	129	129	129+145
Windows			152	152,159,160	150,152,159,160	152					
Niches	Lateral walls	151						151,153		151	
	Front walls		161							161	
	Alter		179	179	165	165					
	Aux. spaces			163,165		165		165		158	
Orientation		-13°	+35°	-15°	-16°	-10°	-12°	+/-Zero°	+/- Zero	+26°	+42°
Location		Alexandria	Cairo					Hilwan	Asut		Luxor

		8th Century									
6/16											
Main Hall	Basilica	3	1	1	2		2				
	B.Transept										
	Coptic					3					
	Central										
Dividing main hall											
Bays	No. of bays/sections	12,13,15	12,13,15	12,13,15	12,13,15	12,15	12,15				
	Transept										
	Choir										
	Return Aisle										
	Inner narthex										
Pilasters	Front walls						23				
	Lateral walls										
	Outer pilasters										
Columns	Between bays	39,40,41	39,40,41	39,40,41	39,40,41		39,41				
	Return aisle										
	Transept										
	Choir										
	Ambulatory										
	Inner narthex										
	Ext. spaces					62,63,64					
Sanctuary		67	67	67	67	66,67,70	67				
Aux. spaces	Flanking rooms			78,79	78,79	82,83	78,79				
	Choir						87,92				
	Aux. spaces	82,83	102		78		66,67				
	I.narthex/R.aisle										
	Portico/concha										
	Outer narthex										
	Atrium										
	Dhefir	86,79				87					
	Doksar				94		94				
	Stairs	112,121	119	118			112				
Doors	Main Hall	134 (ne)	133				125				
	Aux. spaces	136		135	134,135		135,146,147				
	Main entrances		123	123	129	129					
Windows		152									
Niches	Lateral walls			151			156				
	Front walls			159,162							
	Alter		179								
	Aux. spaces						163				
Orientation		-43°	+/-Zero°	+38°	unknown	unknown	+20°				
Location		Aswan			Nubia						

6/6		9th Century									
											
Main Hall	Basilica	3		1	1						
	B.Transept										
	Coptic		3								
	Central					2	2				
Dividing main hall			8	8,9			7,10				
Bays	No. of bays/sections				12,13,15						
	Transept										
	Choir			20	20						
	Return Aisle			21	21						
	Inner narthex										
Pilasters	Front walls				23						
	Lateral walls										
	pilasters										
Columns	Between bays										
	Return aisle										
	Transept										
	Choir										
	Ambulatory										
	Inner narthex										
	Aux. spaces										
Sanctuary			66,69	66	67	67	67				
Aux. spaces	Flanking rooms		78,79	78,79	78,79						
	Choir			87,92	87,92	66,78					
	Aux. spaces	94	99,100,94	94,95,96	95,96	66,94					
	I. narthex/ R.aisle			101,110	101,110						
	Portico/concha					67	67				
	Outer Narthex										
	Atrium										
	Dhefir										
	Doksar		95	95			**66**				
	Stairs				113	113	112				
Doors	Main Hall		125,129	146	124,131		124				
	Aux. spaces	146	125,146	135,146	139,146	135,136,139,146	137,136				
	Main entrances	131		129	129	124	131				
Windows		152		164			150,160				
Niches	Lateral walls		151,153,156				162,163				
	Front walls	162	161								
	Alter	162	179	165	179						
	Aux. spaces		165,163	165,163	179						
Orientation		+17°	-9°	+10°	-30°	+/-Zero°	-50°				
Location		Wadi Al-Natrun			Cairo	Nubia					

5.4. The Language of Designs

5.4.1. Derivations

The parametric shape grammar developed above defines the language of Coptic church designs. A derivation illustrates how the shape rules in the grammar may be applied to generate a specific design in the language. Figures 5.8. to 5.25 show three different derivations. Each figure illustrates the six stages of the various intermediary designs through which a derivation proceeds before it produces the final design shown as seventh. Arrows between the different designs shown indicate the direction through which the derivation proceeds. The numbers above these arrows indicate which rules are applied to the previous design to generate the following one. Each derivation generates a different type of church: a Basilica plan type (See figures 5.8.: 5.14), a Coptic type (See figure 5.15: 5:19), a central type (See figure 5.20: 5.25). Other instances of one of these four types are also possible.

5.4.2. Three Simple Types

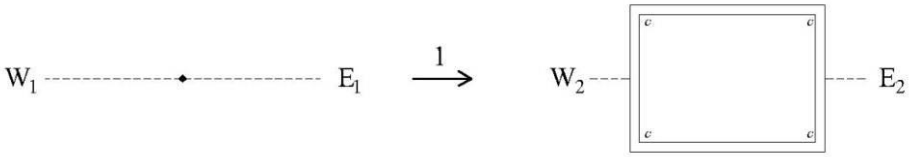
The grammar classifies the designs in language into three simple types. Formally, each type is a sublanguage of the language defined by the grammar. Each sublanguage is defined by a sub-grammar consisting of a particular subset of shape rules. Designs are classified into one of these types during the first four stages of a derivation (main hall, bays, columns and auxiliary spaces). The classification is encoded both in the shape rules and in their admissible application sequences during these four stages. A sequence of possible shape-rule applications is called a shape-rules lattice. Figure 5.26 shows the shape-rules lattices for stages from one to three.

The rule schemata of stage 1 reflect the constraints Copts had to deal with while building the churches. The rules in this stage take into account the possibility of adopting an irregular outline of the main hall. The application of this rule is mandatory, because a main hall is quintessential element shared by all types.

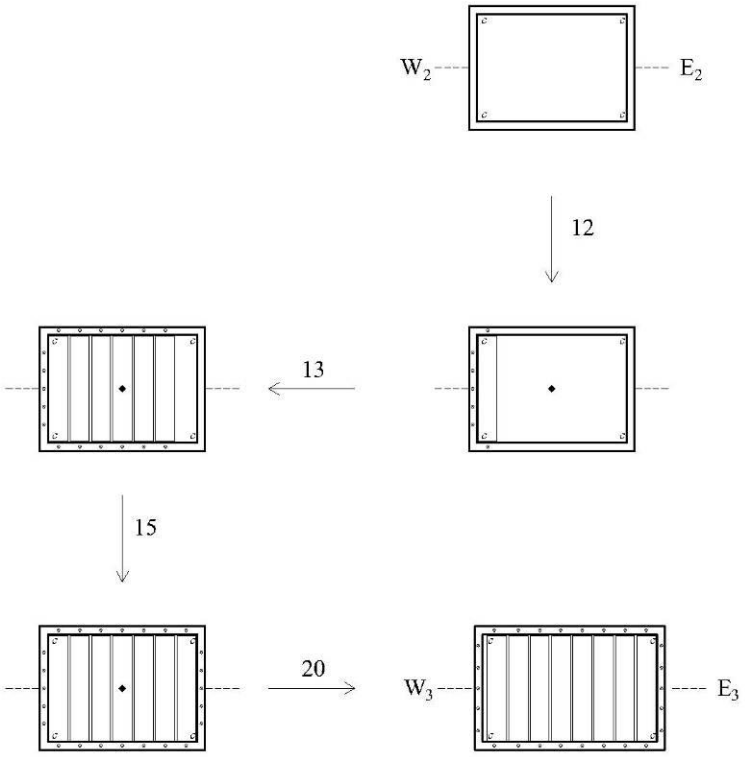
5.4.2.1. Derivation Model for Basilica Plan

The parametric shape grammar developed above defines the Coptic language of church designs. A derivation illustrates how the shape rules in the grammar may be applied to generate a specific design in the language. Figures 5.8 to 5.14 show three different derivations. Arrows between the different designs shown indicate the direction through which the derivation proceeds. The numbers above these arrows indicate which rules are applied to the previous design to generate the following one. Each derivation generates a different type of church: a basilican type, a Coptic type, and a central-plan type. Other instances of one of these three types are also possible.

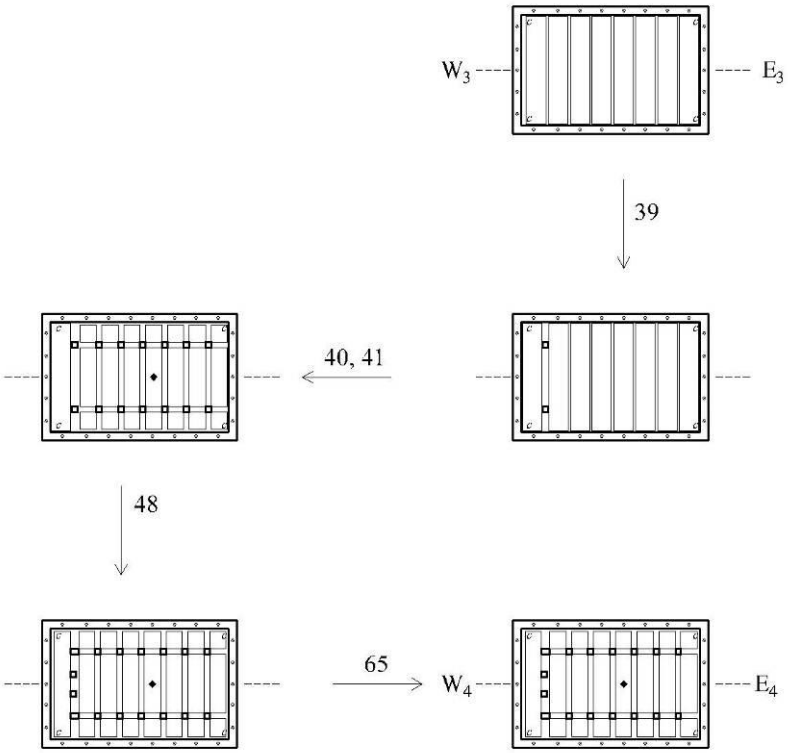
To illustrate how the previous rule schemata work on the basilican paln, they will be applied on one of the significant Coptic basilican plans, Al-Adra Church. It is selected because it is considered the main church of Baramus monastery. Today it is a huge building, and its origins go back to the seventh century, yet it is the oldest remaining church in Wadi El-Natrun. [107: 791]



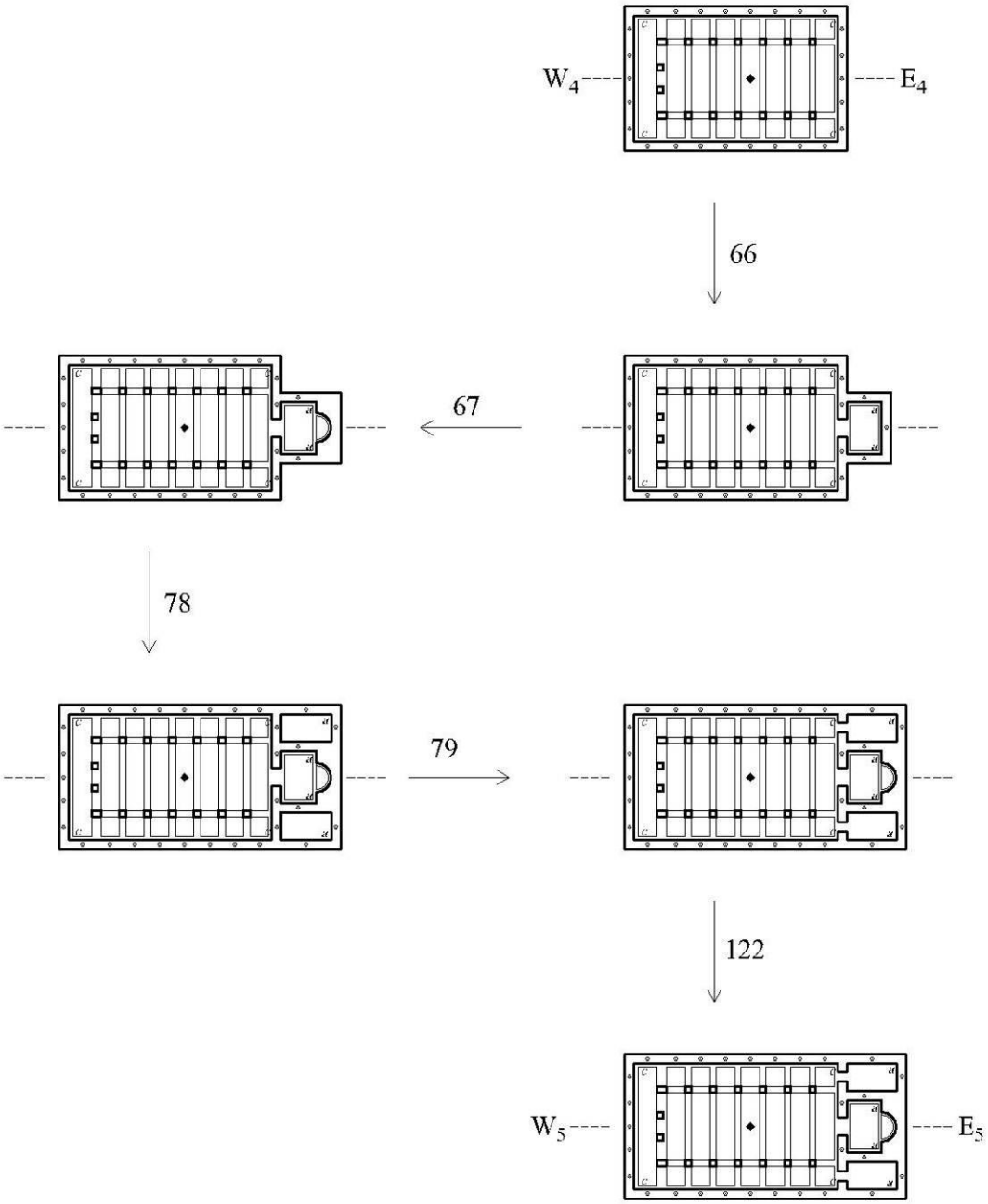
▲Figure 5.8. Model 01: To insert the main hall



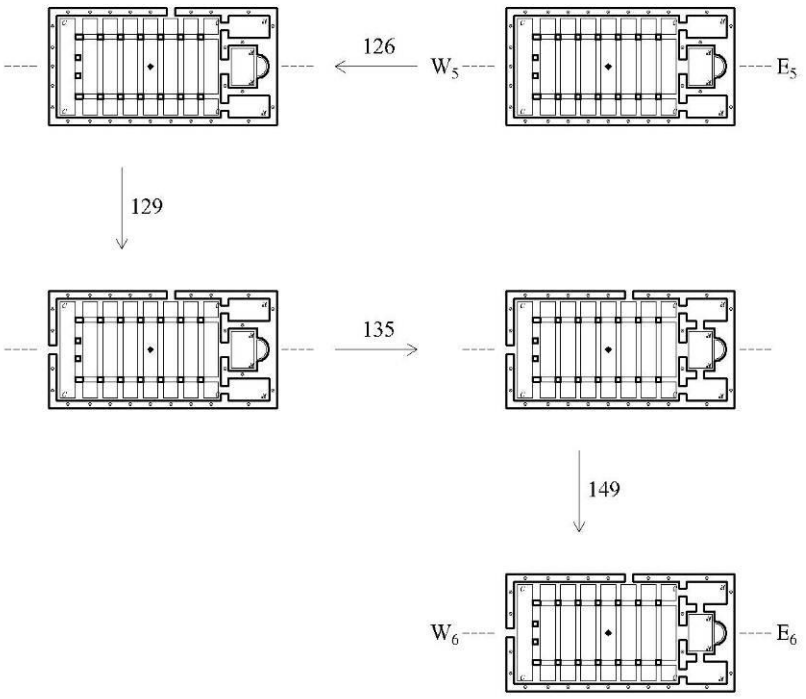
▲ Figure 5.9. Model 01: to dispose bays of the main hall and the return aisle



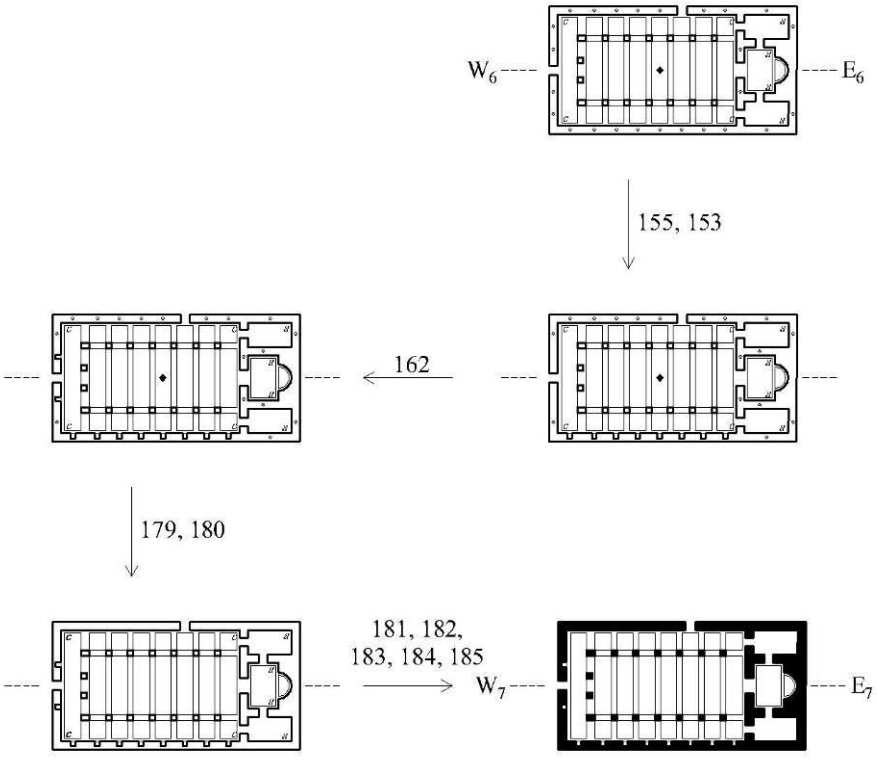
▲ Figure 5.10. Model 01: to fix columns in the main hall



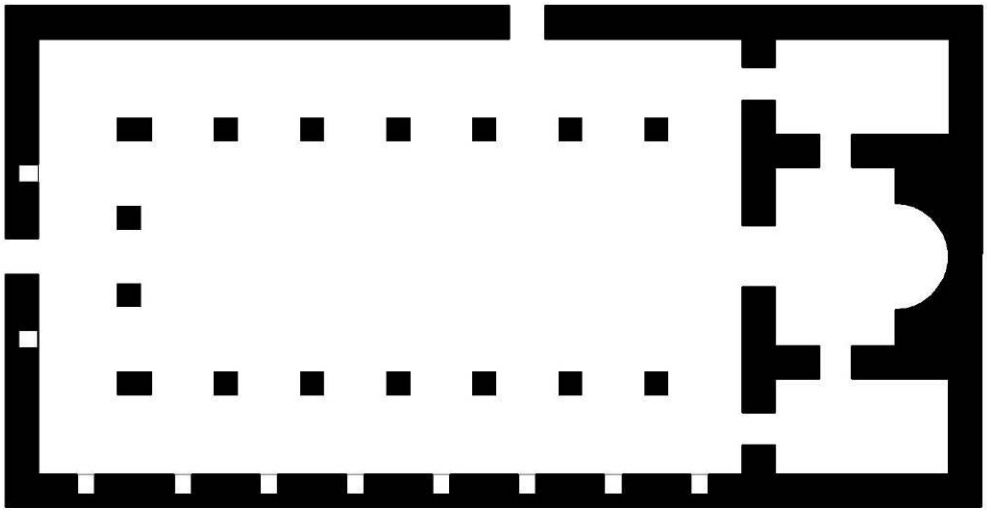
▲ Figure 5.11. Model 01: to add auxiliary spaces



▲ Figure 5.12. Model 01: to insert doors



▲ Figure 5.13. Model 01: to insert niches



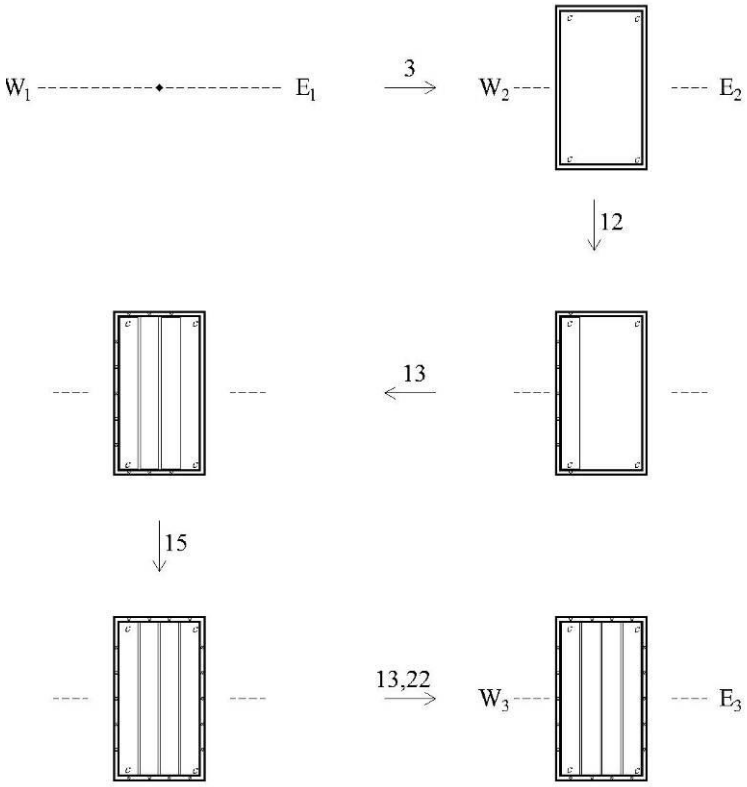
▲ Figure 5.14. Model 01: Final plan of the basilican church

5.4.2.2. Derivation Model for Coptic Plan

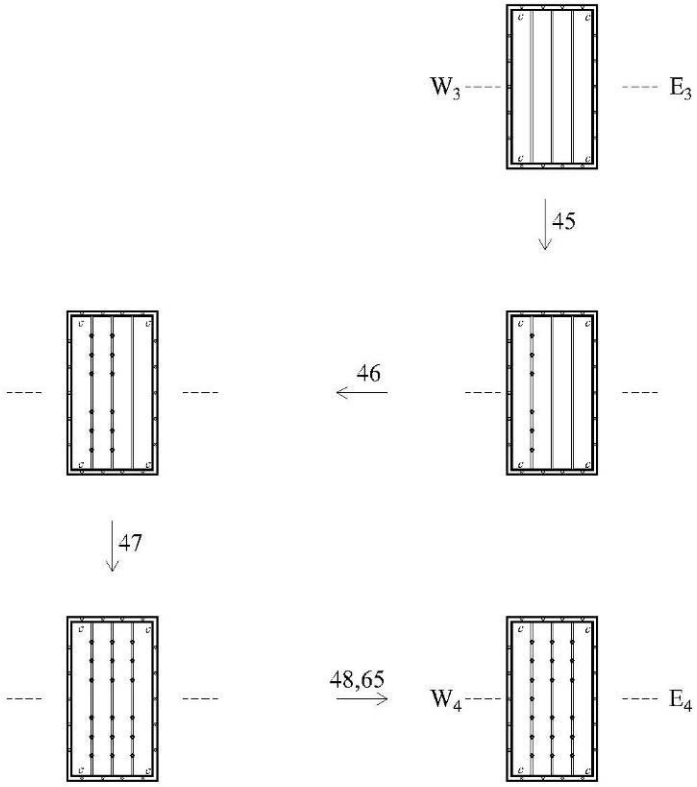
Coptic plan church has a transversal rectangular naos. It is divided into a number of rows in which prayers take their place in the church according to their classification. The Copts at that time believed that prayers were classified into weepers (standing outside the church or in the narthex), followed by preached class, then the kneeling people, and finally believers who stand very close to the sanctuary. [96]

One of those Coptic plan churches was found in Madinet Madi in Al-Fayyum. It was discovered by an Italian expedition in 1978 C.E., within a set of churches dating back to the fifth and sixth centuries [108: 140]. About three churches of the same plan type were found in that site. Italians name them by letters and numbers CH 87 D, CH 88 H, where Gorssmann described them as five-aisle naos, and the chosen one as a model in this study CH 88 G, which is seven-aisle. [109: 1498].

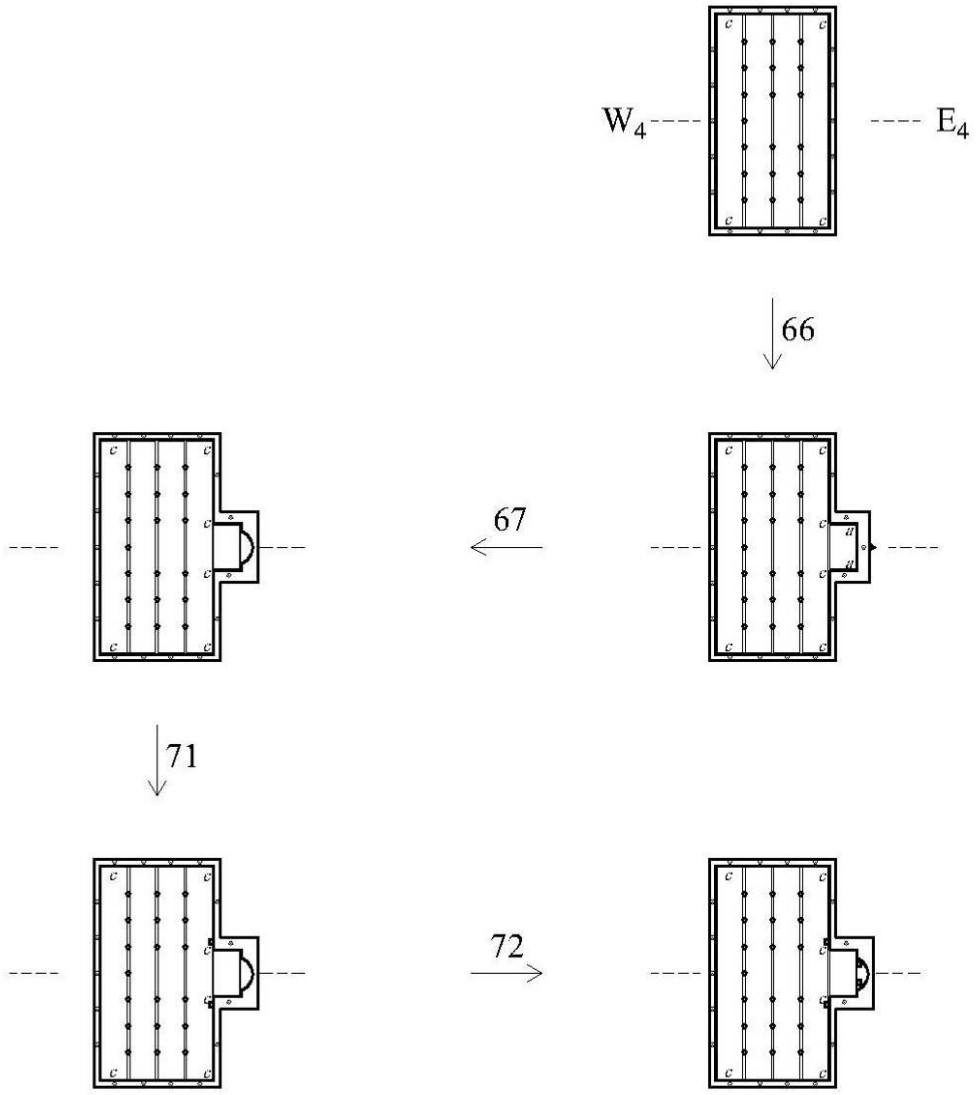
The derivation illustrated by figures 5.15:5.18 show how the shape rules in the grammar may be applied to generate a Coptic plan design in the language.



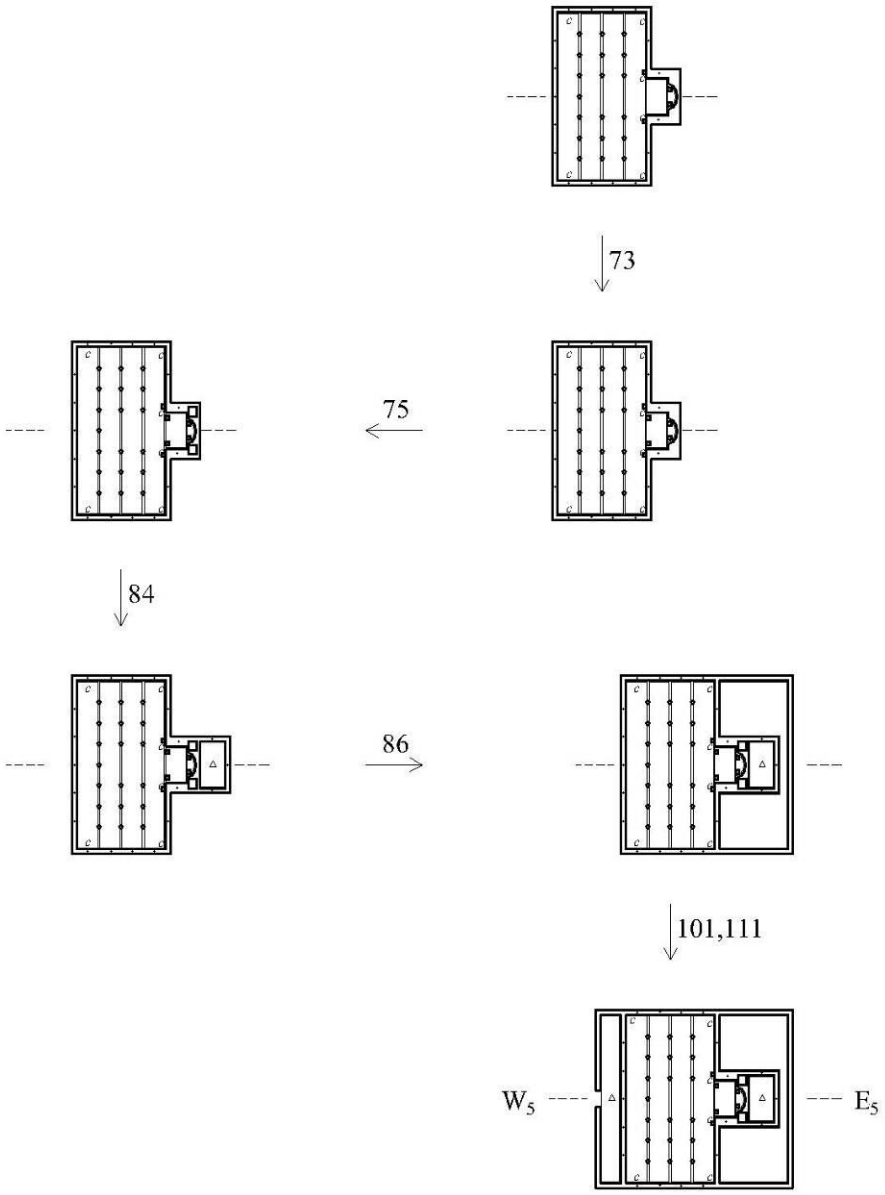
▲Figure 5.15. Model 02: To insert the main hall and bays



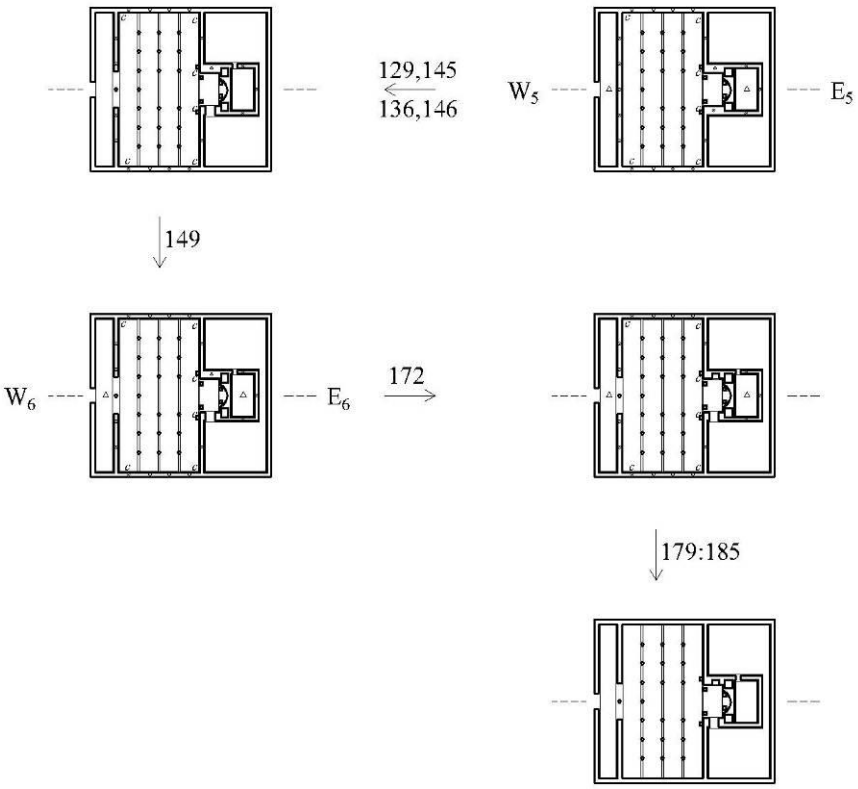
▲Figure 5.16. Model 02: To insert the columns



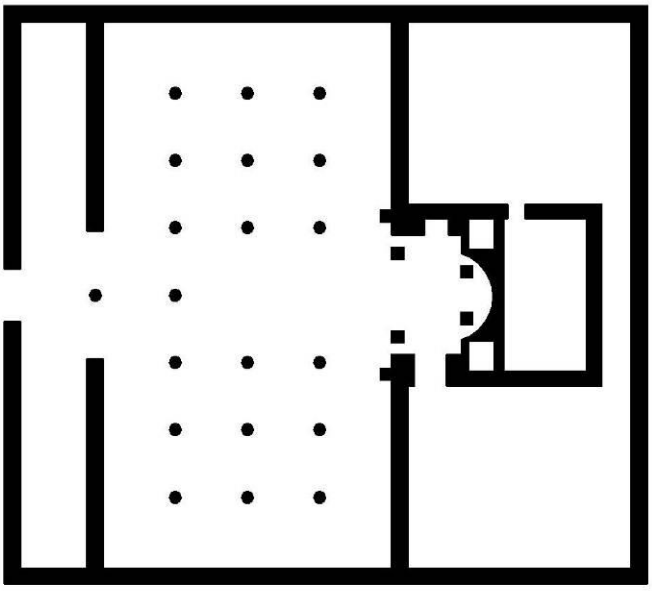
▲Figure 5.17. Model 02: To insert the auxiliary spaces *(continue)*



▲Figure 5.17. Model 02: To insert the auxiliary spaces



▲Figure 5.18. Model 02: To insert doors

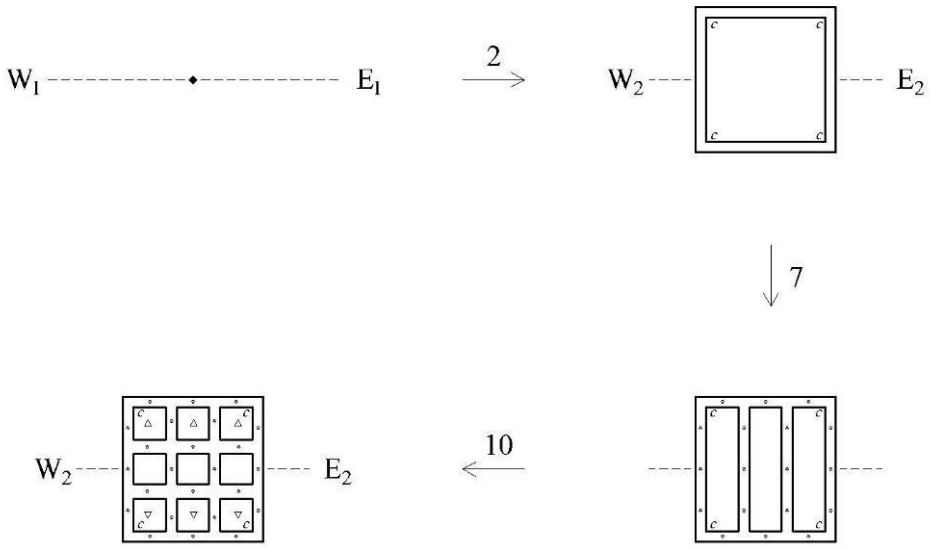


▲Figure 5.19. Model 02: Final Coptic plan

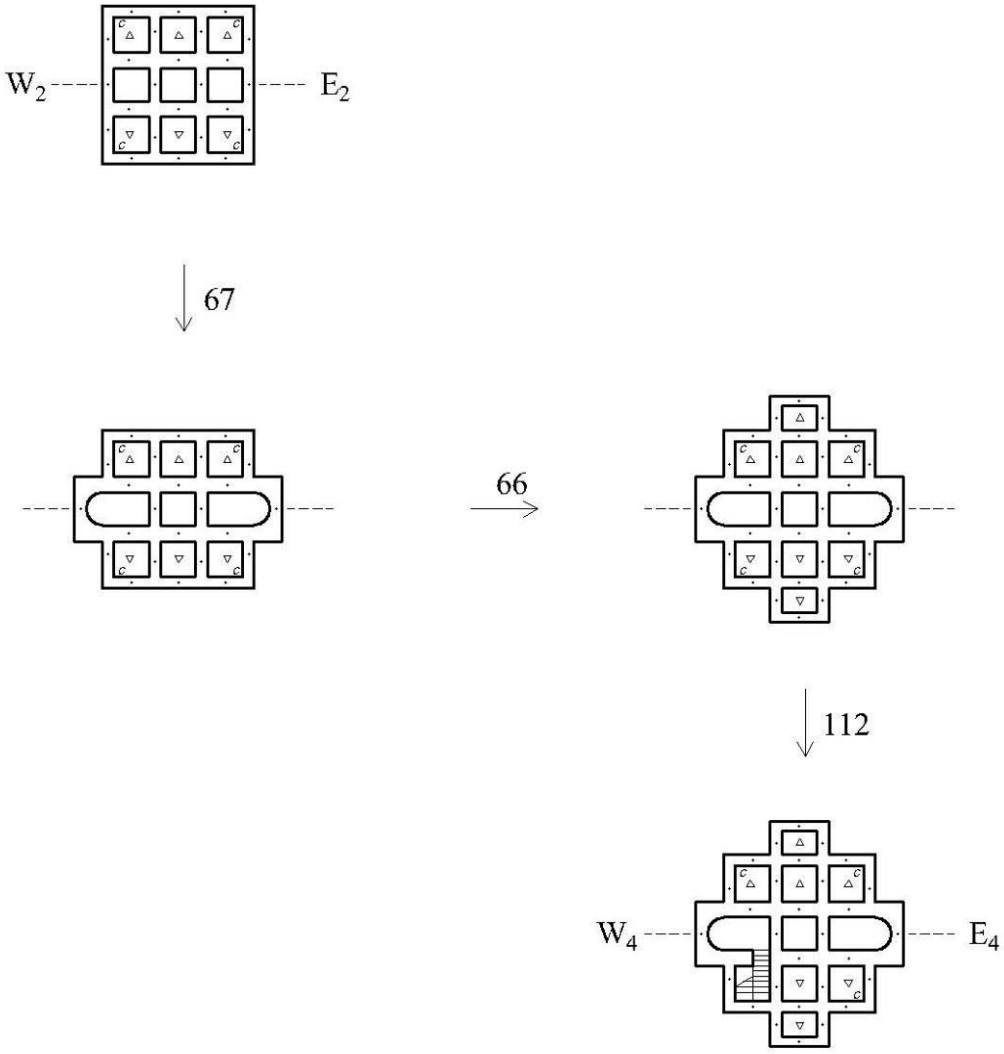
5.4.2.3. Derivation Model for Central Plan

Central plan churches usually refer to the Byzantine plan, whereas the Byzantine plan churches are not common during that time. Yet, other central plans were found back then in Upper Egypt in Nubia. They are crucified central plans.

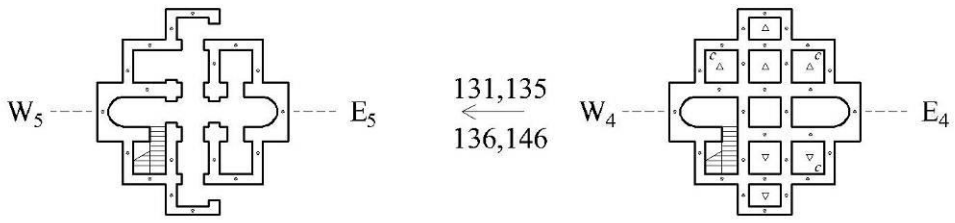
Church of St. Betameet is one of them. It is assumed to be constructed in the ninth century C.E. [110: 236]. Although it has a central crucified plan, it follows the same Coptic architectural language as illustrated in figures from 5.20 to 5.25.



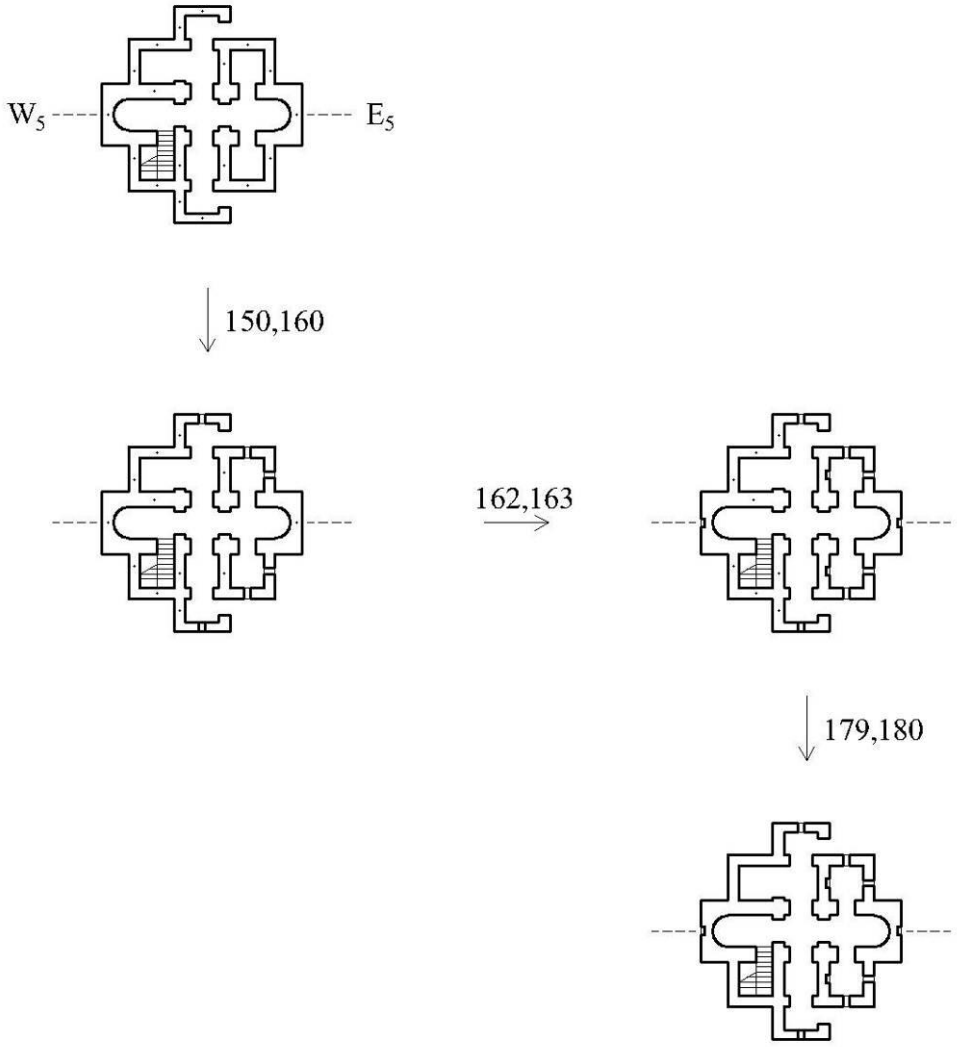
▲Figure 5.20. To insert the main hall and dividing bays



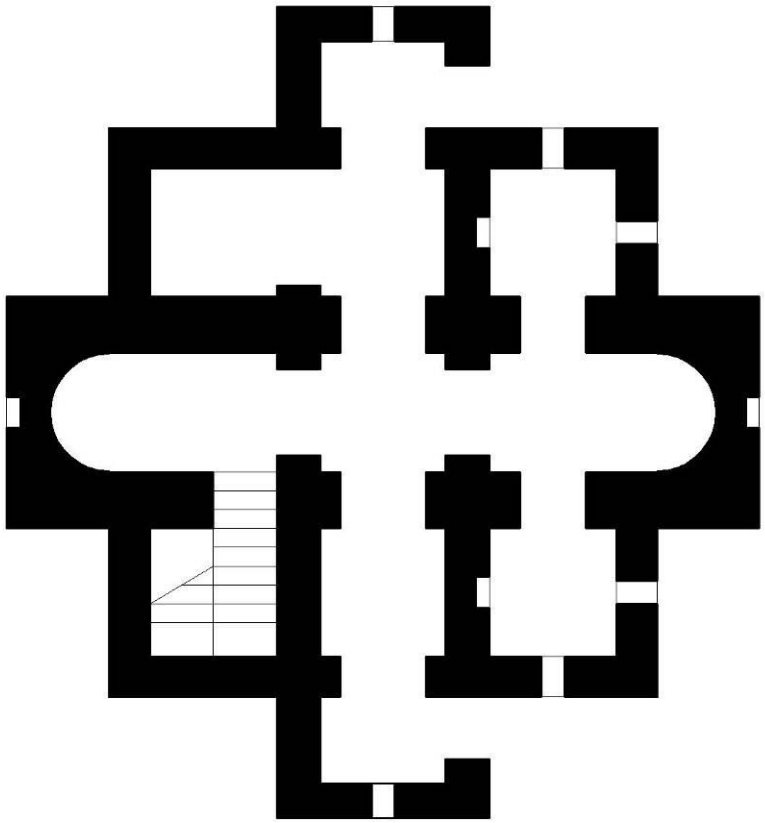
▲Figure 5.21. To insert auxiliary spaces



▲Figure 5.22. To insert doors



▲Figure 5.23. To insert windows and niches

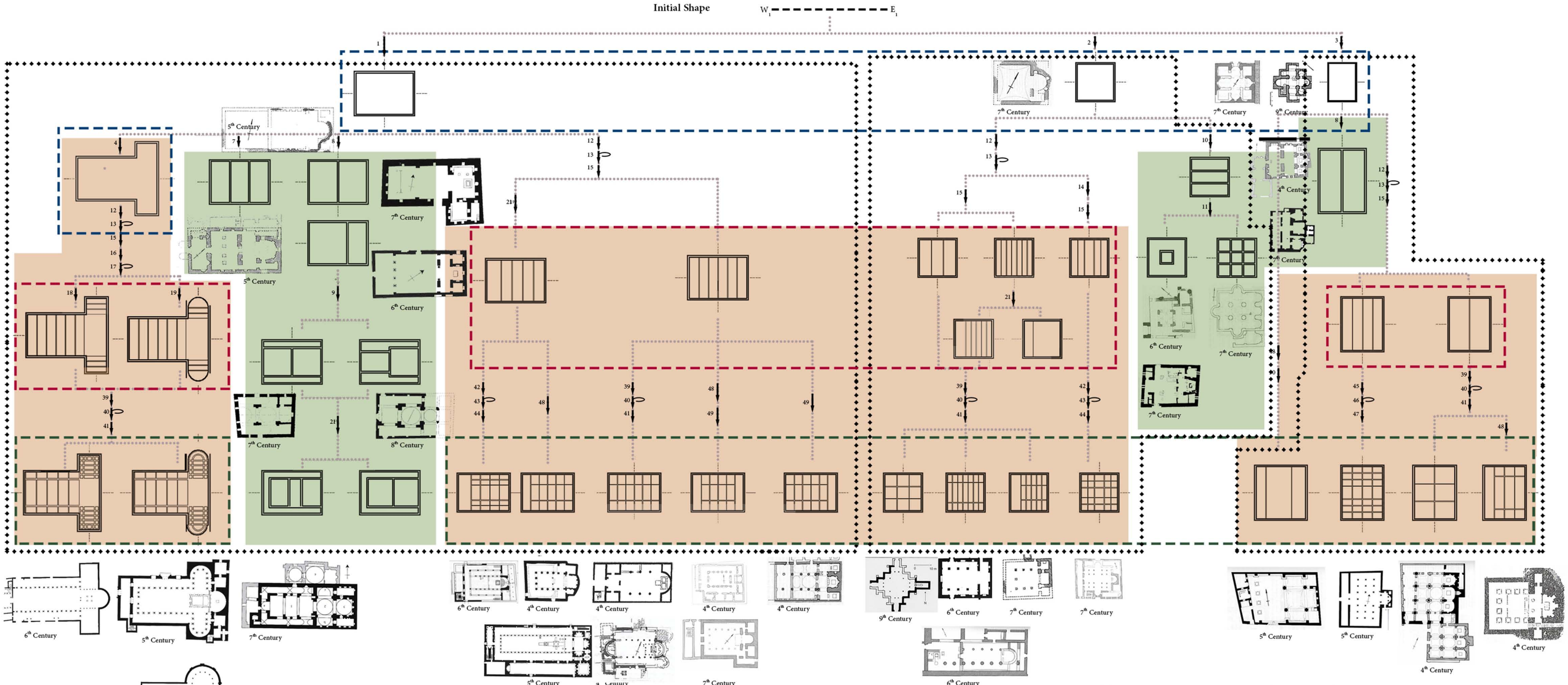


▲Figure 5.24. Model 03: Final Central plan

5.5. Mapping of Coptic Churches

The grammar classifies the designs in language into four simple types. Formally, each type is a sublanguage of the language defined by the grammar. Each sublanguage is defined by a sub grammar consisting of a particular subset of shape rules. Designs are classified into one of these types during the first four stages of a derivation. The classification is encoded both in the shape rules and in their admissible application sequences during these three stages. A sequence of possible shape-rule applications is called a shape-rules lattice. Figure 5.26 shows the shape-rules lattices for stages 1 to 3.

▲ Figure 5.25. Mapping of Coptic Churches according to their rule schemata



This diagram traces the movement of deriving rules of Coptic churches shape grammars of Coptic architectural language, which indicates; their simplicity in transforming the design to develop the model of the church, and the richness of the design ideas that where generated from the Coptic multicultural community, between 4th century and 9th century C.E. That way of development and such ideas gave them the opportunity of satisfy their functional need, and –consciously or unconsciously- obey their social conformity pressure of social interaction between their cultural groups.

Dividing the Main Hall by Walls

Churches built using dividing rule schemata, that divides the main hall by walls, are usually roofed by domes, vaults or both. By tracing the design transformation of Coptic churches it is noticed that dividing the main hall by walls were used after the 6th century. Thus, from that, thus research can deduce that building by that way was a result of the cultural groups' interaction between Copts and Arabs.

This does not mean that Copts never divide the main hall by wall before, however, they used this way in Coptic plan churches since the 4th century, with transversal rectangular main hall, and churches built in the reused ancient

Basilican Plan with Transept

The main halls of the Basilican plan churches with transept never divided by wall. Their main hall is divided into bays, which are separated by columns derivate by the rule schemata of stage three. The First basilican plans churches with transept were built under the orders of Emperor Constantine, in both cities; Rome and his 'New Rome', Constantinople.

However, after the 6th century C.E. Coptic churches with transept never built any more [111]. Normal basilican plans and Coptic plan churches has been developed after that during the rule of Arabs.

5.6. Conclusion

From the previous analysis we can recognize the design of Coptic churches. The distinguished features of each group of churches, according to applying the grammatical shape rules derivation, is influenced by its surrounded circumstances and the social whole of the Egyptian community.

In the next chapter, a discussion takes place concerning that, to explain the cultural/multicultural influences that distinguish each group of them and puts clear justifications for the exceptional plans of Coptic churches back then.

Chapter 6 Discussion and Recommendations

6.1. Introduction

6.2. Before the Fourth Century

6.3. The Multicultural Influences on Church's Plan Form

6.3.1. Basilican Plan Church

6.3.2. Central Plan Churches

6.4. The Multicultural Influences on the Architectural Elements of the Coptic Church

6.4.1. Transept

6.4.2. Dhefir

6.4.3. Apse

6.5. Recommendations

6.5.1. Future Researches

6.5.2. Future Practice

6.5.3. Related Issues

6.6. Conclusion

6.1. Introduction

Depending on the previous five chapters, this chapter discusses the dynamic changes that occurred on the design of churches throughout six centuries; from the fourth to the ninth centuries. The structure of the Egyptian community can be considered interactive pluralism type that cast its shadow on the design of Coptic churches. During that time, dynamic changes happened to the community; it is just turned to an interactive dynamic pluralism state.

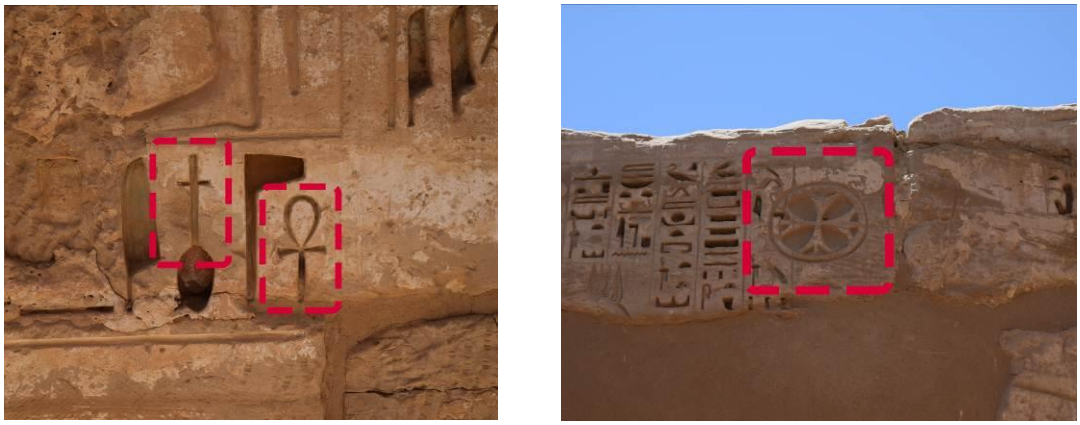
By tracing the rule schemata of Coptic churches, we can see that dynamic reflection on the design of churches. This chapter goes deep through the six stages of analysis applied in chapter five, to discuss each of them from the cultural/multicultural point of view.

As the church is considered the house of God, the emphasis of this study, however, is not to stress abstract ritual concepts or architecture developments so as to cover its applying to true spiritual concepts, to enable Copts to practice them in their daily lives, in a way consistent with the surrounding social and cultural changes. During the period in which the research is concerned, from the 4^{th} to the 9^{th} centuries, the main cultures that existed in Egypt were: the inherited ancient Egyptian culture, the Rroman, the Byzantine and then the Arabian culture. Each one of those had its own impact on the design of the church, in which Copts were able to adapt themselves with the social challenges and circumstances to satisfy their spiritual needs and to keep pace with the society and time. To this end, they found their own and special way in designing churches, and their social and cultural decisions created their architectural Coptic language.

In the early Christian period, their first decision was not refusing to practice their rituals inside the ancient Egyptian religious buildings, unlike the Roromans, where the architectural formulas for temples were unsuitable for their pagan associations, and because pagan cult ceremonies and sacrifices were made outdoors under the open sky in the sight of the gods, with the temple, housing the cult figures and the treasury, as a backdrop. The usable model at hand, when Constantine wanted to memorialize his imperial piety, was the familiar conventional architecture of the basilicas [113]. As a result of this decision, which seems superficial, many design decisions were made.

6.2. Before the Fourth Century

In the beginning, Copts took from the ancient Egyptian temples and tombs a haven to practice their simple rituals. They reconciled the inner design of those buildings to be to be used as a church. They added their ornaments around the place (Figure 6.1.) and disposed architectural elements in its place to reuse the space (Figure 6.2.). It should be emphasized here that the Egyptians had nothing to prevent them from taking the deserted ancient Egyptian temples as churches even after they were officially allowed to build them, often for political reasons and the conditions of persecution they were subjected to.



▲Figure 6.1. The temple of Habu, Luxor, Coptic ornaments. (The researcher)

▲Figure 6.2. the 6th tomb at Bani Hassan. Cops added their ornaments and disposed their architectural elements (the researcher)

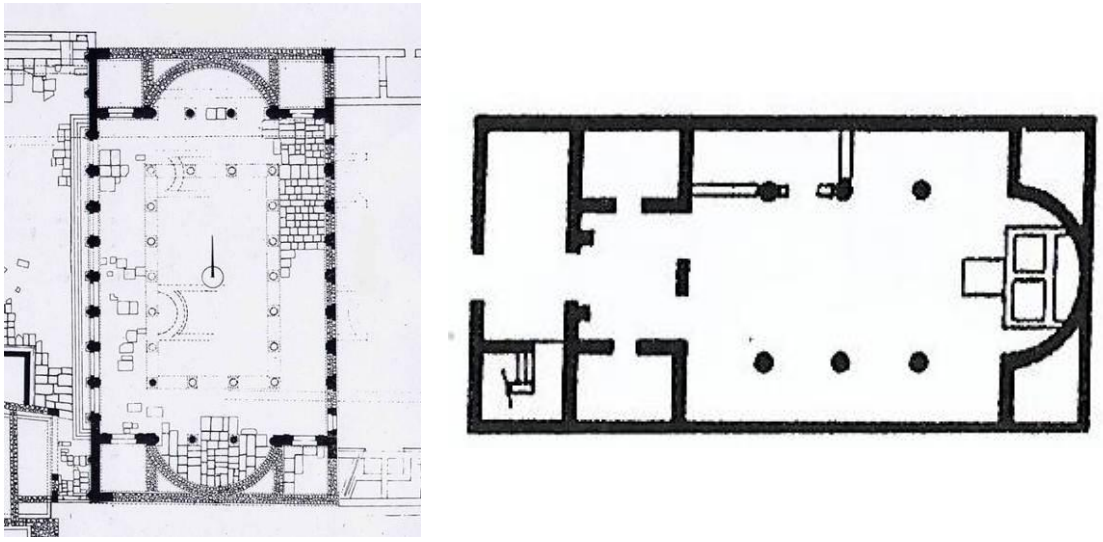
Constantine's declaration of Christianity was in 312 C.E. Christianity became the official religion for the Roman Empire. Copts in Egypt were allowed to erect their churches officially. During that time they were influenced by their inherited ancient Egyptian, Greek and Roman cultures. Generally, Egyptians were open to deal with that cultural stock.

6.3. The Multicultural Influences on the Church Plan Form

The main hall is the main factor that forms the plan of the church. The footprint of the Coptic plan has various forms: basilican, Coptic, byzantine or crucified plan. Each of them reflects a different cultural influence. According to the results of rule schemata illustrated before, this part will discuss the cultural for each one of them.

6.3.1. Basilican Plan Church

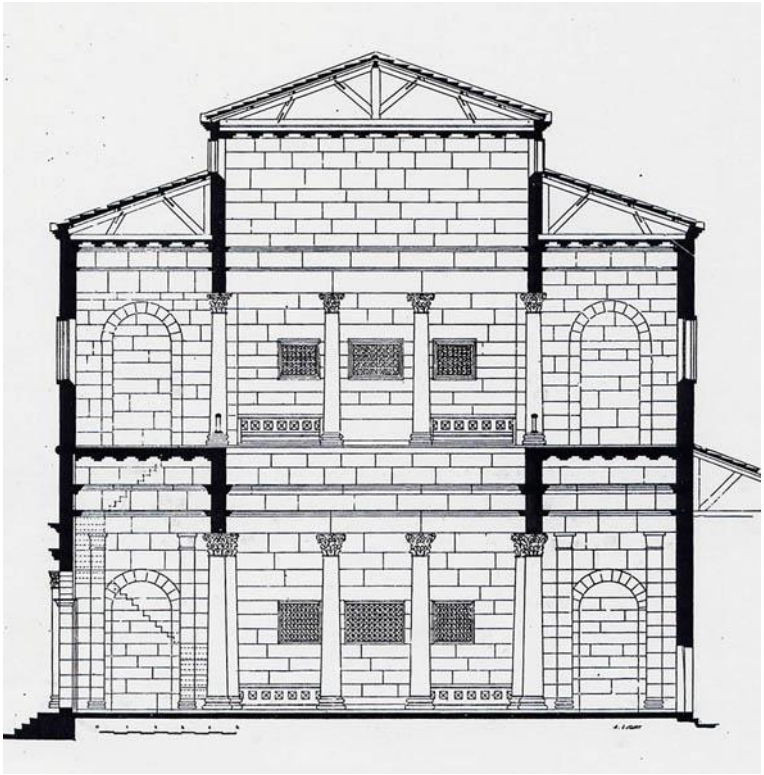
Originally, the basilica is a public Roman plan. Before turning the Roman Empire into a Christian empire, the Romans used the basilica as public buildings where courts were held, as well as serving other official and public functions. The basilica was centrally located in every Roman town, usually adjacent to the main forum [114]. Two factors reflected on Egyptians to use the basilican grammatical form: First, Egypt's existence was a major and important part of the Roman Empire for several decades before their conversion to Christianity, which explains why the Egyptians were influenced by the Roman culture that reflected on the architectural side. Second, the grammatical form similarities between the basilican plan and the ancient Egyptian temples, which make it easy for them to develop the basilican model and turn it into a church.



▲Figure 6.3. *left*: The Basilica of Volubilis, Morocco, 217 C.E. [115], *right: Church of Abu Mena, Alexandris, 4th Century C.E.*

Obviously, Figure 6.3 illustrates the grammatical similarities between the basilican plan model of the Coptic church and the Roman basilica. This is a repetitive

model of churches in Egypt. The Copts kept a rectangular clear form of the building, the nave and aisles, in addition to one of the porticos as well as the flanked two rooms beside that portico. They adjust the building orientation towards the eastern direction, where the kept portico is located. They converted the side arcades of the building into lateral walls, Just like the ancient Egyptian lateral walls' temples. The cross section of the Roman basilica shows the upper gallery, as the stairs located in the south western corner of the Coptic Church introduces an upper path to the gallery.



▲Figure 6.4. The cross section of The Basilica of Volubilis. [115]

6.3.2. Central Plan Churches

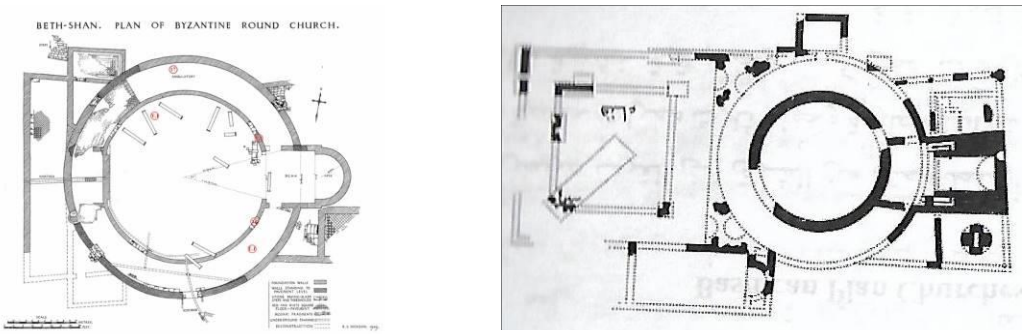
Central plan churches were not common in Egypt during the study period of this research. However, some of the later events of this kind still exist to witness the openness of Copts to the multi-cultures that they were subjected to and dealt with. According to this research, this type has two grammatical forms; the Byzantine church plans and the crucified church plan. Each one reflects different cultural influence.

6.3.2.1. Byzantine Plan Churches

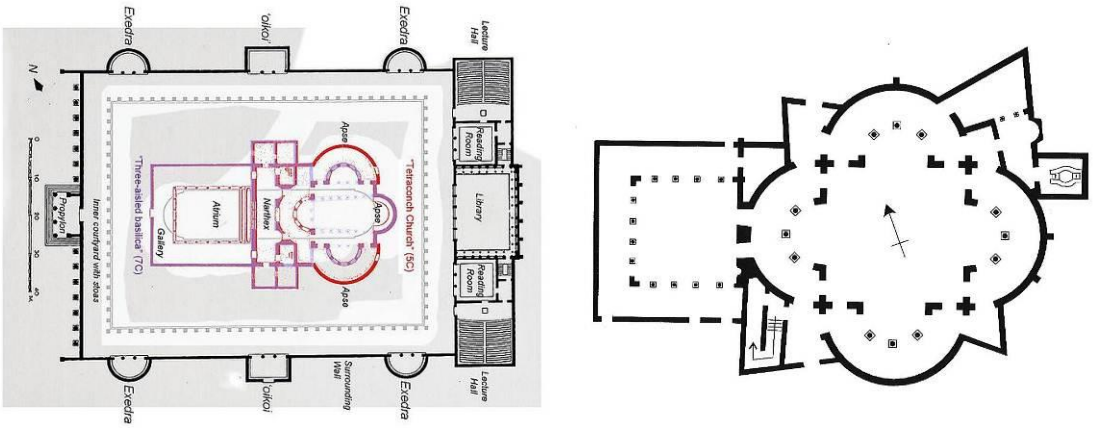
The non-proliferation of this species in Egypt had two reasons; the first is that after holding the Council of Chalcedon where Christianity became the Egyptians worldview, the Egyptian church differed with the Roman church followed by the Byzantine Empire. Therefore, the period when they were ready to build this type was

not large enough to be studied well. The second reason is that the grammatical architectural form of the Byzantine plan was quite different than any of the religious grammatical architectural forms of the Egyptian Cultural architectural inventory. However, they had nothing to stop using this plan from the religious point of view. The Byzantine influence can be noticed by tracing the roots of Byzantine plan churches (See figures 6.5. and 6.6.), which indicate the possibility of having similar grammatical compositions.

During the period covered by this research, only two churches with Byzantine plans were documented in Egypt, so the research did not address them with analysis or extract their architectural grammars, but they should be mentioned



▲Figure 6.5. *Left*: the round church at Beth Shean, 5th Century [116], *right*: the circular church at Sinai, Plusium villiage, Farma, Sinai [5]

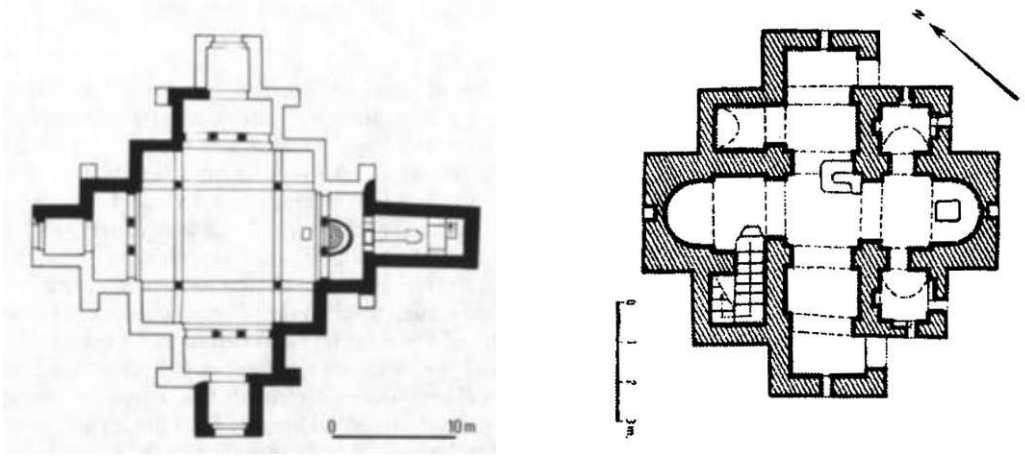


▲Figure 6.6. *Left*: the tetra-conch church of the Library of Hadrian, 5th Century [117], *right*: plan of east basilica of Abo Mena, Alexandria 6th century [108]

6.3.2.2. Crucified Plan Churches

This type appeared in Egypt during the ninth century. It was found in the south in Nubia, indicating the impact and openness of the Nubian culture on Egyptians. Also, this crucified plan was not common between Coptic churches elsewhere. Yet, the political conditions in Egypt were not stable back then, where huge revolutions broke

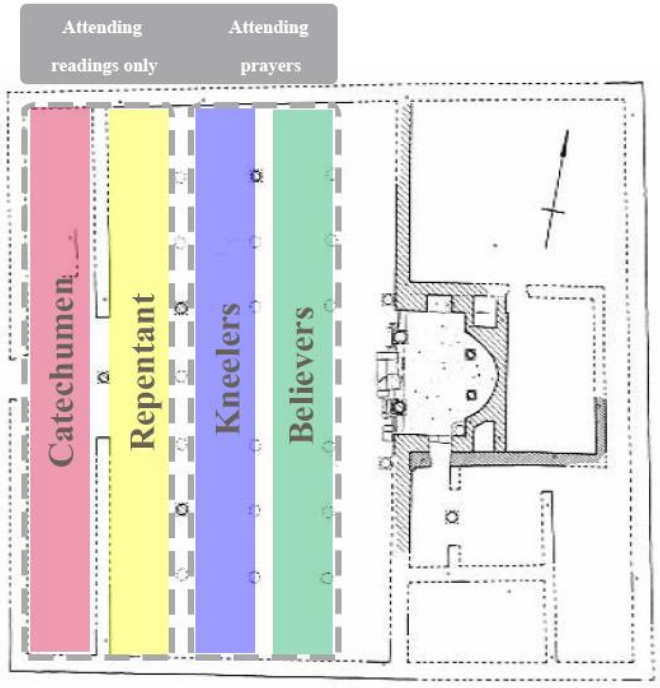
out, followed by many Egyptians turning from Christianity to Islam. Thus, fewer churches were built.



▲Figure 6.7. Left: the Mausoleum in Old Dongola, a crucified church, Nubia, 9th Century [118], right: Church of Angels at Tamit. 9th Century [118]

6.3.2.3. Coptic Plan Churches

Obviously, the Coptic product of churches is very rich with various architectural forms, which reflect different cultural influences. However, the Coptic plan church is most called on the transversal plan churches [119]. This church was divided by bays transversally into four main sections (See Figure 6.8.) in which the plan of the church simulates the four categories of the people of the church. During the early Christianity, the people of the church were divided into four categories; Catechumen who stood outside the church or in the narthex space, repentant who attended the readings only, kneelers and believers who attended the prayers [120]. Such categorization was most probably an ancient Egyptian influence, where it is well known that in ancient Egypt the temple was divided into spaces, each one was dedicated for a certain category of the temple's people. [121]



▲Figure 6.8. the categorization of church people and their location in the Coptic church plan

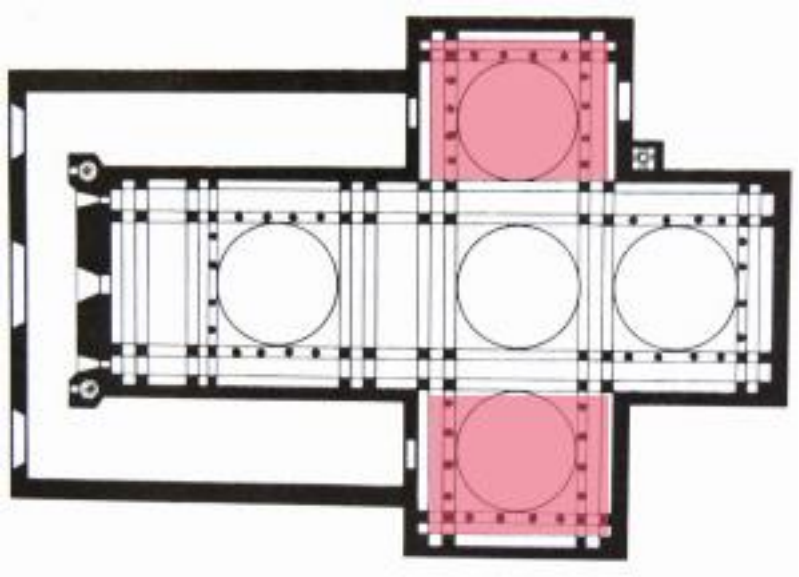
6.4. The Multicultural Influences on the Architectural Elements of the Coptic Church

The architecture of Coptic Church includes a number of elements that distinguish its character. According to the previous study, Egyptians were able to adapt some of those features to serve their religious needs back then, whether they appeared before in other inherited Egyptian religious buildings or borrowed from abroad due to cultural interaction. By observing the rule schemata of the inner architectural elements, some results can be concluded. The following part discusses that.

6.4.1. Transept

In the Coptic churches the transept never appeared before the fifth century or after the sixth century, according to the documented plans of churches. Throughout those two centuries Egypt was under the Byzantine rule. Two important incidents happened within those two centuries. By the end of the fourth century paganism was banned in Egypt, and, almost, all aspects of idolatry disappeared. In the middle of the fifth century the Council of Chalcedon was held, and Churches that rejected Chalcedon in favor of Ephesus broke off from the rest of the Eastern Church in a schism. The most significant church among these churches is the Church of Alexandria.[122]. However, under the Byzantine rule, Egyptians were influenced by their architectural culture, whereas they had used the transept in the first basilicas built by order from Constantine. Around 380, Gregory Nazianzen, describing the

Constantinian Church of the Holy Apostles at Constantinople, was the first to point out its resemblance to a cross. Because the cult of the cross was spreading at about the same time, this comparison achieved stunning success. Thus, a Christian symbolic theme was applied quite naturally to a form borrowed from civil semi-public precedents [123]

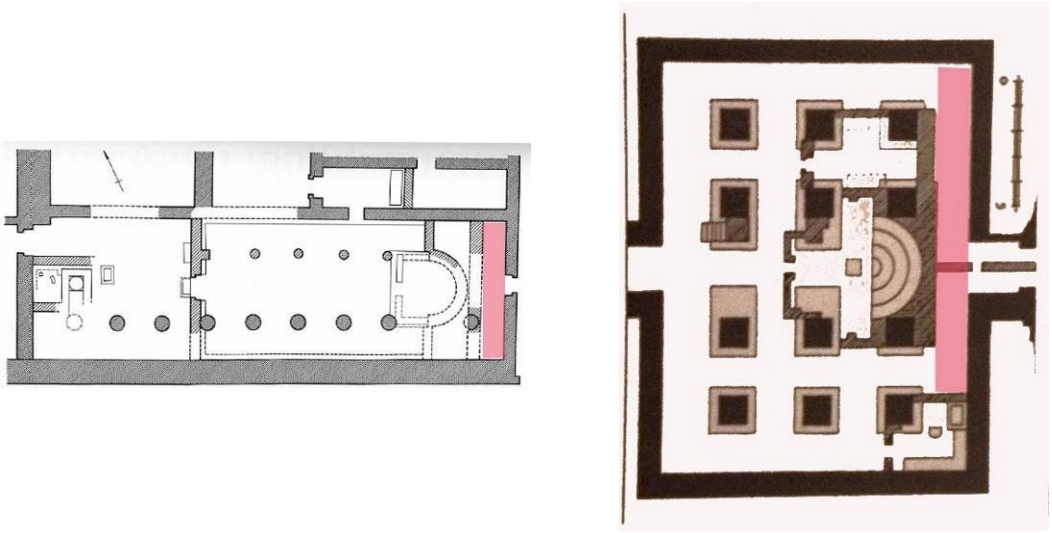


▲Figure 6.9. Transept in the floor plan of the Church of the Holy Apostles in Constantinople.

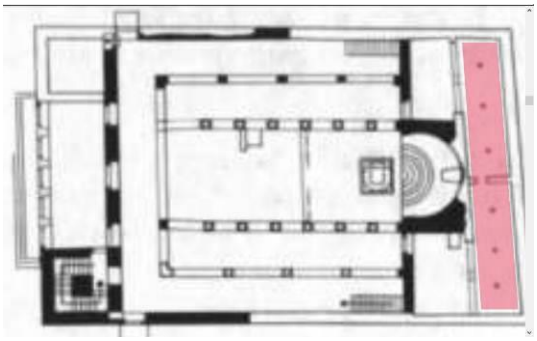
However, with the changing trade routes, Petra's commercial decline was inevitable and its demise was further impacted by a severe earthquake in 551 AD, which ruined the city. It continued to decline with the Muslim invasion of the 7th Century.

6.4.2. Dhefir

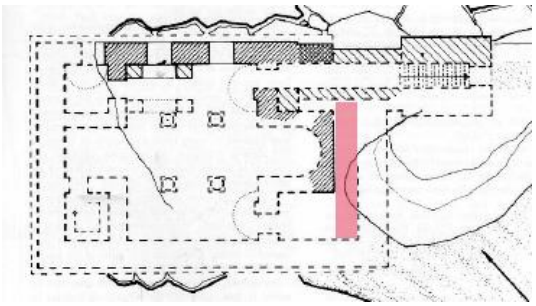
It is a narrow corridor behind the sanctuary area called El-Dhefir. The basic function of this element was protection, after that it was used to store church ritual supplies. This element was used when many churches were exposed to waves of attack. Thus, the Copts worked to protect the most important element in the Church, which is the sanctuary area. So, they sought to build this corridor behind the sanctuary area as a buffer zone to protect it against those attacks. This architectural element was very important especially in churches located in remote places such as El-Fayoum, oases and deserts. Since this component was a temporary function, it was not widespread. It was later used for storage as mentioned before. It was usually associated with Coptic plans churches.



▲Figure 6.10. (left) Dhefir of the basilican plan chamber in the south court of Madamud (6th Century, Luxor), (right) Dhefir of Church inside the temple of Wadi El-Sebo' (8th century, Nubia). Both churches are built inside ancient Egyptian temples.

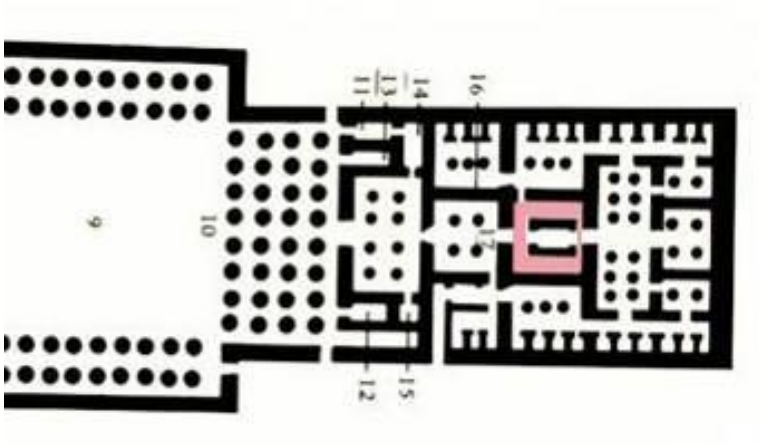


▲Figure 6.11. Dhefir of the Great Cathedral, Kasr Ibrim (6th Century, Nubia)



▲Figure 6.12. Dhefir of a medieval church of St. Psote (8th Century, Aswan), a rock-cut church

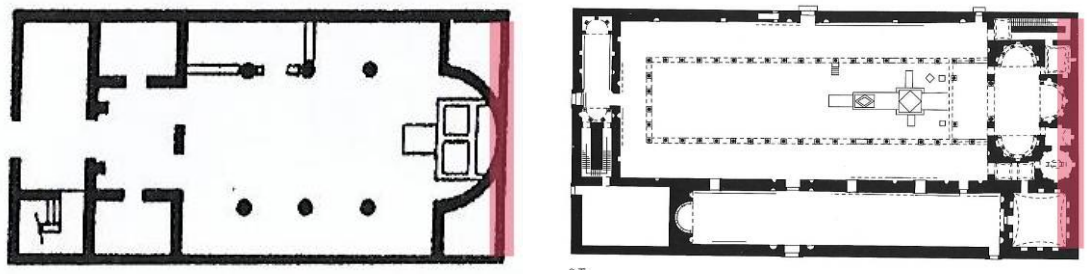
According to the analytical part, this element has an association or a reference in the architectural language of the ancient Egyptian temples where the Holy of Holies was always surrounded by two side corridors and a rear passageway to protect and preserve the most sacred area within the temple. (Figure 6.13)



▲Figure 6.13. Holy of Holies of Luxor temple surrounded by corridors. [124]

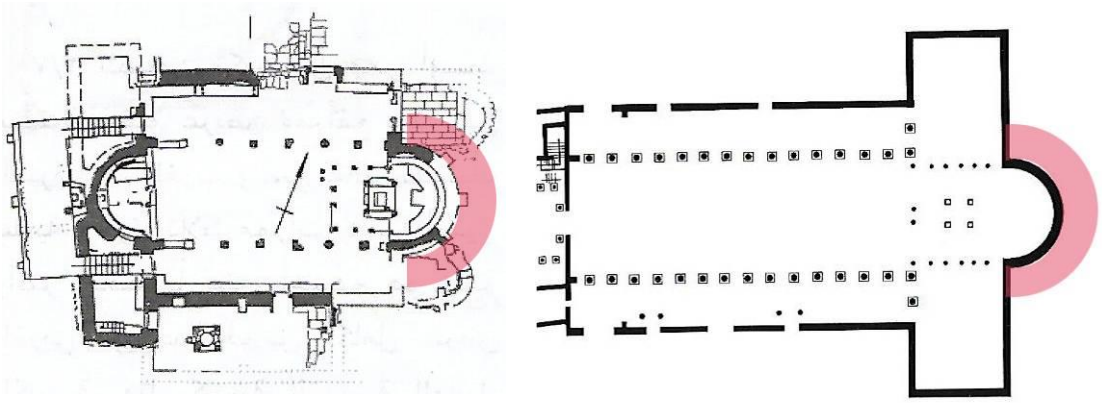
6.4.3. Apse

The variety of sanctuary formation in the Egyptian churches is between the quadrilateral and tri-conch, as well as the apse inside that area, which took several formations either straight or circular or just as a recessed niche in the eastern wall. However, it is noted that it has always been unremarkable from the outside facade of the church. The eastern wall of the church was always straight elevation, not distinguishing the sanctuary area from the other side parts. This is due to the ancient Egyptian culture based on the sanctification of this space, and its protection and concealment from the public eye. (Figure 6.14)



▲ Figure 6.14. (left) St. Marina church (4th Century, Alexandria), (right) Church of St. Shenute, white monastery (5th Century, Sohag), both churches undistinguished apses, not protruded from the eastern wall of the church.

However, this did not prevent Copts, sometimes, from being influenced by the Roman Byzantine culture, which did not mind the protruding of the apse from the east wall externally, so that it is visible from outside the body of the church (Figure 6.15). This form of influence does not affect the basic rituals of canonical performance; therefore there was no antagonism of its use.



▲ Figure 6.15. (left) Burg El-Arab church (4th Century, Alexandria), the church of St. Mena the large cultic complex (right) (5th Century, Alexandria), both of them with protruding apses

6.5. Recommendations

Based on the previous studies, analysis and discussion, several recommendations can be provided, divided into several levels of future studies and future practical applications based on them or even on the relevant subject levels.

6.5.1. Future Researches

The time limitations of this research was between the fourth and ninth centuries. Thus, more architectural studies about the coptic architectural language need to be done. Yet, more researchers can continue to distingush the shape grammars of Coptic churches in the middle ages and later.

In addition, this research was concerned with the architectural language of the churches' plans only. Therefore, many architectural elements of the Coptic church need to be analysed, such as the church roofing system, elevations and inner elements like the columns and arches. Moreover, the information on the development of the Coptic bell tower that is still very vague allows many researchers to discover its roots and its evolution over successive centuries.

The main problem in analyzing baptistries in Egypt is mentioning its first date of construction. Actually, many of them were constructed in early stages or passed by several stages of change, but this did not mean that the baptistry and the churches developed togather at the same time. Grossmann saw that excavations had not discovered yet the history of that element and no seriuos studies could give us enough information about that issue. Nevertheless, there is evidence about the baptistry cermony during the mediavel centuries.

Finally, the Coptic monastries can be rediscovered by highlighting their architectural grammatical languages.

6.5.2. Future Practice

Using the resulted rule schemata, many researchers or authors can use to conduct any further analyses about the Coptic architecture and build up new architectural theories. Also, academically, students can learn more about the Coptic language and form composition of ancient Copts.

Moreover, by the help of Shape grammars, as a systematic analytical tool, architects can learn how to distinguish the architectural language of their predecessors and put their contributions according to the needs of their community by using and developing their contemporary tools And yet develop their traditional architectural model or a new general one, preserving their architectural identity. By using the Coptic architectural rule schemata, architects will not create their designs from scratch, but from a combination of analyses and the creation of original design. Hence, architects can develop a method for creating a new design language on the basis of that one. First, the Coptic style is analyzed by creating a grammar, and then the rules of the grammar can be transformed. Those new rules are the basis for a new grammar. In this way, architects learn the work of designers and develop their own work.

Through that process, Architects should pay attention to the nature of the multicultural community they are dealing with. They have to put into consideration that there is no type of multicultural community that is better than the other; yet, architects should deal with each type as it is, help those societies to maximize their potentials, and reduce their multicultural problems.

To facilitate those future researches and practices using the rule schemata of Coptic churches' shape grammars, they can be computed by a software application. Such an application will support its users through the process of derivation which helps to choose and which is mandatory to use according to their first choices and the entered labels.

6.5.3. Related Issues

Old manuscripts of old centuries should be translated. They were written in Greek, Roman, and Coptic languages. Those manuscripts still carry lots of information about the early life of Copts, taking into consideration many social, political, religious and architectural aspects as well. By knowing this information researchers may reconstruct a more precise image about the Coptic life, and discover new aspects.

Another issue is to build true integral relations with international and regional associations to produce deeper architectural studies about Coptic architecture and human heritage. Cultural associations in Egypt must work on putting the Coptic era on the Egyptian history timeline, due to its huge importance for humanity. This is a big responsibility upon all history researchers' shoulders.

The discourse of multiculturalism has diverted attention away from more fundamental structural problems of racism and social inequality that may land disproportionately and unjustly on Egyptian cultural groups. Multiculturalism must not be the price that Egyptians have to pay for their inability or unwillingness to incorporate into their society. Authors and decision makers have to work on maximizing the potentials and richness of their multicultural community, no matter what its type is, and reducing such problems that fragment the communities. That can happen if authors suggest that the focus should be changed so that users of

multicultural products - no matter to which cultural group they belong – would know that they are an integral part of the overall activity of the local social whole.

6.6. Conclusion

Through this study, it can be concluded that the Egyptians in the Coptic era were open enough to deal with the received or tangible multi-cultures around them. They were able to absorb any new or ancient architecture model by adding to it or modifying its elements to match their spiritual needs. Throughout more than six centuries of Coptic civilization, the model of the church design developed and varied according to their social, cultural and political aspects. Yet, the Copts were able to preserve the main religious elements of architecture in their churches, so as not to disrupt the practice of religious rituals. However, the architectural model itself varied and differed from time to time and from place to place. According to S. R. Morgan, this way of design, nowadays, is called "traditionalism". [125]

The Copts throughout six centuries proofed that multiculturalism is an opportunity and not a problem for their interactive pluralism multicultural type of communities.

Coptic architects were able to put their contribution in designing their churches. Basilican plan churches with transept and Byzantine model churches did not last. Consciously or unconsciously, they tended to communicate with their community by using or transforming pervious or existed architectural languages using their own tools.

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مر بها المجتمع خلال عملية التحول الديناميكية، والتي كانت تتسم ببعض المحاولات إنكار للثقافة المعمارية الموروثة، ولكن هذا لم يحدث بشكل كامل نظرا لطبيعة المجتمع المتماسكة، وبجانب استحداث حلول معمارية جديدة ظهرت نتيجة التعرض لثقافات جديدة.

ملخص

طبقا لآراء الكثير من المفكرين والباحثين يعد التعدد الثقافي سلاح ذو حدين، له إيجابياته وسلبياته التي تنعكس بدورها على المجتمع بشكل عام والمعماري بشكل خاص كجزء من التكوين الكلي للمجتمع. ومنذ حوالي ٣٠ عاما تناول الباحثين هذا المصطلح بالدراسة في الدول الغربية يهتمون بعرض وتدقيق ومعالجة الجزء السلبي منه، والمرتكز على مشكلتين أساسيتين، الأولى هي تفتت وتقسم المجموعات الثقافية المختلفة داخل المجتمع الواحد، والثانية هي إنكار أو تجاهل أو نسيان مخزونه التراثي. وبما أن مصر دولة ذات تاريخ عميق، فقد تعرضت منذ أمد بعيد لفترات كبيرة من التعدد الثقافي ولها خبرة ذات أهمية في هذا المجال ترقى للاستفادة منها وتتبع كيف أثر ذلك على منتجها المعماري.

ومن هنا جاءت أهمية هذا البحث، حيث يتناول بالبحث والتدقيق فترة من الفترات المهملة من تاريخ مصر وهو العصر القبطي. في تلك الفترة عاش في مصر مجموعات ثقافية مختلفة وكان لها منتج معماري غني جدير بالدراسة والتحليل بحيث يستطيع المعماري أن يعظم من الإيجابيات ويقلص من السلبيات ويكون واعيا بحيث لا يقع في فخ سلبيات التعدد الثقافي ويستفيد من إمكاناته. يقوم البحث برصد الحالة الإجتماعية للمجتمع المصري ويحدد نوعه من حيث التعدد الثقافي، سواء كان مجتمع كوزموبوليتيني أو متعدد مجزأ أو متعدد متفاعل، فلكل نوع سماته وخصائصه التي تؤثر على المنتج المعماري. وقد تبين بالبحث والدراسة أن هذا المجتمع ديناميكي متفاعل، يتسم بأن له هويه قوية وواضحة تظهر على عمارته وله دورة من التفاعل يمر بها عبر الفترات الزمنية المختلفة حتى يصل لمرحلة النضج الكامل.

البحث يرصد أكبر عدد ممكن من المساقط الأفقية للكنائس عبر العصر القبطي (من القرن الرابع وحتى القرن التاسع ميلاديا) تم تحليلهم بدقة وتحديد القواعد الحاكمة لتشكيلهم لاستنباط اللغة المعمارية لكنائس تلك الفترة. ومن ثم يمكن تحديد الجذور الثقافية لتلك القواعد وإلى أي مدى استطاع المعماري أن يتستوعب الثقافات الموروثة بجانب المتعرض لها وينسجها في منتج معماري يحقق احتياجات مجتمعة بأدوات عصره ويعبر عن هويته.

والخلاصة أن معماري هذا العصر استطاع ببساطة وتلقائية أن يتجنب قدر كبيرة من سلبيات التعدد الثقافي، واستفاد من امكاناته في نسج ثقافات متنوعة موجودة داخل مجتمعه في منتج معماري فريد ومبتكر يعبر عن هويته وعصره، وعلى أساس قوي من الثقافة المعمارية الموروثة من العصور المصرية الأقدم، ولكن هذا لا يخلو من مروره بفترات من عدم الاتزان التي

مهندس: مها أبوبكر إبراهيم

تاريخ الميلاد: ١٩٧٩\٠٦\٢٢

الجنسية: مصرية

تاريخ التسجيل: ٢٠١٢\٠٣\٠١

تاريخ المنح: ....\....\٢٠١٨

القسم: الهندسة المعمارية

الدرجة: دكتوراه الفلسفة

المشرفون:

ا.د. سامي صبري شاكر

ا.د. شيرين محيي الدين وهبة

الممتحنون:

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أستاذ العمارة بالأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري	
أ.د زينب يوسف شفيق	(الممتحن الداخلي)
أ.د. سامي صبري شاكر	(المشرف الرئيسي)
أ.د. شيرين محيي الدين وهبه	(عضو)

عنوان الرسالة:

العمارة في المجتمعات متعددة الثقافات

دراسة تحليلية لتأثير التعدد الثقافي على عمارة الكنائس خلال العصر القبطي

الكلمات الدالة:

التعدد الثقافي، العمارة القبطية، الكنائس القبطية، القواعد النحوية للشكل، مخطط القاعدة

ملخص الرسالة:

يعد التعدد الثقافي سلاح ذو حدين له انعكاساته السلبية والايجابية على المجتمع بشكل عام وعلى المعماري على وجه الخصوص. ومنذ أكثر من ٣٠ عام تناول الباحثون في الغرب هذا المطلح بالبحث والتدقيق لمعالجة سلبياته. في حين أن المجتمع المصري صاحب التاريخ العميق له خبرة طويلة في هذا الصدد أثر على ما توارثه من منتجه المعماري. ومن هنا جاء اهتمام هذا البحث بجزء تم تجاهله من هذا التاريخ وهو العصر القبطي وتراثه المعماري من كنائس. وقد تبين من خلال البحث في طبيعة هذا المجتمع أنه نوع متعدد متفاعل له يعيش دورات ديناميكية لتحول هويته من فترة لأخرى. ومن خلال هذا الطرح تم رصد أكبر عدد ممكن من المساقط الأفقية للكنائس التي تم انشائها من القرن الرابع وحتى القرن التاسع الميلادي، ليتم تحليلها وتحديد القواعد الحاكمة لتشكيها بحيث يمكن استنباط لغتها المعمارية، ومن ثم تتبع الجذور الثقافية لتلك القواعد. وقد تبين أن المعماريين في ذلك العصر استطاعوا ببساطة وتلقائية أن يتفاعلوا مع ثقافاتهم الموروثة والثقافات الواردة عليهم ويقدموا منتج معماري يحقق احتياجاتهم ويعبر عن هويتهم ومتعامل مع أدوات عصرهم، متجنبين بذلك جزء كبير من سلبيات التعدد الثقافي.

العمارة في المجتمعات متعددة الثقافات

دراسة تحليلية لتأثير التعدد الثقافي على عمارة الكنائس خلال العصر القبطي

إعداد الباحث

م./ مها أبو بكر إبراهيم

رسالة مقدمة إلى كلية الهندسة ، جامعة القاهرة

كجزء من متطلبات الحصول على درجة الدكتوراه

في الهندسة المعمارية

يعتمد من لجنة الممتحنين :

الاستاذ الدكتور:سامي صبري شاكر ..... المشرف الرئيسى

الاستاذ الدكتور:شيرين محيي الدين وهبه ..... عضو

الاستاذ الدكتور: زينب يوسف شفيق ..... الممتحن الداخلي

الاستاذ الدكتور:أيمن فتح الله ونس ..... الممتحن الخارجي

كلية الهندسة ، جامعة القاهرة

الجيزة ، جمهورية مصر العربية

٢٠١٨

العمارة في المجتمعات متعددة الثقافات

دراسة تحليلية لتأثير التعدد الثقافي على عمارة الكنائس خلال العصر القبطي

اعداد

مها أبوبكر إبراهيم

رسالة مقدمة إلى كلية الهندسة – جامعة القاهرة
كجزء من متطلبات الحصول على درجة **دكتوراه الفلسفة**
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٢٠١٨

العمارة في المجتمعات متعددة الثقافات

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إعداد

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كجزء من متطلبات الحصول على درجة **دكتوراه الفلسفة**
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٢٠١٨