1. INTRODUCTION

This article touches upon Marcus Vitruvius Pollio, Leon Battista Alberti (1404-1472), Andrea Palladio (1508-1580), and other Renaissance architects who compare a city to a building or a building to a city, who match the city and the building into a human body, and who develop their own works. The objective of this study is to furnish an interpretation of their theory and practice through their literature and designs. In this point of view, this article takes notice of Vitruvius’s six concepts coined from venustas and divides them into two parts: i.e. aesthetic quality (ordinatio, dispositio, and distributio) and technical activity (eurythmia, symmetria, and décor) each. This thesis indicates that Vitruvius’s successive impacts from the concepts bring about concrete design principles through proportional measurements, placing together, and hierarchic values for the former, as well as appropriate use through beautiful look, symmetrical harmony, and appropriate uses for the latter, tracking notions between a city as a house and vice versa, and either the ideas of the house or the city in the synthesis of the human body, which follows the perfect number and module based on the human body. The thesis shows that the representations of architecture and the city take place with the form of a circle and a square that express the religious belief and the cosmos, substantiating the connection between the proportions of the human body and numbers, and ultimately satisfying a concept of centrality, which is slowly extended to the enclosed plaza at the urban level from chambers, atrium, and corridors at the residence level.

Abstract  This thesis explores Vitruvius and his impact upon other Renaissance architects who compare a city to a building or a building to a city, who match the city and the building into a human body, and who develop their own works. The objective of this study is to furnish an interpretation of their theory and practice through their literature and designs. In this point of view, this article takes notice of Vitruvius’s six concepts coined from venustas and divides them into two parts: i.e. aesthetic quality (ordinatio, dispositio, and distributio) and technical activity (eurythmia, symmetria, and décor) each. This thesis indicates that Vitruvius’s successive impacts from the concepts bring about concrete design principles through proportional measurements, placing together, and hierarchic values for the former, as well as appropriate use through beautiful look, symmetrical harmony, and appropriate uses for the latter, tracking notions between a city as a house and vice versa, and either the ideas of the house or the city in the synthesis of the human body, which follows the perfect number and module based on the human body. The thesis shows that the representations of architecture and the city take place with the form of a circle and a square that express the religious belief and the cosmos, substantiating the connection between the proportions of the human body and numbers, and ultimately satisfying a concept of centrality, which is slowly extended to the enclosed plaza at the urban level from chambers, atrium, and corridors at the residence level.

Keywords: Marcus Vitruvius Pollio, Leon Battista Alberti, Andrea Palladio, Vitruvian Man, Human Body, Architecture and the City

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clarify the theoretical and the practical precedents suggested by Vitruvius.

2. ARCHITECTS WHO COMPARED THE ORDER OF THE BUILDING TO THAT OF THE CITY

2.1. MARCUS VITRUVIUS POLLIO

Vitruvius says that architecture consists of firmness (firmitas), commodity (utilitas), and delight (venustas). These qualities pertain to buildings to be seen as the basic premises of a curriculum not to a discipline, and they must be viewed as goals of the architect’s ability because skill must be taught, neither inborn nor acquired. (Leatherbarrow, 2011: 84-85) He argues that architecture has its origins in utilitas (utility or commodity) which refer to the use of buildings and the guarantee of successful functioning. (Vitruvius, 1960: 38-39) Through the relation of venustas and utilitas, in his own words, between buildings and occupants, a concept is anticipated in line with the beautiful and proportional expression (venustas) of utilitas to suit the social status of their occupants and the expression of its function. The venustas’s classification is divided into six basic concepts in connection with social tastes; ordinatio (order), dispositio (arrangement), eurythmia (eurythmy), symmetria (symmetry), décor (propriety), and distributio (economy). (Vitruvius, 1960: 13-17) The ordinatio are the result of aesthetic proportioning applied to a building, while the dispositio is the suitable arrangement of parts that denotes the design of a building in plan, elevation and perspective. The eurythmia is the elegant form proportionally and symmetrically, while the symmetria is the harmony of the parts in relation to the whole within the total design by the modular coordination. The décor is the correct exterior of a building conforming to convention, while the distributio is the advantageous management of materials and site, corresponding to building costs. Vitruvius’s six terms are dependent on architecture and represent its aesthetic properties and creativity, and they are divided into two groups: the ordinatio, dispositio, and distributio are regarded as the proportional principle and design method in the sense of his technical activity, while the eurythmia, symmetria, and décor as the aesthetic qualities of the building that is produced as the work of art in correct use.

In the first place, the ordinatio, dispositio, and distributio are operated as basic design principles to produce a proportional building. The ordinatio is the adjustment of proper measurement according to the given function and the detailed proportioning of each separate part of a building with regard to symmetria. The dispositio is defined as two folds: the one is as the placing together and the effect of the object on an observer, and the other is as the subdivision of ichnographia (a ground plan laid out on site with the competent use of rules and compasses), orthographia (an elevation in proportion to the recommended structure), and scenaechographia (a perspective with the delineation of the façade and the receding sides of the building). The ichnographia and scenaechographia are employed using compass and rule, while the orthographia is served as an imago and a figura. Thus, the dispositio is the process of designing something, as distinguished from the completed design. The former is in addition the distribution of buildings which must be designed to suit their occupants. In that those with great wealth or for the high position of the statesman are located in important sites, the distributio talks about the hierarchic values of the houses with different classes, and controls the uses of materials and sites. This point accords with Vitruvius’s words that buildings must correspond to their special needs. (Vitruvius, 1960, I.i.I: 6, Loeb, vol. I; IX, vi. 2: 244-246, Loeb, vol. II; Frank E. Brown, 1963: 99-107) It means that Vitruvius recognizes an overall frame with the participatory design concept of the city planning in the comparison of a house to a city because he says that the important buildings are erected for heads of households, for those with great wealth or for the high position of the statesman. Town houses certainly ask for a dissimilar kind of construction from those which take the goods of country estates. In order to show the power that governs the state, buildings must correspond to their singular demands. Namely, the distribution of buildings should be arranged to suit the occupants. (Vitruvius, 1960: 9-10, 17)

In the second place, the eurythmia, symmetria, and décor are functioned as its felicitous use. The eurythmia is the graceful appearance in the way in which its separate parts are arranged proportionally and symmetrically, which mixture applies with harmony. The symmetria is the correspondence of the individual elements to the appearance of the building as a whole edifice in a static proportion, which follows the human body with symmetrical proportion between foraearm (cubitus), foot (pes), palm (palms) and finger (digitus). (Vitruvius, 1960: 14) The décor is the propriety of perfect style. The décor implies three folds: convention, custom, and nature. First of all, each temple refers to convention such as Doric, Ionic, and Corinthian style. Temples of Doric have qualities with virile nature, not ornament, while those of Corinthian style have buildings of more slender proportions, embellished with flowers, leaves, and volutes with delicate nature. The Ionic is appropriate to their immediate position. (Vitruvius, 1960: 14-15) The attribution of styles answers specific qualities fitting to the several kinds of divinity. As a fashion, the instances of attainment embrace the observations that splendid interiors should have grand vestibules and that the details of the Ionic and Doric orders should not be mixed. Also, natural décor contains the recommendation that temples should be in healthy sites, and that interiors should be provided with the kind of light apt for their use. Accordingly, the décor implies some kind of pertinent building to function or tradition.

Vitruvius integrates both the technical activity by the art of the architect in the order symmetria, eurythmia, and décor and the aesthetic qualities for the production of the building in the order dispositio, ordinatio, and distributio into a combined frame. He clarifies the integral structure between both establishing symmetrical buildings with a proportional standard and arranging rooms and buildings with a strictly defined hierarchy that consider the nature of the site and the matter of use and beauty. (Vitruvius, 1960: 174-175) The unified frame completes an urban structure, in which the buildings have proportional and symmetrical arrangements, and are placed in suitable locations conforming to social status and convention. The two ideas are immersed into a well-built human body that influences upon all measurements such as inch, palm, foot, and cubit, as well as the arrangement of both the separate parts and the whole design that should be harmonious. In particular, the close association of the separate parts into the whole is extended from the private to the public, a house to a city. The important medium between the both is an atrium which has a semi-private and a semi-public territory.
Vitruvius's section on the ancient house is difficult to understand. But, two points pertaining to the atrium are clear, addressing that the rules on these points (concerning the house) will hold not only for houses in town, but also for those in the country, except that in town atriums are usually next to the front door, while in country seats peristyles come first, and then atriums encircled by paved colonnades. (Vitruvius, 1960: 183)

One of them concerns the location of the atrium: it comes first in the entry sequence in town houses and follows the peristyle in country residences. The other relates its social significance. The atrium is one of the public spaces of the house that conveys social status. Then, the houses are divided into the private and public, interweaving a law of the Roman people and Greek original tradition. (Vitruvius, 1960: 182) (Fig. 1, Fig. 2) On the one hand, the private rooms are those into which nobody has the right to enter without an invitation, such as bedrooms, dining rooms, bathrooms and all others used for the same purposes. (Vitruvius, 1960: 181-182) On the other hand, in case public area, he states that, having laid out the alleys and determined the streets, we have next to treat the choice of building sites for temples, forums and all other public places, with a view to general convenience and utility. In this point, the house atrium particularly is a core to connect the outside places in the association of a house to a city. He strives to understand public areas like house atriums, temples, and urban forums in the house’s view, comparing urban alleys and streets to corridors and colonnades. The alleys and streets are defined, and then public spaces like temples and forums are later distributed as collective consumption that refers to the many goods and services that are produced and consumed on a collective level, such as in cities.

2.2. VITRUVIUS’S INFLUENCE ON ALBERTI

Alberti, standing in parallel with Vitruvius, believes that architecture has its origins in utilitas. However, he subdivides Vitruvius’s concept of utilitas in light of the purpose (possibly function) of different types of buildings, namely, into buildings that merely serve necessitas (the needs of life), others that serve opportunitas (fitness for a given purpose), and others that serve voluptas (passing enjoyment) (Alberti, 1988, IV, 1), all of which remains to be seen in the desirable expression of human individuality, and then he points out that the size and ornament of a building should be apt to utilitas of a building and appropriate to its users, and that utilitas acquires an influence over the aesthetic criteria of venustas.1 Alberti also re-arranges Vitruvian concept of utilitas drawing on the functions of different types of architecture. Without relation to Vitruvius, Alberti names six fundamental elements of architecture, “locality, area, compartition, wall, roof, and opening” (Alberti, 1988: 7-8). They are diametrically opposed to the six concepts Vitruvius argues, but have the same context in that Alberti includes the technical activity and the aesthetic quality in the six elements. The most important part of Alberti’s reproduction appears on plans, integrating Vitruvian criteria of functionality and aesthetics. It also contains the analogy of a house and a town, the town being considered as a great house and the house as a small town. The two folds are worked together by the organic concepts that as the members of the body are correspondent to each other, so it is right that one part should answer to another in a building. Alberti’s metaphoric comparison of a house to a city via the measurement of the human body is the same as Vitruvius does. In particular, of the headings, the similarity takes place in the interpretation of the compartition, the closest with Vitruvius’s concepts of venustas, because it merges both the technical activity and the aesthetic quality. The compartition is the process for dividing up the site into smaller units, so that the building may be considered as being made up of close-fitting smaller buildings. The building which is compared to the overall body and which consists of numerous components is joined together by several housing units (Alberti, 1988: 7-8), explaining “the city is a large house and the house is a small city.” He copes with this house-city or the city-house relationship even more specifically than Vitruvius does. ‘The various parts of the house – atria, xysti (open colonnade spaces for promenading), repertories, dining rooms, and porticoes (Alberti, 1988: 23, Book I. 9) – can be considered as a city like a miniature. They are more comparable to a city because rooms, constituents of houses, may be suitable for family use. Alberti, in the comparison of a house to a city, states that atriums and salons should be closely related in the same way to a house, as forums and public squares are dealt in the same to a city. So, he places emphasis on the role of stairways and passageways because stairways and passageways begin and here visitors are greeted and made welcome. (Alberti, 1988: 119, Book V. 2) There should be roofs and colonnades, not only for humans but also for beasts, to protect them from sun and rain. A portico, walkway, and promenade are connected by the vestibule for a playground, throwing quoits and wrestling, and a space for conversation, and a waiting place from young men who are waiting for the elders. He continues to argue extending the territory from a house to a plaza in a city, “the forum may serve as a marketplace for currency or vegetables, for cattle or wood; each type of forum should be allocated its own site within the
city and have its own distinctive ornament, and should prefer to make the area of the forum a double square; the portico and other surrounding buildings must have dimensions that relate strictly to those of the open space in order to appear neither too extensive and the surrounding buildings too low, nor too confined if hemmed in by the buildings stacked up all around.” (Alberti, 1988: 263–4, Book VIII. 6) It suggests the colonnaded urban spaces embodied by the active roles of public authority in keeping with the location and by proportional prescriptions extended from the house atrium to the urban forum, directly originated from Vitruvius. The colonnades even make a dignified and united scale to the facade, in particular lineaments. The following serves as a good example. In case Palazzo Rucellai at Florence, the lines separating the columns from the wall, the curves of the window arches, and the horizontal and vertical bands of the façade show a structure following a united proportion corresponding to the urban scale. (Fig.3)

Moreover, the great ornament to the forum or crossroad would be to have an arch at the mouth of each road, continually open. As the city increases in size, it is decided to retain the old gates for practical purposes, one of the reasons being perhaps to provide a further safeguard against the incursion of the enemy, and continuously victory for the enemy would be deposited by the gates, standing as they did in a busy place, where a road meets a square or a forum, the most suitable place. (Alberti, 1988: 265, Book VIII. 6) It indicates he recognizes that the gate should be an important part of the city, as it can be a meaningful part of a house. Thus, it might be thought that a gate should be preserved, though its aim would be prevented from animals or invaders, as a symbolic existence. Alberti is very conscious of the status of the triumphal arches, and he regards them as a building type like main entrances of the city to absorb all products from the neighboring locales and to enter the main town of the city like the mouth of humans (Hart, 1998: 39–40), transplanting the symbolic meaning as the old Roman triumphal arch to the political status of the city, and forming such an outstanding facade in the front of his buildings, particularly churches; the front facade of the church is all important as a sort of “rhetorical arch,” and the church of Sant’Andrea at Mantua shows an exemplary building of the triumphal arch. (Fig. 4) Thus, the loci in which the arches are situated turn out to be public places for market venues. The places in which the triumphal arches and roads meet overlook buildings that are important for the management of the city. They are converted into playgrounds for processions, pilgrimages and pageantries, whether the aims are political or religious.

Alberti further recommends that the temple or church should be raised on several steps made accessible by flights of stairs. The altar for the sacrifice should be established higher than anything else (Alberti, 1988: 218, Book VII.9). In contrast to medieval practice, he calls for designing churches as free-standing monuments, some left their entrance and openings quite free and open, without any buildings or any intervening section of walls on the sides (Alberti, 1988: 218, Book VII.9). Consequently, a plaza - transmuted from Greek and Roman plazas - around or in front of the church is reconstructed surrounded by buildings. He says that the structure of the church should be monumental, perfect and be centered as the body of the city, accepting his notion of organic harmony, which in turn must be represented by means of refined proportions, strict compositional relationships, and above all symmetry deduced from the measurements of the human body. (Alberti, 1988: 218, Book VII.9)

2.3. PREDECESSOR’S RE-INTERPRETATION BY PALLADIO

Palladio, a remarkable successor of Alberti, follows the Vitruvian principle that perfection in architecture is best achieved when buildings perform the principles of beauty, permanence, and commodity in the architectural tradition of ancient Rome building types, skillful at reinterpreting the ideas of others, especially the Greeks. He designs plan, elevation and section in his own works, many of which appear through a return to antiquity, and is designed to be in harmony and balance with man and nature and with a scale that is acceptable for both. In the aesthetic ideas, Palladio is largely dependent on Vitruvius and Alberti. His categories of convenience (commodita), durability, and beauty are, as pre-mentioned, Vitruvian. The convenience indicates the pertinent position or place to locate each member while the beauty is a correspondence of the whole to all the parts, of the parts to each other, and of those parts to the whole. He recognizes a building as a well-defined and as a fully-balanced body. (Palladio, 2002: 6-7, Book I, Chapter 1) However, Palladio’s interest lies in the perception of a building unlike Vitruvius focus in the mental grasp of it. Palladio’s perception runs toward nature because he believes that architecture is the imitation of nature as a beautiful building, which implies a true and good building, and which contains the Neo-Platonic notion of the unit of the good, the true and the beautiful on par with the aesthetic harmony of the human body. Like this, Palladio catches an analogous idea between the concept of commodita and the human organism. The combined function and aesthetic consideration show a correspondence of all individual parts to the whole over and over again.

Palladio likewise considers a house to be a model for a city, borrowing the significant notion from Vitruvius and Alberti. He writes, “When choosing a site for a building on the estate, one must bear in mind all those considerations that relate to select a site in the city, because the city is nothing more or less than some great house and, contrariwise, the house is a small city” (Palladio, 2002: 122, Book II, Chapter XII). As he says in the Preface, the primitive house has been evolved, as society matured, into public buildings: of several houses, villages are formed, and then of
many villages, cities, and in these public places, buildings are made (Palladio, 2002: Preface). The overall shape in the city may be the outcome traceable to each house in recurrent relationships. Such decisive assumption can be inferred due to his statement “the image of the whole is repeated in its parts.” This innovative urban view is more influential in achieving consistent developments from the form and type of villas. The basic geometrical forms of the circle and the square are conceived as the most beautiful because it is a picture of the circular movement of the cosmos as well as the cruciform plan whose meaning shows the iconological reference to the cross of Christ and the soul form the contemplation of a divine thing.

The elements of the house could be separated out as distinct forms and be arranged hierarchically, with the principal accommodation at the center, flanked by dependencies (kitchens, stables, etc.), of which the Villa Barbaro is a good model. (Fig. 5) The spaces are arranged as a single large block around a courtyard, as buildings might be symmetrically and regularly placed around a forum, with the emphasis on an enclosed space. Such tendency is shown in the Villa Serego at Santa Sofia, one of his last. (Fig. 6) The type of the placement, considerably influential for the House of the Ancients, is shown in his urban houses with various shapes of rooms surrounding the larger courtyard, which are suitable for an urban setting and palace designs. In two types, what has to be noticed is that the courtyard in Palladio’s architecture which symbolizes an urban plaza is taken as the most significant part of the house, following Alberti’s comparison between the forum of a town and the cortile of a house (Rudolf Wittkower, 1971: 79). (Fig 3, 4) Palladio, conversely, strives to reinterpret them for his own new use. They exhibit three goals by following the proportions, rhythm, scale and symmetry found in nature. Through the illustrations in his book, Palladio proposes that architecture should make use of the proportions found in the human body and then should achieve a divine perfection. Palladio addresses that the foot is divided into 12 inches and each inch into 4 minutes (minute). (Andrea Palladio, 2002: 79) It indicates that the 12-inch foot as a standard module of measurement is selected to aid the translation of anthropometric proportions from the human body to the design plan of a building.

3. COMPARING THE HUMAN BODY TO THE BODY OF A BUILDING AND CITY

3.1 DISCOURSES FROM VITRUVIUS’S VIEWS

The associations of the body to architecture and the complex phenomenon of corporeality have always a privileged position within the history of architectural culture. Vitruvius’s points germane to the amalgamation of the body to architecture are composed of three folds: drawing upon the human figure with anthropometric concepts, first, the proportion and the symmetry, second, the centrality on it, and third, the application of the number six and ten measurements, which deeply made an influence upon the Renaissance architecture.

The first point to notice is that the architectural and urban tradition offers the anthropometric Vitruvian disposition via the proportional measurements by overlapping the circular and square form. The anthropometric methods are developed by Vitruvius. He says the method in the proportional application of the human body as follows, “In the human body the central point is naturally the navel. For if a man be placed flat on his back, with his hands and feet extended, and a pair of compasses centered at his navel, the fingers and toes of his two hands and feet will touch the circumference of a circle described therefrom. Just as the human body yields a circular outline, so too a square figure may be found from it. For if we measure the distance from the soles of the feet to the top of the head, and
then apply that measure to the outstretched arms, the breadth will be found to be the same as the height, as in the case of plane surfaces which are perfectly square. (Vitruvius, 1960: 72-73) In particular, he uses a naked man to make both precise proportions in interrelatedness of parts to other part and concrete measurements within them. However, the arresting image of a naked male body called Vitruvian man afterwards is not drawn by Vitruvius. The images of the male body appear by Renaissance architects such as Francesco di Giorgio Martini (1439-1501, Fig. 7), Fra Giovanni Giocondo (1435-1515, Fig. 8), Cesare Cesariano (1475-1543, Fig. 10), and Giovanni Battista Caporali (1476-1560, Fig. 21) during the Renaissance period after the publication of architectural treatises and the illustrated editions of Vitruvius. However, the drawings are fundamentally different from Leonardo da Vinci's drawings (maybe completed around 1490), which are more so by far than Vitruvius's text because, in Leonardo's works, a man's body first stands inscribed in a square and then with feet and arms outspread inscribed in a circle. (Fig. 9) At any rate, they are products on the analogy of Vitruvius's own words. Vitruvius's book also includes the attributes of the perfect number ten in the circle that bounds the Vitruvian man with the extended fingers and toes touched by the line the compass makes. The circle allies him with the highest degree of coherence and indestructibility. It is in the same view with that Marcus Tullius Cicero says there are only the heavenly bodies which could maintain the uniform disposition and regular movements perfectly, and that Augustan poet Marcus Manilius mentions the universe's perfect roundness in the Astronomica. They both believe that the shape of nature forever most evokes that of the gods in the endless universe; there is start or end nowhere in it. (McEwen, 2003: 160-162)

Also, Vitruvius fundamentally applies the notion of centrality to religious buildings, superimposing the human body in the sacred plans. He says that in sacred dwellings there ought to be the greatest harmony in the symmetrical relations of the different parts to the general magnitude of the whole, and then the center of the human body is naturally situated at the navel. (Vitruvius, 1960: 72-73) In the light of these facts, he understands the construction method of the temple architecture. Because the temple is the god's dwelling, the shape of the temple rests on the figure of heavenly bodies. Thus, it is a matter of course that the whole plan of the temple corresponds to the circular outline the same as nature employed by heavenly bodies. In the anthropomorphic shape superimposed on the human body, the central point is naturally the navel. As the circle is drawn along the distance from the soles of the feet to the top of the head, so the square figure is found from it. Thus, the god's dwelling with a proportional frame coincides with a perfect square which has same width and height. In this context, Vitruvius says, "Therefore, since nature has designed the human body so that its members are duly proportioned to the frame as a whole, it appears that the ancients had good reason for their rule that in perfect buildings the different members must be in exact symmetrical relations to the whole general scheme." (Vitruvius, 1960: 73) The perfect scheme builds on the symmetrical vs. the proportional, and the circle vs. the square simultaneously.

Likewise, Vitruvius argues a perfect number as a basic measurement for drawing the human body on the grid plan. The perfect number is number ten, saying "it was from the members of the body that they derived the fundamental ideas of the measures which are obviously necessary in all works, as the finger, palm, foot and cubit. These are apportioned in an attempt to form the 'perfect number,' called in Greek τἑλειον (full grown). As the perfect number the ancients fixed upon ten, for it is from the number of the fingers of the hand that the palm is found, and the foot from the palm." (Vitruvius, 1960: 74) With the scale of the number ten, the main parts such as a navel, feet and hands above the human body are positioned appropriately. That is on the whole true of the tradition springing from Vitruvius, who compares the human body directly to the body of a building, and then who makes a sequence of claims for this analogy that far transcend the need to explain the meaning of proportion, symmetry, and harmony in architecture (Vitruvius, 1960, book III, Chapter 1). He also adds a note that Plato states the number ten is perfect because it is composed of the individual units (the Greeks μονἁδες (monad)) made up by a palm of four fingers or a foot of four palms or a cubit of six palms. The ten fingers or toes are calculated as the foot unit or the palm each. Through the measurements, it is possible to make a man, fixing six as the perfect number. The man's foot is a sixth of his height which consists of twenty-four palms. (Vitruvius, 1960: 74) (Fig. 9, Fig. 10) On the contrary, another perfect number that Vitruvius mentions is number six. Considering the question of symmetria, Vitruvius shows that eurythmia, particularly in sacred buildings, takes its symmetrical quality from the forearm [cubit], foot, palm and finger [inch] traced from the human body, saying "as the foot is one sixth of a man's height, the height of the body as expressed in number of feet being limited to six, they hold that this is the perfect number and observed that the cubit consists of six palms or of twenty-four fingers." (Vitruvius, 1960: 72-73) Like this, the number ten comes from the cosmos and neo-Platonic idea that rests on the empirical questions, while the number six comes from basic units (e.g. cubit, foot, palm, and finger) by the human body. Vitruvius ultimately wants to combine the number six to the number ten into such a number system as a module; the sum of the two perfect numbers, ten plus six, is sixteen. The number sixteen is the perfect number as well. In particular, Vitruvius tells that temples to the immortal gods should be suitable with the perfect number, and that the temple should follow a harmonious correspondence between the varied parts of the body and its whole form in fixed proportion, because he believes that the human body is stemmed from a divine model. But, Vitruvius deals with experiential values only focused on columns, not absolute and systematic values in describing the human body. He divides temple types into five classes, and provides concrete proportional numbers substantiated by the analogy of columns with the human body: the Doric order is considered as the male body while the Ionic order is the female. It follows from what has been said that he does not take account of individual building types, even doing not apply his criteria to specific buildings or types. (Vitruvius, 1960: 69-74) Yet, Renaissance architects try to categorize building types afterwards, as Alberti does for example sacred, public, and private buildings.
3.2 VITRUVIUS'S INFLUENCES UPON ALBERTI

Alberti, much influenced by Vitruvius, accepts that a building is a "kind of body." Like Vitruvius, Alberti argues that architecture has its origins in utilitas (Alberti, 1988: 92, Book IV. 1). It is one of huge imperative principles for the constructions in Alberti's views. In defining the ultimate aim of the sculpture in De statua (perhaps written in 1464 to educate the sculptor), Alberti's method is to adopt the imitation of nature, as seen in his treatise, "the convenient and necessary means are that nature lets sculptors execute their works perfectly." (Alberti, 1972: 121, 123) The convenient and the necessary means Alberti calls dimensio and finitio. The dimensio (size) is "the process whereby the sculptor takes precise planar measurements of height and width with an exempla (literally out of feet based on human feet (pedes), idealistic proportion) ruler and records the diameter of three-dimensional forms with a tool constructed of two movable right-angles called normae (calipers)." (Alberti, 1972: 125, 127, 129) whereas the finitio (definition) is ostensibly intended to locate the position of any anatomical or sculpted parts relative to the central or internal axis of the figure being measured. (Alberti, 1972:129,131,133) The finitio requires an elaborate machine called a finitorium, similar in appearance to a mariner's astrolabe. It is possible to make a map with the device as Alberti uses to map the city of Rome. They both provide the specific and the generic characteristics of a figure as it is mapped for future reproduction drawing on the human body. (Fig. 11)

Alberti also starts with an assumption that a building is "a kind of body," consisting of lines and materials, in which the lines are produced by mind, the material obtained from nature. (Alberti, 1988, Book I. Chapter 2, 10) His ideas are initially developed from an intuitive response to nature, and intend to prove that the parts of the human body relate harmoniously and rationally to each other. In De statua he thus talks about human anatomy, and lets the sculptor instruct the human body with an organically structured whole. But, in De statua Alberti discloses little information concerning the number of bones and the projections of muscles and sinews. He discusses shipbuilding to let the sculptors know what the parts of the body are composed of, how they fit together, and how they relate to each other. (Alberti, 1979, para 13, 8) In fact, Alberti has a fondness for maritime imagery and a lively interest in the practical arts of navigation, naval and aquatic construction. (Pérez-Gómez & Parcell, 2007: 50-51) Likewise, Alberti has more to deal with human anatomy in De pictura. In the book ii (Alberti, 1979, para. 43), in terms of an architectural metaphor he portrays a solid rapport with body weight, body structure, and position change. Alberti then indicates the complex inter-dependence of body parts by applying the principle of the level to the movements of the body. The metaphorical use of the column in this context alludes to the anthropometric Vitruvian tradition, dependent on De statua by devising human proportions. Through the procedures, he finds a series of optima numbers, nearer to nature such as four, five, six, seven, eight, nine, and ten, which present an equivalent significance for architecture while irrational numbers only based on geometrical means play a smaller part on account of their incommensurability. His notion on numbers resorts to the relativity of beauty; the numbers belong to his three criteria of beauty; the beauty arises from the conjunction of the numbers. Hence, the beauty means the agreement of the parts of a whole, employing harmony (concinnitas) that is the absolute and supreme law of nature. It shows the neo-Platonic view with the succession of Vitruvian tradition, dwelling on the empirical questions.

By contrast, discussing the key definitions of beauty and ornament in Book IX, Alberti sets out from an organic way of architecture in terms of the human body. (Alberti, 1988: 301, Book IX, Chapter 5) He studies Roman architecture through the research of several geometrical patterns, and recognizes the centralized plan, which is dated back to the late style of Roman temple and which is suggested as an idealized shape for the divinity and the perfection of nature. As to the dovetailed relation between gods and buildings (dwellings), Alberti sees eye to eye with Vitruvian views. As stated previously, though there are many mentions about the city and architecture in his books, actually his works can be disclosed only with a few parts, the façades dwelling on the human proportions of buildings such as the triumphal arch within the plaza. The ideas of the human body are also employed by such other architects as Filarete (1400–1469), Francesco di Giorgio Martini (1439–1502), and Luca Pacioli (1446/7–1517), who work with Alberti (1404 –1472) in the contemporaneous period.

3.3 VITRUVIUS'S IMPACTS UPON RENAISSANCES ARCHITECTS

In case Filarete's works, the proportions of the human figure are converted into the important scale of reference, and the first representative of pure anthropometry into the design of the first hut, establishing a linkage between body parts and building parts. The head as the noblest part of the human body suits the standard unit of measurement as a module. (Kruft, 1994: 54) In Filarete's treatise, he recognizes that the body itself provides a model for the first architectural construction. His drawing of Adam achieved through decoding of the Eden's Garden shows Adam's hands raised in anguish to protect himself from the rain, shaping a roof over his head. Filarete supposes that "it must be believed that when Adam was driven out of Paradise, it was raining. Since he had no readier shelter, he puts his hands up
to his head, to defend himself from the water. “(Rykwert, 1972: 118) This shows that the human body or its gesture had an impact upon architecture and its primitive roof form through an equilateral triangle because his two hands consider the need for making a living. (Fig. 12) Filarete’s anthropomorphic ideas, in conjunction with human proportions, actually resemble the human organism as a part of the body. The representation links all geometric shapes on the human proportion, whether they are round or square.

Conversely, Francesco di Giorgio Martini in the same period illustrates this association at a great range. In his works, the arrangement of buildings in city plans and the decorations of facades are carried out following the images of human body (Anderson, 2002: 238-246). In an illustration of his treatise, he adds a town plan with a male human figure and with a fortress placed upon his head. It seems to reinterpret the notion of the Vitruvian man. The fortress as the headquarters of the town is attached to his head like a hat. Both the circle and the square are retained as the most important shapes together with a church on his breast. He puts his hands up to the fortress or his head. The square becomes the navel of the town, and foods are distributed therefrom. (Fig. 13) The gesture looks like a primitive roof, and his two hands consider the need for protecting a town, rather than for making a living seen in Filarete’s figure. (Fig. 12) His analogy is expressed not only between man and the city or architecture, but between man and the cosmos. Francesco di Giorgio further evolves a theory of the origins of architecture in connection with the orders, yet in contrast to Filarete. Francesco claims to have achieved his own proportions for columns and capitals, superimposing human and architectural measurements. Nevertheless, they all are fully at odds with Vitruvius’s column proportions. As for Filarete, unlike Vitruvius who derives rational numerical relationships from the human body and who applies them to architecture and its branches, because Filarete prefers the Christian myth relevant to the origin of architecture, the Doric column represents the oldest and most important type of column equated with nobility, as it is modelled on Adam’s proportions and on God himself, while the Ionic is the lowest order of column which carries the whole burden of the building. Whereas, Francesco is in abundance of excessive analogies in that the capitals become faces and the entablatures become busts in profile at the same time. Even, the columns are brought to life as the bodies of men and women and as the ramparts and fortifications, or even the entire plans of towns are supposed to resemble human figures. (Kruft, 1994: 57-58) (Fig. 14)

Also, to the Renaissance architects, the plaza is a small body of the city, and buildings with the façade of a triumphal arch are created as a public and symbolic gate of the house in the center of the world and the plaza. To take simple examples, the Florentine facades are functionalized as public spaces they address, rather than buildings they clothe (Hart, 1998: 50). His inspired concept influences the whole shape of ideal cities with an open space at the center, particularly those of Filarete (Antonio di Pietro Averlino, 1400-1470), Tommaso Campanella (1568-1639) and Johannes Valentin Andreae (1586-1654). In particular, Sforzinda, the first planned ideal town of the Renaissance, is a town with a centralized octagonal layout and a radial street pattern as well. A central square flanked by markets, a palace, and a cathedral is in the heart of the town. The street pattern is in tune with Vitruvius city plan that agrees with the orientation of winds. Along with the regions of the winds, the orientation of streets should be rotated obliquely.
Discussing Architecture and the City as a Metaphor for the Human Body

2002: 57) For instance, Palladio’s houses such as the Villa Barbaro, other and the walls will take the weight of the roof equally (Palladio, 1570: 57) Palladio believes the human form is the key to perfect harmony since humans are molded in the image of gods. Finding the human body as a divine model, Renaissance architects attempt to achieve a balance and perfection in their buildings. (Wittkower, 1945: 68) Encounters with Francesco di Giorgio Martini are much more significant through his own works. Francesco attempts the application of the choir and nave to the human head and body respectively, superimposing the Latin cross plan (Kruft, 1994: 87), whereas Pietro Cantaneo (1510-1571) also describes longitudinal and centrally planned buildings. Unlike Palladio who praises the Greek cross style, both Francesco and Cantaneo plead much more emphatically for the Latin cross form as the ideal ground plan. Be that as it may, Palladio might refer to Francesco di Giorgio’s works and use the anthropomorphic ways for his own tasks. It is especially noteworthy that Vitruvius’s human figure set within a circle and a square no longer forms the starting point for his deliberations; rather his proportional figure slots into the circle and square of hierarchically ordered rooms of decreasing size but increasing importance (Palladio, 2002: 57) For instance, Palladio’s houses such as the Villa Barbaro, the Villa Rotunda, and the Villa Trissino have a square plan. The facades of the villas are all of nearly equal length and importance. To put it more precisely, they are foregrounded on geometric properties independently of a situated observer such as symmetry, alignment, congruence, and repetition. (Fig. 1, Fig. 2, Fig. 22) Also, the synthesis of the circle with the square are drawn on the plans of Palladio’s villas shows a geometric concept with a cross-shaped style. It is comparable to the diagram of the Vitruvian man, in that the circle and square are marked by the Vitruvian man’s key geometrical attributes such as centrality, symmetry, and interrelatedness, which rely on the proportions of the human body which conjure up the shape of gods. (Fig. 20, Fig. 21)

On the other hand, Palladio indicates “a correspondence of the whole to all the parts, of the parts to each other, and of those parts to the whole,” closely following Vitruvius’s definition. (Wittkower, 1945: 72, Vitruvius, 1960: 13-14) The types of Palladian villas are presented in a twofold manner: the one is planned for an open space surrounded by rooms and colonnades like Greek or Roman atriums, while the other is for a symmetric and axial structure with centrality. The both concepts are gradually combined in his later works, in particular the Villa Trissino. (Fig. 22) The concepts are structurized by the sequences of spaces and events and by the configurations such as en suite, enfilades and spaces aligned by common axis, implying the movement of an observer. The enfilades and axial alignments of doorways create the secondary and lateral axes that typically extend left and right towards both halls and rooms, in tandem with the balanced suites of rooms on either side. The axial sequences of doorways lead through a series of hierarchically ordered rooms of decreasing size but increasing social exclusivity. Also, either an atrium or a courtyard is placed along colonnades or neighboring rooms split in half along the axis.

Palladio’s villas further serve a set of social relations in interior spaces. As well as the aesthetic value, the existence of the programme is expected through symmetries, alignments, and repetitions by the homogenized and enclosed rooms at each regular distance. (Fig. 22) The axis, symmetry, harmony, proportion, and centrality are more embodied through the movement of users, uncovering social and symbolic connotations, similar to the sequential motion of perception through language. They could be shaped as a set of relationships among things, all of which interdepend in an overall structure. (Hiller, 1996: 23) The notions, dwelling upon the notions of interrelated parts to other part, are intimately coupled with those of the structural system of a house to a city and with those of the figurative expression to the whole of human body.
4. AUTHOR ARCHITECT'S DESIGN

4.1 CONCEPTUAL DEVELOPMENT OF TECHNICAL ACTIVITY AND AESTHETIC QUALITY OVER TIME

Marcus Vitruvius Pollio talks about six concepts of the venustas with aesthetic and proportional notion. The elements, as has been noted above, are classified into two folds. Looking from the point of view of the technical activity, the ordination, dispositio and distributio are concentrated on proper measurements, disposition of rooms, hierarchical paths from courtyards to plazas via streets, building materials, and relationship between location and social status, whereas, from the point of view of the aesthetic qualities, the eurhythmia, symmetria and decor are articulate on symmetrical harmony, proportionally aesthetic appearance, and reasonable decorations to building function engaged by convention and custom, drawing on human measurement. Vitruvius defines measurements as values that estimate the real dimensions of individual body parts that rely heavily on ancient building practices and Greek metrology. The definition of the concepts is more embodied by the Renaissance architects through the expansion toward urban scale, the metaphorical overlapping he human body. In extending the use of urban scale, the comparison of a house to a city becomes a tendency that is consistently used by such Renaissance architects as Alberti and Palladio. In case Alberti, unlike Vitruvius, suggests six concepts: locality, area, compartition, wall, roof, and opening, which include aesthetic qualities and technical activity, and similarity between architecture and the city. Of them, the compartition is a medium distributing the site into proper smaller units by expanding from the residence to the city, atriums/vestibules to plazas, and colonnades to streets. Alberti regards the place or the building as close-fitting smaller places or buildings in comparison with the human body because he tells that the great ornament to the forum should have arches as the mouth of each road. It means that he recognizes the urban space as the human body in addition to the modular space dwelling upon it. On the contrary, Palladio expresses the notion of the compartition as that of the convenience for the correct position or place. The convenience includes the proportional harmony and aesthetic consideration between the whole and all of the parts. Further, Alberti and Palladio do not only establish urban expansion, but attracts natural environments into the context. As the expression of the universal principle and the emblem of respect for gods, they prefer a square and circular plan. This is congruent with the Vitruvian principle. So, the combination of the residence and the urban expansion with the human body is clarified with the symmetrical and proportional building form. This tendency is applied to the Renaissance architects without discrimination. As seen in the chronological changes of the Vitruvian man, architectural concepts are more embodied over time. In Francesco's and Giocondo's drawings, a man stands stretching out his arms and legs, superimposing him in a circle and a square, while Leonardo's drawing displays the application as a module unit. It confirms that Leonardo attempt to comprehend the human measurement with more correct notion. Moreover, Cesariano's and Caporalis drawing, through the cognitive enlargement of Vitruvius's argument prove that the human body is employed as a module by covering the Vitruvian man on the grid lines. They as a result attempt to clarify Vitruvius's intention which touches the human measurement in the square and circular shape.

4.2 PROPORTION AND SYMMETRY THROUGH THE ANTHROPOMORPHISM

Vitruvius initially makes statements about anthropomorphism with the example of Dinocrates and with a study of the Doric column. The most comprehensive and prominent remarks on harmonious measurements to suit the human scale universally applicable to architecture are found at the beginning of his third book. There he writes that the design of religious architecture has recourse to symmetry and proportion, and that this design corresponds to the right organization of the human body. As suggested above, he even derives the individual measurements, along with the two geometric figures of the circle and the square, from a well-formed body stretching out its arms and legs, while the navel forms the body's center. As the size of the circle and the square matches that of the man, so the man stretches out its arms and legs. The notion is on the surface echoed in the cosmos and the world for gods, while the human body more to immediate point calls forth the anthropocentric thought and the measurement of all things. The use of the human body by the Renaissance architects further blows its cover to represent the idealistic values of the Renaissance period. Namely, Francesco, Giocondo and Leonardo strive to combine the human body covering the square and the circle by dividing palm, cubit, foot and finger into the units of the human measurement. The diagram is itself emblematic of the proportional system of all things that rests on the human body.

Besides, the human body has the symmetrical figure in the center of arms and legs on the both sides. The primitive motive of the proportional and the symmetrical figure that rests on the human measurement is derivative of the human body, and the conception is more reified through newer definition by Renaissance architects on the metaphorical level. As Alberti says, it is more extended responding to the urban context and to the proportion and harmony with the correspondence of the whole and the parts. As a result, Palladii's buildings have the circular and square plan built in the equal-armed Greek cross form that relies on the human
measurement and that resounds with the cosmos and the image of gods at the same time. Additionally, Vitruvius deals with the number ten and six. The number ten is an emblem of the cosmos and neo-Platonic idea, while the number six proceeds from the basic units of the human body. By contrast, Palladio says the 12-inch foot as a standard module as a divine perfection. Here twelve is a multiple of six. Vitruvius’s influence upon Palladio might be considered through such correspondence. Given these interpretations, the principles bound up with the human measurement are consistently changed among the Renaissance architects.

Accordingly, both the body and the building are in a metaphorical sense transcribed with the help of measurements, numbers, proportions and geometric figures. From all this, admittedly, Vitruvian principles must be more deployed in the analysis of Renaissance architects about architecture and cities.

### 4.3 CENTRALITY

Vitruvius’s centrality should be considered in religious facilities with a proportional and a symmetrical frame and with a square and a circular plan that brings to mind gods and all sorts of things. The center of the Vitruvian man covered above the square and the circle is looked upon as the resonance of the cosmos, but also is echoed as anthropocentric thought colliguated with Humanism and Christianity spread throughout Europe in the medieval times. The anthropocentric idea considered, the same is true of that a plaza is in the center of the ideal city in the Renaissance era and that Roman forums and Greek agoras are in the center as the public place of discourse. In this regard, the plaza captures the spirit of the age in a combination of human rights and divine rights led to the Renaissance architects at that time. To begin with, in case Francesco, the town plaza is situated at the human body’s navel in the anthropomorphic analogy. In case Filarete’s Sforzinda, a church, a palace, and a market are located in the center of the town plaza. It indicates that the plaza is very significant in the town because it is flanked by main facilities relevant to political and economic parts. In case Palladio, his designs are focused on the symmetrical distribution in the center of the Greek cross hall flanked by rooms founded upon the square and the circle plan, as well as the human measurement overlapped on the Vitruvian man.

By contrast, the concept of the centrality is employed in concert with Francesco’s and Cantano’s Latin cross plans. It shows Vitruvius’s notion regarding the cross. Also, it indicate the image of Rome, the center of the world, whose position Vitruvius claims as the natural source of its power because Rome is in fact precisely located by the crossing of this meridian. Squaring is fundamental in augury. It has the division into four lines with two lines crossing at right angles. Moreover, both Francesco and Cantano regard the choir and apse as a human head, the nave as a human body. In particular, Francesco decides the scale of the nave aisles and the transepts on both sides by applying the human head as a basic unit to the church plan. What is unique about the religious plans is that the center of the human body is not the navel, but the breast. It shows that there are different interpretations about the centrality that is somewhat distinct from Vitruvius’s understanding. Consequently, Vitruvian centrality is gradually evolved as time goes by, and becomes an important concept, taking proportion and symmetry into account.

### 5. CONCLUSION

Vitruvius mentions significant concepts with regard to theory and practice in the comparison of architecture to the city grounded in the human body. He first focuses on six elements composed of aesthetic proportion, proper arrangement, elegant form, fitting harmony, correct appearance and advantageous management, which are divided into technical activity and aesthetic quality each. In conjunction with them, he lays stress on the proportion, the symmetry and the centrality that reflect the structure of anthropomorphic analogies. Also, the proportion and the symmetry are exhibited in the square and circular form, which are founded upon Vitruvius’s analysis of the human body and the appropriate harmony that rest on the absolute law of nature and the supreme order of the cosmos because the humans are strongly reminiscent of the image of gods. Furthermore, his ideas provide a driving force in regarding a public area, an urban forum and plaza as the extension of a house atrium, and even a temple as a perfect dwelling. The house atrium with colonnades, as the semi-private and semi-public area, is a principal venue to link streets with squares (plazas) in the understanding of a residence compared to a town. Hence, proceeding from such findings, one could logically assume that in the existence of cosmic ratios there is a parallelism between the proportions of the body and those of the building like the application of a module. The integrated system even completes an urban structure, in which buildings are placed in suitable locations conforming to social status.

Taking into account the above evidence, there are two conclusions to be drawn. First, as Vitruvius’s successors but with their own critical perspectives, Leon Battista Alberti, Andrea Palladio, and other Renaissance architects such as Filarete, Francesco di Giorgio Martini, Tommaso Campanella and Johannes Valentin Andreae give one clue as to common approaches in recognizing architecture and the city in a metaphorical sense as the human body. Second, Vitruvius’s influence on the Renaissance architects is vital in grasping the diverse and sophisticated spectrum because such access methods are more embodied and exploited by the late Renaissance architects.

### REFERENCES


Filarete (Antonio di Pietro Averlino) (1965), Filarete’s Treatise on


**ENDNOTES**

1. But, it does not mean that venustas are immersed in the utilitas.

2. The ideal roof height would be between one third and a minimum of two sevenths the width of the forum. He also states that the portico is a base one fifth its width high; the depth should be equal to the height of the columns.

3. I refer to this book, On Painting and On Sculpture: The Latin Texts of De pictura and De statua. Unless otherwise noted, all quotations from De statua and De picture are from this edition.

4. He notes that he is fond of questioning shipbuilders and other craftsmen to learn what rare and hidden special knowledge they hold.

5. In book ii, para. 36, he says that bones bend very little, indeed they always occupy a certain position . . . and in the same passage, the correct arrangement of the bones is linked to the proportionate relationship of the parts.

6. He is employed by the ruler Francesco Sforza and produces a large volume of plans and drawings for an ideal city called Sforzinda.

7. The words suffice in the Palladio's circle, addressing "As man is the image of gods and the proportions of his body are produced by divine will, so the proportions in architecture have to embrace and express the cosmic order.”

8. Palladio would be aware of Francesco di Giorgio's innovations in the field of architecture both in Serlio's adaptation and almost certainly through the direct consultation of copies of his manuscripts.

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