Conceptualisation and Organization of Knowledge Between the 10th and 14th Centuries in Arabic Culture

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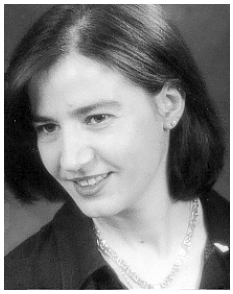

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ABSTRACT: I present a detailed philosophical study of three classification systems: Al-Farabi, Al-Ghazali and Ibn Khaldun. The primary aim of this study is to formulate the underlying philosophical basis of each classification and to relate this basis to certain principles contained in the Islamic revelation. I also give analytical treatment of the following questions: the major distinguishing features of each classification and the attitude of each thinker towards the philosophical and religious sciences and how they envisaged the distinction between the two fields.

1. Introduction

From the beginning of Christianity, knowledge theory was closely linked to religion. All the great philosophers, Christian, Jewish or Muslim, had the same compulsion to interpret the universe and existence from a theological perspective. Until the 15th century, science and knowledge were linked one to another, and knowledge (supreme knowledge) was considered to be the Knowledge of God. In reality, the dominant epistemology at this period of history was a means of reinforcing theological thoughts, to back up religious ideas and belief in the power of the divine.

Religion, therefore, influenced the context in general, and in particular the conceptualisation and the organization of knowledge, in Islamic philosophy. For a long time, Muslim thinkers and philosophers have tackled the problems of knowledge and the classification of science. Greeks took a keen interest in the issues of knowledge and theory about the world and its existence. For centuries, Muslims were deeply influenced by Greek philosophy, in particular Aristotelian philosophy. But the history of Islamic thought divides, in fact, into two principal periods: the period of transmission and the period of production. In the first phase, the Muslims had no single philosophy or school of thought. In this period, authors like Aminos and Yehie al Nahaoui were very interested in translation, and thus, they conveyed to the Muslim world multiple interpretations of Aristotelian thought, during the fifth and sixth centuries. These translators actually extracted principles and rules from Aristotle's classification, from which Muslim philosophers built, later, their own classification of science (Soliman, 1996). Various studies

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and thinkers claim that Muslims were so dependent on that philosophy that they did not add or modify anything to their own knowledge classification systems (Nillino, 1982).

So, is it true that Muslims neither evolved nor developed a philosophy based on their own culture? Our response to this assumption leads us to the second phase of Islamic thought. From the 8th century onward, two great schools of Islamic thought began to come into sight, the Mutazilits, and the Sophists or Mystics. Their complementary philosophies provide examples that reflect the scientific context of this period. According to the philosophy of Mutazilits, God has asked us for the frank and the just because reason requires them, and God has forbidden us lies and injustice. The Sophists, by contrast, think that God gave us reason, and that reason leads us to the frank and the just, not the inverse. But both the Mutazilits and the Sophists were in agreement on the three major categories of knowledge: Compulsory, Necessary and Deductive. Compulsory knowledge dwells in reason, and enables knowledge of primary subjects, such as the laws of logic. Necessary knowledge is acquired by reason as soon as one has acquired knowledge of God and God's existence; and deductive knowledge is based on rational vision, such as the interpretation of the world, comprehension of the characteristics of God, and the acquisition of sciences. (Saliba, 1986).

This way of looking at knowledge distinguished, in reality, Islamic philosophy from Greek, and this is the kind of conceptualisation which remained dominant in the following centuries. This is why, we suppose, that Muslims made progress in this domain, and they developed independent theories and philosophical schools, completely separate from the Greeks, especially as far as Islam is concerned, which is the basis of their civilisation.

To clarify our supposition relating to the evolution of Islamic science, we have chosen three founders of Islamic philosophical and intellectual schools, Al-Farabi (10th century), Al-Ghazali (12th century), and Ibn Khaldun (14th century). Contrary to Al-Farabi, Al-Ghazali and Ibn Khaldun did not propose explicit classification systems, so we analyze their philosophical works to understand their conception or interpretation of the problems of knowledge, and how, consequently, they classed sciences in this period. Each of them represented Islamic thought in their time. We also have chosen to express their classification principles in detailed tables to show, on the one hand, the diachronic evolution of their way of thinking and of their philosophy of the classification of science, and, on the other hand, to provide an analytic comparison of their classification principles. We have also added to the first table the science classification system of Aristotle, the Master of Greek philosophy of the 4th century.

Our motivation is twofold. First, we would like to show how much Muslims were influenced by religion and how this influence was translated in their works and in their method of interpretation of science and knowledge. At the same time, we would like to show how influence by religion could detach Islamic philosophy from Greek. Secondly, we are formulating the following questions: 1) first, if Muslims had made progress in the fields of science and philosophy, when did this progress stop; and 2) what would prevent the Arab world from taking into account this global rethinking of its ancient classification system in order to develop it in Arabic language and use in its libraries? This question is related to the great rule of language and its influence on the conception of knowledge, and consequently on the construction of classification systems, because we consider language to be one of the important fundaments of knowledge organization.

2. Science classification

2.1 Aristotle and Al-Farabi

Fourteen centuries have passed between Aristotle and Al-Farabi's philosophies, but the former's science classification system was the first upon which Muslim philosophers of the ninth and tenth century inspired their own philosophy of knowledge and, later, their classifications of sciences. According to some Greek and Syriac versions, the works of the "First Master" were fully translated in Arabic during the tenth century, and henceforth, they are at the source of philosophies in the Islamic world (Gusdon, 1996).

Before discussing their philosophy of science classification, it may be interesting to address Al-Farabi's thoughts, his knowledge philosophy, and his own interpretation of knowledge. Real existence and reason are two things, for Al-Farabi, which complement one another and one cannot exist without the other. God is pure reason and the human soul cannot attain perfection and happiness without reason; God, thus, is the soul of souls. The theory of knowledge in Al-Farabi's philosophy is based actually, on a sacred triangle: God (only), Reason, and perfect

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Soul. This is, in fact, the theory of *Abundance* of Plotin (205-270) which represents the doctrine of Aristotle and Plato. Al-Farabi took and adapted it to his culture and his education. God is the creator of world, existence is the object of thoughts, and thoughts need subject matter. God, according to Al-Farabi's philosophy, cannot be this subject, because he is only and simple. Al-Farabi was a mystic or sophist philosopher, for him, God is the source of existence and the creator of both the world and reason. Al-Farabi's theory is an ontological theory, its object is the organization of the mechanism of human intellect. His theory of knowledge depends on a dual philosophy, he tried to combine Aristotelian and Platonian thought so as to explain the theory of Abundance and the mysterious idea about World creation. He was inspired by all the prior schools of philosophy, which distinguished his thoughts from the others. So his philosophy may be summarized in these three points: a) the unity of philosophy, b) the unity of truth and, c) the unity of knowledge.

In the whole of his works, Aristotle presents a global map of knowledge, which explains his own philosophical vision of human knowledge classification (table 1, column 1). This philosophy relies upon the distinction between theoretical, practical and productive sciences. We note that Aristotle did not mention logic in his system: considering that logic is the tool of sciences, or the foundation of all sciences, he did not include it as a part of the philosophical sciences. However, in the third class, he considers poetry, rhetoric and dialectic as parts of the creative activities (Khafaja, 1983).

In relation to Aristotle, two types of remarks can be made about Al-Farabi's classification:

– There is a resemblance between the two systems: although this is not clearly stated by its author, the classification proposed by Al-Farabi relies on the distinction formulated by Aristotle between practical, theoretical and productive sciences. For instance, political sciences (table 2, column 5) can be assimilated to practical sciences; mathematics, physics and metaphysics can be considered as theoretical sciences, whereas language and logic can be compared to Aristotle's productive sciences. In other words, and on a fundamental level, Aristotle and Al-Farabi's presentations are deeply connected.

Aristotle (4th century)	**St. Augustine (4-5th century)**	**Al-Farabi (10th century)**	**Al-Ghazali (12th century)**	**Ibn Khaldun (14th century)**
1. ***Theoretical philosophy or pure knowledge of the world*** a) Geometry b) Astronomy c) Music d) Physic e) Metaphysic 2. ***Practical philosophy or study of the social sciences*** a) Moral b) Economy c) Politic 3. ***Productive philosophy, poetic, or study of creative activity*** a) Poetry b) Rhetoric c) Dialectical	1. Physic: God heart of substance 2. Logic: God heart of intelligence 3. Ethic: God heart of the life mode	1. Language sciences 2. Logical sciences 3. Mathematical sciences 4. Physical and metaphysical sciences 5. Political sciences	1. Theoretical and practical sciences 2. Religion sciences and rational philosophy 3. Immediate knowledge and acquired knowledge	1. Philosophical rational sciences 2. Theological sciences or transmitted sciences

Table 1. *Classification of sciences since Aristotle*

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Language sciences	Logical sciences	Mathematic	Physical and metaphysical sciences	Political sciences
1. Sciences of simple and compound expressions 2. Syntax: science of compound expressions rules 3. Etymology: science of simple expressions rules 4. Science of writing corrections rules 5. Science of reading corrections rules 6. Science of prosody	1. Logic 2. Syllogism 3. Premise 4. Speech 5. Demonstration 6. Dialectic 7. Sophistic 8. Poetry	1. Arithmetic: numbers science 2. Geometry 3. Optic 4. Astronomy 5. Music 6. Weight science 7. Mechanical science	*A) Physical sciences* 1. Natural bodies: simple and compound 2. Being simple bodies and their number 3. Generation and corruption of natural bodies: simples and compounds 4. Accidents and affections principles of elements 5. Bodies compound of simple elements 6. Bodies compound of similar parts 7. Botanical and zoological kinds *B) Metaphysical sciences* 1. Beings and their mutations 2. demonstration principles in theoretical and particular sciences 3. Being which not in the bodies, neither through the bodies	*A) Civil sciences* 1. Moral 2. Politic of cities 3. Happiness 4. Virtual city *B) Jurisprudence* 1. Jurisprudence in the opinions 2. Jurisprudence in the actions *C) Scholastic* 1. Scholastic in the opinions 2. Scholastic in the actions

Table 2. *Al-Farabi science classification system*

– However, we can also note a certain number of divergences. The first one concerns the presence of logic and of language sciences as independent categories in Al-Farabi's system. Language and logic are, for him, the essential tools (the mechanism of thought). They are, thus, the means (to express reasonably this mechanism) by which one can access knowledge as it was cited by Al-Farabi, himself, in his book *Ihsa'a al-ulum* (Sciences enumeration): "logic gives the rules which make the spirit upright and drive Man to the path of reason."

An additional divergence is related to the appearance of new scientific domains related to Islam. Although St. Augustine (4th-5th century) had already mentioned God in his classificatory principles, it is only with Al Farabi (10th century) that the first reference to Islamic religious inspiration appears in the enumeration of sciences like jurisprudence, the science which interprets the Koran and the Hadith, and the scholastic (table 2, column 5). Al-Farabi, a pioneer in that sense, has thus inspired new perspectives on knowledge organisation for his successors: Ibn Sina (Avicenna), Al-Ghazali, Ibn Roshed (Averse), etc.

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Theoretical and practical sciences (sciences according to their nature)	Religions and rationales sciences (sciences according to their origins)	Immediate knowledge and acquired knowledge
A) Theoretical sciences 1. Metaphysic 2. Physic 3. Mathematic 4. Logic *B) Practical sciences* 1. Moral 2. Domestic economy 3. Political science	*A) Religion sciences* **1. Principal sciences (original sciences)** a) Theological science b) Sciences of prophets c) Eschatological sciences d) Resourceful sciences **2. Secondary sciences** a) Obligations sciences, imposing by God b) Obligations sciences, imposing by society c) Obligations sciences, imposing by individual him self *B) Rationales sciences* **1. Mathematic** a) Arithmetic b) Geometry c) Astronomy d) Music **2. Logic** **3. Physic** a) Medicine b) Meteorology c) Mineralogy d) Chemic **4. Metaphysic** a) Ontology b) Knowledge of theologians c) Knowledge of simple substance d) Knowledge of subtle world e) Prophetical science f) Dreams sciences	*A) Immediate sciences* 1. Immediate sciences 2. Supra-Rationales sciences 3. Intuitif sciences 4. Contemplatives sciences *B) Acquired sciences* 1. Mediation sciences 2. Rationales sciences 3. Logical sciences 4. Discursives sciences

Table.3. *Al-Ghazali science classification system*

2.2 Al-Ghazali

Al-Ghazali was a mystic and a great Muslim philosopher and theologian in the history of Arabic thoughts. His philosophy aimed to disprove the existence of natural laws, because, for him, only the will of God can control the world. Sciences, therefore, become obliterated in the face of the power of religion. Different degrees and categories characterize the conception of knowledge for Al-Ghazali, with the result that sciences, in his philosophy of classification take different values. In his scientific and cultural development, Al-Ghazali has had different philosophical attitudes about knowledge and science classification. According to Khafaja (1983), these attitudes match two precise phases of his life: the first within which only the influence of earlier philosophies was essential; and the second, in which he acquired a pronounced taste for Islamic culture. These two phases sensitively influenced his philosophy of classification:

– Classification of sciences according to their nature (phase 1-column 1, table 3)
– Classification of sciences according to their origin (phase 2-column 2, table 3)
– Classification of sciences according to their finality (end of phase 2-column 1, table 3).

In the first phase of his life, Al-Ghazali took up the classification of previous philosophers by highlighting what seemed to be implicit for them: the difference between theoretical and practical sciences (col-

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umn 1, table 3). Theoretical sciences are concerned with the manipulation of ideas and concepts which allow us to understand the laws governing the Universe; practical sciences focus on Man, his behaviours and the exchanges which structure his social or familial relations.

In the second phase of his life, Al-Ghazali would develop a more personal classification, founded more on his religious beliefs. The second column of table 3 introduces a structuring of sciences according to their origins, religious or rational. The first are borrowed from prophets, whereas the latter are produced by mortal humans. We realise here the importance granted by the author to the reference to God as the structuring element of scientific thought. Everything appears to be classified according to human or spiritual origins, spiritual knowledge capping them all.

In his last classification, the religious militancy becomes more pronounced, which motivates his separation between immediate sciences and acquired sciences. We notice therefore a focus shift, from the origin of sciences to their finality: God reveals immediate sciences, and acquired sciences result from a learning process. On the one hand, immediate sciences are characterised by their 'pure' origin, because they are spiritual and divinatory: sciences are, in fact, sciences that neither spoken nor written language can transmit, in a similar way to supreme knowledge, the truest form of knowledge. On the other hand, acquired sciences are reserved to the study of less abstract scientific fields which are founded on the human notion of knowledge transmission: these are the sciences of Man's social relations, of his behaviours and of his acts, of his rituals and of his traditions (table 3, column 3).

2.3 Ibn Khaldun

Two centuries after Al-Ghazali, Ibn Khaldun developed a classification of sciences based on the particular influence of the trend of thoughts of his time. Unlike his predecessors, Ibn Khladun was situated in a philosophical and scientific context in which a central place was given to the search for rationality. He chose to classify sciences into two major categories: rationales philosophical, and theologically transmitted sciences. The first category expresses the sciences, which can be discovered by the human being, through his spirit and his reasoning. The second category contains the sciences related to the Muslim nation, made by and for Muslims.

If this classification was inspired by Al-Ghazali's, the resemblance is only superficial. In other words, even if both authors adopted a separation into two essential categories (one of them being identical, the rational sciences), the intellectual principles underlying the separation are broadly different. Whereas Al-Ghazali relied on the power of religious thought as the crux of his separation, Ibn Khaldun adopted a clearly more objective reasoning, wherein the scientific is the one and only rationale for separation. Religion cannot therefore be allied with science (viz. Al-Ghazali), precisely because it lies upon no rational element other than faith in God. If a category is given to theological sciences, it is in a rational and scientific meaning that it must be understood: no allusion is made to the prophets or the spiritual relations between God and the human being.

If the theological sciences have a category, however (as rational sciences have), it is because Ibn Khaldun considered Islamic thought and its functioning as an object of research which cannot be a part of the totality of universal sciences. During the 14th century, the influence of Islam was predominant on the other religions of the world and the importance of this influence made Ibn Khaldun take it as an object for particular study. In other words, the influence of Islamic culture at this time was such that it drove Ibn Khaldun to focus his classification around the distinction between sciences of the global world and sciences of the Islamic world. His classification system thus relies on the following two axes:

- Philosophical and intellectual sciences, which can be learned naturally by the human being via innate reasoning; and,
- Transmitted sciences, whose study require a return to the source of transmission (e.g., the founder of this science) and a return to the source of the revelation, for religious sciences.

3. Comparative analysis of classificatory Principles

It is obvious that Al-Farabi, out of respect and admiration took much of his inspiration from Aristotelian philosophy. But this influence allowed him to develop a classification system based on his own way of looking at knowledge and which, inspired by Islamic culture, could reflect a society well known for its specific characteristics. In his system, he developed a particular classification methodology in which he classified the sciences according to new

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Rationales sciences (philosophical sciences)	Theological sciences (transmitted sciences)
A) Logic 1. Syllogism 2. Premise 3. Demonstration 4. Sophistic 5. Speech 6. Poetry *B) Physical sciences* 1. Zoology 2. Botanic 3. Elements and metals 4. Celestial bodies 5. Sol 6. Inaction and movement 7. Natural phenomena 8. Medicine 9. Agriculture 10. Chemic *C) Mathematic* **1. Arithmetic** a) Properties of numbers b) Art of calculus c) Algebra d) Commercial transactions e) Law of successor **2. Geometry** a) Plans b) Sphere bodies c) Mechanic d) Geodesy e) Optic **3. Astronomy** a) Astronomical tables b) Movement of Celestial bodies c) Judicial astrology d) Magic **4. Music**	*A) Sciences of Koran and Hadith* 1. Interpretation 2. Reading 3. Abrogation 4. Jurisprudence 5. Scholastic 6. Dialectic 7. Sophistic *B) Sciences of Arabic language* 1. Arabic language 2. Grammar and syntax 3. Rhetoric 4. Literature and poetry

Table 4. *Ibn Khaldun sciences classification system*

scientific needs, which matched the new wave of Islamic culture. This 'new wave' sprang from a new conception of the relationship between revelation, spirit, and reason, and hence the relationship between religion, science and philosophy, at this time, where Muslims were opening up to the cultural world through the various translations of scientific and philosophical masterpieces.

As we have seen previously, Aristotle and Al-Farabi established science classification systems relying on formally different principles, but bearing a fundamental resemblance. Aristotle considered the difference between theoretical and practical science according to the foundation that the former would be only known, whereas the latter would be known and further studied. One of the privileged characteristics in Al-Farabi's system is the relationship between theoretical knowledge and its applications, including ethical, political, productive and daily life aspects. Moreover, for Aristotle, what differentiates physics from mathematics and metaphysics is the subject: the object of physics is the material and moving essence, the object of mathematics is the non-material and moving essence and the object of metaphysics is the non-material and non-moving essence. In Aristotelian productive philosophy, po-

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etry and rhetoric are classified as a third kind of philosophical thought. These genres have been put in the front in Al-Farabi's classification philosophy. Aristotle did not put logic in his system as a science, he instead considered it as a tool (organon); Al-Farabi gave an entire category to logic. This difference in the mode of organisation shows implicitly the animated evolution of Al-Farabi's classification with respect to Aristotle's.

Al-Ghazali incorporated in his system the majority of Al Farabi's scientific divisions (but left out some branches), and reorganised them according to his philosophy and his religious and intellectual perspectives. He classified the linguistic sciences as a part of religious knowledge, because in his eyes they were its tools. For him, linguistics referred to the Arabic language. Instead, Al-Farabi considered them as tools of all sciences: he classified them in an independent category, a category which divided according to the structure of human language, in general. Between the subdivisions of intellectual sciences in Al-Ghazali's classification and the subdivisions of philosophical sciences in Al Farabi's, there is a slight and negligible difference. For Al-Ghazali logic is a part of the philosophical sciences, and medicine and alchemy are in the category of physical sciences, but they are excluded from Al-Farabi's classification.

If there are many differences between the two systems indeed, it is because each author has classified sciences according to his own philosophical point of view, and in particular according to his view of the reality of the world. Al-Ghazali admits that there is an intermediate layer between the spiritual and material worlds, which he considers as a subtle domain and classifies in the category of existence. For Al-Farabi, mathematics and politics are the intermediate layers between the physical and metaphysical worlds. However, mathematics are only numbers and figures as one can find in the physical world of Al-Ghazali (Bakar, 1989).

This divergence finds its roots in two difference contexts: rational (Al-Farabi) and religious (Al-Ghazali). In the 14th century, this tradition of describing science becomes more and more prevalent, thanks especially to Ibn Khaldun's famous "*Introduction*" which contains the most important and arguably the best science classification. It also becomes more and more of a priority with scientific advances and with the appearance of new domains of study (sciences of the Arabic language, history, and geography among others). Ibn Khaldun's analysis of science is the result of immense and profound work on the sciences at the time, which was the end of the greatest and richest period of Islam. As he himself predicted (Imam 1985, 125 translation supplied):

> Thanks to Muslim philosophers, there has been an important invigoration of Greek rational and philosophical sciences. These sciences, which are transmitted to the western world by these philosophers themselves, constitute the major fracture in the civil mutation of this world, who do not realise that it was the beginning of the end of the Muslim world.

Because of its originality, and because it was much more than a simple repetition of earlier works, the classification system of Ibn Khaldun is considered to be definitive version of the division of sciences in Islamic thought. This system has been much studied in schools and in universities of the Arab world (Naser, 1979).

4. Conclusion

This comparison of the three science classification systems, Al-Farabi, Al-Ghazali and Ibn Khaldun, shows that Islamic thought in science classification is based on philosophical principles shared by the different Islamic intellectual schools (Sophist, Sunni, Shiite, etc.). It is also based on specific ideas related to the religious and intellectual stances of their authors and of the schools they represent (and particularly for Al-Ghazali, for whom the link to the Islamic culture is very strong). There exist two dominant points of view: the first one is the hierarchy and harmony of sciences, and the second is the distinction between science, philosophy and religion. This distinction relies upon the separation between revelation and reason, even if there is a terminological difference in their expressions.

These systems can therefore be classified in three fundamental philosophical genres, with which we can evaluate historical and scientific development in the conception of classification systems in Islamic thought:

- Epistemological classification
- Religious classification
- Constructivist civilian classification

The first of these genres classifies sciences based on human cognition, theoretical or practical, creative or romantic. The second divides sciences based on religious principles, and the third treats the classifica-

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tion of sciences using a civilian (or lay) point of view, with respect to scientific progress and interdisciplinary science.

These systems of classification also fundamentally reflect three bases of science hierarchies: methodology, ontology and ethics. We can see the methodological base with respect to the hierarchical order of the proofs, arguments, and the means used to know things. The ontological base depends on the hierarchical order of the perspectives of the Universe; and the ethics base with respect to the hierarchical order of human needs. Generally speaking, each philosopher has developed his classification system and his hierarchical order of sciences based on a personal point of view and on his own interpretation of the Universe.

To conclude, it is important to mention that the way of looking at language, in these three classification systems, was related to the sacred characteristics of Arabic language, the language of the *Koran*. The importance of this language meant that language science took an independent category in the classification system of each philosopher, as we have seen. We can mention, also, that language is an important factor in the organization of knowledge in general and, in particular, in the construction of a classification system, it is one of foundations of knowledge organisation. So, now, the question: why does the Arab world not take into account the factor of language in order to develop a system based on the specificity of Arab culture, a system which can be a reflection of the monument of Arabic sciences? This question result informed a recent thesis about the fundaments of knowledge organization (Charaf, 2005). In this thesis, we used comparative analysis of the structure of architecture domain (as a domain of analysis) in the *Dewey Decimal Classification* applied in the libraries of the Arabic World, Anglo-Saxon and francophone countries. The results relating to the Arabic World were disappointing. In fact, this study shows, for instance, that Arabic modifications were not affected by the particularity of Arabic or Islamic arts, neither, by Arabic or Islamic architecture, its history and its style or type. At the same time, all the categories relating to history and style of architecture in the American and western world were kept in the Arabic system modified. Consequently, all the works which deal with these subjects, will be classified in a vast category "Islamic architecture." We suppose that translation is the principal reason for this gap in the Arabic application of *DDC*. Translation is related to language, and we suppose that the translation is the culprit, because the translation of *DDC* into Arabic betrayed the special nature of Islamic and Arabic culture.

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