

The Universal Decimal Classification: Some Factors Concerning Its Origins, Development, and Influence

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The bibliographic enterprise envisaged by Otlet and LaFontaine, which resulted in the *Universal Decimal Classification* (UDC) being developed in 1895, and the subsequent history of the scheme is outlined. Relationship with *Dewey Decimal Classification* (DDC) from which it was derived deteriorated in the early 20th century and changes in funding, location, and editorship of Duyvis from 1929–1959 had a profound effect on the scheme's development and management. Lloyd, Duyvis's successor, reformed the revision structure, and further management changes from 1975 to the present day, culminated in the formation of the UDC Consortium in 1992. The subsequent creation of a machine-readable Master Reference File and speedier revision procedures are noted. The scheme's structure, development, and influence on classification theory are examined, problems caused by longevity and lack of standard procedures, and proposals for their reform to improve the scheme's suitability for an automated world are highlighted. Research projects in the 1960s foreshadowed possibilities today being explored, such as a complementary thesaurus and individualization of single concepts notationally. The value of classification in a multilingual environment is emphasized and future developments outlined. A list of recent editions is appended.

Original Concept

The origins of the classification scheme that we know today as the *Universal Decimal Classification* lie in an enterprise quite different from library or bibliographic classification. It was designed as an adjunct to a much grander scheme, not dissimilar to that promulgated by IFLA some seventy years later with its concept of Universal Bibliographic Control.¹

Towards the end of the last century, a Belgian lawyer, Paul Otlet, together with a fellow countryman and fellow lawyer, Henry LaFontaine, embarked upon the task of compiling a bibliography of everything that had appeared

in print,² a *Répertoire Universel Bibliographique*. In order to provide a systematic arrangement for this *Répertoire*, they negotiated the agreement of Melvil Dewey, the fifth edition of whose *Decimal Classification* had recently been published³ and used his scheme as the basis of their mammoth bibliographical task. They were permitted both to expand the main tables and to add certain auxiliaries and connecting devices, in order to handle the great detail of their listing and to introduce some flexibility into the rather rigid structure of the original.

At the outset, the intention was a bibliographic source for lawyers, and the social sciences were tackled first, but very soon the project was expanded in an attempt to embrace the whole of knowledge in their listing. More than 16 million records were created before the First World War, but subsequent stringencies brought the bibliographic enterprise to nought. However, the by-product which we know today as the Universal Decimal Classification survived and is still being developed to meet modern needs in the way that has happened throughout the past century. It has been through many changes in management and in editorial processes, but it remains today as one of the world's most widely-used classification schemes. Its French-language origins are undoubtedly a contributory factor in this, and it is especially popular in the French-speaking countries of North Africa, in Spain and Latin America, and throughout Eastern Europe. In the English-speaking world, however, it has always been, and remains, used principally in specialist libraries, and most frequently in those with a strong emphasis on technological interests.

Relationship with Dewey Decimal Classification

Otlet and LaFontaine began their enterprise by basing the organization of their bibliographic listing on the fifth

¹ For an outline of the original program, see Kaltwasser (1971). A more recent update on activities is Plassard (1990). Some aspects of the program and its relevance for subject control are discussed in Cochrane (1990).

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² The full story of the beginning of the enterprise, of the subsequent correspondence between Otlet and Dewey, and ultimate agreement with Dewey to use his classification for their purposes is set out in Rayward (1978).

³ Fifth edition was published 1894 and little changed from the two previous editions (Comaromi, 1976, p. 218ff).

edition of Dewey's *Decimal Classification*, but they rapidly found that its structure was not sufficiently flexible to accommodate all the concepts that they wished to express. It is not surprising that they were quick to see the advantages of the identification of recurring concepts intellectually and notationally, in the manner that Dewey demonstrated as a possibility, in a rudimentary way, in his classification scheme, as well as the benefits of using a decimal notation to reflect the hierarchical structure of knowledge. These factors were particularly appealing for a multi-lingual enterprise. Otlet and LaFontaine developed these and other of Dewey's ideas and so produced the system that was originally referred to as the "Brussels expansion." It was so called because the body set up by Otlet to undertake this bibliographic enterprise, the Institut International de Bibliographie (IIB), was the outcome of a conference of bibliographers held at Brussels in 1895. The first edition of the classification was completed and published in 1907 (*Manuel du Répertoire*, 1907). The whole enterprise was housed in Brussels and received financial assistance from the Belgian government until the 1920s.

Development from 1919–1975

Throughout the early part of the present century, the classification was closely linked with the Dewey Decimal Classification, and Dewey himself, and subsequently his son Godfrey, as well as his assistant Dorcas Fellows, remained in close contact with Otlet. Godfrey Dewey and Miss Fellows attended a congress in Geneva in 1924, when an attempt was made to reestablish a direct concordance between the numbers used in the two classifications. Both Deweys, father and son, were anxious that the two schemes should be harmonized but Miss Fellows took the opposite view. Her influence gradually prevailed and by the 1930s the two schemes were diverging on separate paths.⁴

In the 1920s, the need was felt for additional assistance in the work on the 2nd French edition of the classification. Donker Duyvis of the Dutch Patent Office became Secretary of the International Committee of the Decimal Classification, the governing body for the scheme set up by Otlet in 1921, and he initially was responsible for assisting the development of the natural sciences. In 1929, the Office of the IIB was moved from Brussels to The Hague; in 1931, the Institute became the International Institute for Documentation (IID), and in 1937, the International Federation for Documentation (FID). On relocation in the Netherlands, Duyvis was employed as full-time editor of the classification, and remained in that office from 1929–1959. The second French edition was published as *Classification Décimale Universelle* in 1927–1933. Work on editions in German and in English began in 1934, and

the German edition was completed in 1953 (*Dezimal-Klassifikation*, 1934–1953). That in English remains unfinished and now is unlikely to be completed in the light of recent policy discussed below.

The responsibility of developing the scheme remained essentially in the hands of Duyvis throughout a period of 30 years, during which the Second World War occurred, with the inevitable disruption caused by the occupation of The Netherlands. By 1959, his health was failing increasingly, and he retired. At this juncture, the Universal Decimal Classification was subjected to severe criticism, especially by Barbara Kyle and Brian Vickery in Great Britain, and the question of whether it remained a valid classification was raised (Kyle, 1961; Vickery, 1961). These critical reports coincided with Donker Duyvis's retirement and death, and resulted in serious attention being given to ways in which the structure and effectiveness of the classification could be improved. One result was the institution of an elaborate committee structure which was eventually to become another hindrance to the speedy implementation of revisions and amendments. In 1963, Geoffrey Lloyd, who was at that time the editor of the English edition of the UDC, was appointed editor of the classification, and he imposed a more rigorous procedure for revisions with the publication of instructions to revisers and clear guidance on how to construct a schedule according to the principles of facet analysis.

After the completion of the second French edition in 1933, it became the policy to extend involvement in the classification on a more international scale and permission was given to competent recognized institutions to publish the classification in their own languages. It was on this basis that the German and English editions commenced, and subsequently those in other languages. In this way, the responsibility for individual editions passed from the central authority to appropriate language publishers, in the case of the German and the English editions, the German and the British Standards Institutions, respectively, and there ceased to be any possibility of creating a degree of harmony across the various editions. Responsibility for the authorization of changes was in the hands of the Central Classification Committee of FID, and the various editions were based on the authoritative text as it stood at the moment of their creation.

The Central Classification Committee originally consisted of the editor of the UDC and the Secretary General of FID. In 1965, as the direct result of Lloyd's tightening up of procedures, they were joined by representatives of the national committees responsible for the various language editions, and in this way a network was built up through those concerned at national level with specific subjects to their representatives on the Central Committee (Strachan, 1990). Lloyd remained editor until his retirement in 1975, by which time the Central Classification Committee had 25 members and parts of the classification had been published in editions of varying fullness in 22 languages.

⁴ A full account of this period is given in Comaromi (1976, chap. 11).

On Lloyd's retirement, a UDC Directorate was set up, and David Strachan who had already been working as Lloyd's assistant, was appointed Technical Director. He remained in this post until 1992. By 1978, the size of the Central Classification Committee and the elaborate structure of dependent committees and subcommittees at national level had become too unwieldy for effective management. The situation had become such as to lead FID to commission an external management study of the organization of the entire scheme, including the procedures for revision. The study reached the conclusion that the size, scope, and level of activity of these committees was so diverse and uncoordinated that a new system should be introduced. As a result, a two-tier structure was put in place, responsible for the strategic and the specialist level, respectively. A UDC Management Group was set up, in 1984, to implement the recommendations of the report, in full cooperation with the Central Classification Committee. The Management Group's "Proposal for the future organisation of the UDC management and revision structures" (Gilchrist, 1984) was approved by the Council of FID at the Montreal Conference in 1986, and, at the end of that year, the Central Classification Committee was formally dissolved.

As the result of the new structure, a Management Board and five revision committees, which between them covered the whole of knowledge, were set up. The intention was to instil some overall control and to reverse the procedure of individuals working in isolated groups on a specific part of the scheme, without reference to the rest of the classification. The chairman of each committee sat on the UDC Management Board, and the chairman of the Management Board was the President of FID. By 1989, the Management Board was dissatisfied with the working of the new arrangement and was also increasingly concerned over the financial structure underpinning the classification. It therefore set up a short-term Task Force to look into the future of the classification and to make recommendations for its future management. The Task Force reported to the Management Board at the beginning of 1991 (Task Force, 1991). As the result of its deliberations, it endeavored to evolve a forward looking and practical plan for the future of the UDC. There was consensus that the scheme should be maintained. There was, however, anxiety that if it were to continue, there was an urgent need for action. The first recommendation was that a standard version of the UDC should be created. This should be in machine-readable format, it should be in English, and should consist of c. 60,000 classes and subdivisions (about three times the size of DDC). It was also felt that there was a clearly discernible demand from the user community that the system should be underpinned by a semantic network, in order to assist verbal-based retrieval of information in automated systems, i.e., that in addition to the classification, it would add value if there were also a thesaurus. It was very strongly felt that it was

essential that the basis should be linguistically sound to facilitate the production of editions in all target languages where there was a need. It was also recommended that it should have a much more consistently faceted structure.

It was considered that the creation of such a version would enable individual publishers (including FID itself) to publish the standard version, or expansions or abridgements of it. These could be in a variety of languages, wherever there was a perceived need. Full editions and special subject editions could also be developed from the database by interested bodies. It was recommended that FID should retain the overall responsibility for the classification and have available an easily updated version—a live database into which publishers might key as often as they wished to produce editions. This version would be FID's property, used by the publishers, but not freely available. FID would produce updated versions as required and would continue to publish *Extensions and Corrections* to the standard version annually, but would cease to publish the consultative provisional revisions known as P notes. It was agreed that FID was unable to guarantee the necessary updating of the full schedules in their entirety, and therefore a compromise was essential. That compromise was Medium level, for a number of reasons, not least that there was already in existence a 1985 version in English (*Universal Decimal Classification, 1985–1988*) in machine-readable form.

Prior to this date, the scheme had existed in various sizes, the most detailed of which was described as the "Full edition." This was the basis of the first five editions, in French, German, and English, as well as of those in certain other languages, that began to be developed from the 1950s onwards. In addition to these full tables, cut down versions were produced, loosely described as "Medium editions," approximately 30% of the whole, and "Abridged editions" approximately 10% of the whole. In practice, there was considerable variation in the actual size of these editions. In addition to the full, medium, and abridged editions, a number of "Special subject editions" were also published, containing all those sections of the scheme needed for a specific subject area, e.g., Education (*Universal Decimal Classification, 1965*) or Building (*Abridged Building Classification, 1955*). From 1990 onwards, attention has been focused only on the production and maintenance of the classification at Medium edition level, and at the present time that is the "standard" authorized as the authentic version. All versions that are now published must conform to this, though expanded or contracted versions may be produced in accordance with agreements negotiated with the UDC Consortium.

The Task Force felt that if UDC was to be retained and maintained it was essential to take rapid action. Therefore, the report proposed that a crash program across the whole classification should be carried out to produce the Master version and set the scheme on a much more viable footing. Its recommendations were partially fulfilled. A Master Reference File, in machine-readable for-

mat was created and in place by the middle of 1993,⁵ though only one post was permitted for undertaking the work, rather than the two recommended; this was the already existing one of Technical Director. A Consortium was set up, not of large institutions which used the classification, as was the original intention, but of publishers who wished to publish the classification in their own languages. The Master Reference File is kept at The Hague. Extensions and corrections are published annually and are then incorporated into the File and become the authorized version of the scheme. This may be purchased under license by interested bodies who wish to use it either as the basis for publication of a language edition in a language other than one of those which the Consortium members are responsible, or to mount it on a network, or for some other purpose. The Consortium holds the view that anyone wishing to publish in a major world language must become a full member, not just a licensee.

The Consortium maintains its connection with the organization set up by Otlet, now known as the International Federation for Documentation and Information (FID), which has also changed out of all recognition in the century through which it has lived. The connection now is that FID is a member of this Consortium of six publishers which came into existence on January 1st, 1992 as the UDC Consortium, and has joint responsibility for the maintenance and development of the classification. The remaining members of the Consortium are those responsible for publishing the classification in Dutch, English, French, Japanese, and Spanish.⁶

Revision Process

The democratic approach to revision was seen by the Task Force as a major handicap to development of the classification. It was difficult to achieve international agreement on controversial topics, the task of finding people with the time and interest to sit on revision committees and to produce work for them was becoming increasingly burdensome, and there were large sections of the classification that were in urgent need of overhaul. Therefore in 1993, when the Consortium was fully in operation and the Master Reference File completed, the members took the decision to set up an editorial board with an editor in chief. So the present situation is that the editor in chief, acting on advice from the members of the Board, commissions revisions for sections of the classification scheme, and the revised tables are then submitted to a quality assessment by a specialist or specialists. The advice and

expertise of the editorial board is invaluable in this process. When approved, revisions are published as the authoritative text in *Extensions and Corrections* and incorporated into the Master Reference File. The intention is to update the obsolescent sections of the classification as speedily as possible (McIlwaine, 1994).

Structure of UDC

The original framework set up by Dewey had, for copyright reasons, to be maintained, and even today, with the exception of the empty class 4, the first thousand subdivisions of the two classification schemes remain fairly comparable. But the scheme was expanded and given added flexibility through the facility to combine any two numbers by using the colon. This was a great step forward. For the first time it became possible to express facets of a subject other than those that recur commonly across the whole of knowledge, without enumerating the compound concept within the structure of the classification. In other words, simple concepts could be identified intellectually, verbally, and notationally, permitting the combination of compounds as required and without the need for their being set out within the tables of the classification, in the manner that Dewey's *Decimal Classification* or the Library of Congress Classification do. The first edition of the UDC (*Manuel du Répertoire*, 1907) does actually list a great many such combinations in the tables through use of the colon, and there are many places where the class marks are worked out for complex topics, e.g.:

238 Symboles de la Foi. Symbolique.

238:281	Credos de l'Église primitive. Symboles oecuméniques
"0381"	Symbole de Nicée. Constantinople
(Ap)	Symbole des apôtres
(Ath)	Credo d'Athanase
238:281.9	Credos de l'Église orthodoxe orientale
"1453"	Confession de Gennadius
"1640"	Confession orthodoxe
"1672"	Confession de Jérusalem
238:282	Credos de l'Église catholique romaine
"1564"	Confession de Jerusalem
238:238	Credos de l'Église réformée, anglicaine et américaine
"1551"	Confession de trente-neuf articles
238:284.1	Credos de l'Église réformée luthérienne
"1530"	Confession Augustiane
"1580"	Formula Concordiae
238:284.1(493)	Confessio Belgica
238:282(443.6)	Cathéchisme du diocèse de Paris
238:282(493.4)	Cathéchisme du diocèse de Namur

This use of the colon has brought its own problems, the principal one being that it fails to distinguish between different types of relationship, but it represents the synthetic quality of the UDC which was unique at the time of its invention. The selected piece of punctuation has

⁵ The first published version of the classification based on the Master Reference File is *Universal Decimal Classification* (1993).

⁶ The members of the Consortium, in addition to FID, are AENOR (Asociación Española de Normalización y Certificación) Spain, Bohn Stafleu Van Loghum, The Netherlands, BSI/DISC, UK, CLPCF (Centre de Lecture publique de la Communauté française de Belgique), Belgium, and INFOSTA-NIPDOK (Information Science and Technology Association), Japan.

made its individual impact on the development of classification theory, for it was the use of the colon in the UDC that suggested the use of the same symbol to Ranganathan to denote the Energy facet⁷ which he saw as all important, and so consequently, he named his own classification scheme after it. Tables for clearly identifiable facets were introduced from the outset, and the 1907 edition of the classification was equipped with seven tables of common auxiliaries, those of form, place, language, time, points of view, the colon combination sign and the use of alphabetical extension for proper names. The example above demonstrates the use of the auxiliaries of place within curved brackets, of time within inverted commas, and the use of alphabetical extension, in addition to the use of the colon.

The *Universal Decimal Classification*, throughout the century of its existence, has provided a testing ground for many ideas that have subsequently been adapted to other uses. This is the nature of development; just as it is itself derivative, taking over many of the features of Dewey's scheme, and then shaping and developing them to serve its own ends, so the UDC in turn has been used as a source for other systems. The scheme exerted a strong influence, for example, upon the *Colon Classification*. For some years Ranganathan worked on the UDC while he was living in Switzerland after the Second World War, so it was a two-way process.⁸ As the creator of a classification scheme ab initio, Ranganathan was able to profit from the inventions of his predecessors, and so was fortunate. He was not hampered by the trappings (and errors) of either a parent scheme or of a century of custom and usage, which militate very strongly against change, however desirable this may be in theory.

The UDC has made its own additions over the years, some great improvements, others which, in the testing ground of time, might have been better not made. It has added to its use of auxiliary tables. Just as the History class eventually became the source for the Common Subdivisions of Place in DDC, so the special auxiliaries of persons, originally provided for class 3—Social Sciences and 61—Medicine, became a common auxiliary table of universal application, an arrangement that the parent scheme was also later to adopt. Other auxiliaries and connecting symbols have been introduced over the years. A problem here is that sometimes the enthusiasm of revisers has over-reached itself, and the meaning of a symbol has been altered, leading to great confusion for the user. One such instance is the apostrophe. This was originally introduced to join two synthesized concepts within a special auxiliary or one main class only (as opposed to the colon, and other relational symbols which apply across all classes), to denote compound concepts such as chemical compounds or Christian churches that have amalgamated or united with one another, e.g.:

546.32'131	Potassium Chloride KCl
546.32'135	Potassium Chlorate KClO ₃
546.32'173	Potassium nitrate KNO ₂
456.32'175	Potassium nitrate KNO ₃

It has, however, in recent years, been used simply in the same manner as the hyphen and .0 to indicate a special auxiliary, with no implication of synthesis, e.g.:

903 Prehistory. Prehistoric remains, artefacts, antiquities

Special auxiliary subdivisions	
903'1	Prehistoric culture forms
903'12	Hunting and fishing cultures
903'13	Primitive farming cultures
903'14	Pastoral cultures
903'15	Nomadic cultures
903'16	Advanced farming cultures
903'18	Town, city cultures (civilizations)

Such changes in intention are very confusing, especially to someone who is not extremely familiar with the idiosyncrasies of the classification and its revisers.

Facet Analysis and Its Application in UDC

The UDC throughout its existence has greatly extended the use of tables to identify recurring concepts (or made use of an analysis into facets) by creating many series that are peculiar to one discipline or even to one small sub-branch of a discipline. This is true to the principles of facet analysis⁹ that have now been universally accepted as the most sensible basis on which to structure the organization of knowledge in a systematic way. It has also created problems, because there are major difficulties when one attempts to transform an enumerative, or even a semi-enumerative classification into a faceted one. Dewey succeeded in identifying the constituent facets and individualizing them notationally in the literature class of his scheme right from the outset, but this must be one of the most straightforward of disciplines to subject to such treatment, and even then he overlooked Prose as a form and moved straight to individual prose forms. There are many places in the UDC today, in addition to class 8, where a totally faceted approach is adopted. Classes 52 Astronomy (McIlwaine, 1995) and 903/904 Prehistory and Archaeology are only two examples. The result of this is the clear identification of concepts both structurally and notationally, and this provides an excellent basis for searching across language barriers.

⁷ Ranganathan (1957, p. 120).

⁸ For an appreciation of his contribution and list of his papers for FID, see Duyvis (1965).

⁹ The problems of mixing of facets and of citation order are discussed in *Guide to the Universal Decimal Classification (UDC)* (1963). A more recent discussion can be found in McIlwaine (1995).

Lack of Standard Rules for Application

Unfortunately, as far as rapid development is concerned, UDC is a classification that is used in hundreds of libraries in a whole range of different versions, and therefore, although frequently published by Standards Organizations, it can in no way be described as a standard. Although there are rules for filing order, no rules are prescribed for the combination of facets, a situation which leaves the individual free to adopt the practice best suited to a particular need. This means that it is possible to construct a variety of different combinations to express a compound concept, each of which may be correct according to the rules of UDC, but none of which corresponds precisely with another. There is, therefore, no standard for application, only a standard for the symbol representing a simple concept. There are also a great many places in the scheme where the faceted approach breaks down and enumerated compounds remain. Consequently it is quite possible to create two "correct" yet quite different class marks for the same concept, even if the construction of the classmark is based on the same analysis of the subject and even, in places, the same application of citation order. Traditionally, this has been perceived to be an advantage, since it permits the individual to adapt the classification to the arrangement that best suits an individual collection. Nowadays, standardization and correspondence in records is seen as much more desirable, and in an automated environment, there is far greater pressure for conformity. Unless a strict order for the combination of concepts is rigidly applied and universally adhered to, it is difficult to claim the title of "standard" for the scheme. It means that a standard citation order must be imposed, a suggestion that is unpopular with users. This is a major problem that those responsible for maintaining and developing the classification are attempting to tackle in as non-disruptive a manner as possible. To rid the scheme of all these enumerated compounds cannot be accomplished in a hurry, since it will affect the classification practices of those hundreds of users who are locked into its structure in their shelf and indexing arrangements. Until it is accomplished, there will remain the possibility of constructing class marks for compound concepts that are enumerated in the tables either by using the enumerated notation or by combining the same concepts singly, through the use of auxiliary tables. Additionally, there are places where the combination of elements in two different ways is possible (though not, of course, within the same institution), e.g.:

597.553.2-113.2	Salmon—digestion
591.132-755.32	Digestion—salmon
34(410.5)3.21	Law—Scotland—criminal law
343.21(410.5)	Criminal law—Scotland

This facility makes machine retrieval of single concepts impossible. It is not clear to a machine, or indeed to the

average user, that these two sets of class marks each consist of the same notations combined in different order.

Auxiliary Tables

The auxiliary tables are one of the UDC's great strengths because they permit the expression of a wide range of varying concepts and provide great specificity of expression. But they have been subjected to many additions over the years and the results of this exemplify the problems of attempting to build a faceted structure onto an enumerative base. This is particularly evident in the Common Auxiliary of Materials, which began as a special auxiliary and was later converted to universal use. Many of the materials listed in this table occur in a range of locations throughout the classification as enumerated concepts with totally different and varying notations. Attempts are being made in the current program of revision (McIlwaine, 1994) to rectify some of these problems, but it is slow, expensive, and unpopular with many users.

An interesting piece of research into the use of the auxiliaries was undertaken by Jean Perrault, one of the leaders in the theory of information retrieval for the past 35 years, during the 1960s (Perrault, 1969, 1994), at the time when the importance of identifying different types of relationship in order to enhance machine retrieval was being examined. At that time, Farradane was working on his system of analets (Farradane, 1961, 1970; Farradane, Datta, & Poulton, 1966) and others in the field were identifying and distinguishing recurring relationships and providing notational symbols or imposing orders on words for retrieval purposes, so as to differentiate between the same word being used in a different sense, or context. Farradane's "rabbit as a pet," "for food," etc. are examples frequently cited to demonstrate the need for distinction in relationships. Perrault produced a detailed "schema" in which he identified a range of different relationships and concepts and provided a notation which he proposed as another common auxiliary table for the UDC. This idea was never adopted, and did not receive universal favor, but it remains a valuable analysis and enumeration of concepts that has not been overlooked by those currently responsible for maintaining and developing the classification.

Perrault suggested that the freedom to combine at will should be curtailed, and that instead, there should be only one combination order permitted in the construction of class marks, to conform with an order that he laid down. In other words, he proposed that a standard citation order should be imposed. Thirty years on this still has to be recognized by those users of the classification who employ it for shelf arrangement and for the organization of a classified card catalog. If the scheme is to continue and to maintain its standing in an automated world, it must adopt some standard practices in application, in order to ensure that records can be created, used, and understood in the same way across the world by all different kinds of user.

Application in Automated Systems

Again, in the 1960s, the UDC was perceived, despite certain problems with some of the notational symbols, (problems, incidentally, which still remain) as having great potential for use with automated systems which were at that time being developed. Work was undertaken to investigate the possibilities by Pauline Atherton (now Cochrane) and Robert R. Freeman at the American Institute of Physics (Freeman & Atherton, 1968; Mølgaard-Hansen & Rigby, 1969), and several papers on the possibilities of UDC in an automated world were presented at the FID Conference held in Washington in 1965 (Freeman, 1967). This project was named AUDACIOUS—Automatic Direct Access to Information with the Online UDC System. Many of the conclusions reached by Freeman and Atherton in this work, such as the value that a notated system provides for international exchange networks where the problem of language might otherwise prove a serious barrier, and the possibility of using UDC in conjunction with a thesaurus, are topics that are being very actively pursued, and are central to several projects that the UDC is engaged upon at the present time. This provides a salutary warning, for there are many enterprises being undertaken in the information world today that have already been tackled, albeit not in an automated environment, and the results of earlier research often suggest solutions to problems in an online context. A number of other projects involving automation and the UDC were undertaken in the early days of mechanization, and these are usefully summarized in Rigby's report and bibliography (Rigby, 1981).

Influence of UDC on Classification Development

The history of the UDC has always been an economic struggle and it remains so. There are many works which trace its development in a variety of languages. The intention here has been to highlight some aspects of its history which still seem important in the present day context. But what of its influence? In passing, this has already been touched upon, for Ranganathan was heavily influenced by the classification in the design and development of his own scheme. This, in turn, has led to certain ideas being taken across into the accepted theory of library classification that has strong links with all that Ranganathan did and wrote. The analytico-synthetic quality that was present in UDC from the outset lent an additional facility for the expression of compound concepts that was not present in any of its contemporary systems for subject arrangement. Bliss, in 1910, was the next to develop the same approach with the range of tables that he provided in his classification. But, in 1910, he only published the outline of a classification that took another 45 years to appear in its entirety.

Links between UDC Structure and Thesaurus

The UDC has been used as a source for terminology by makers of both general and special classifications, as

well as those who are engaged upon compiling thesauri. It has a very rich vocabulary and is an excellent source for specialist subjects, especially in the full tables. At meetings of the Classification Research Group in London, Mills frequently acknowledges his debt to the scheme in the work that he is undertaking on revising the Bliss *Bibliographic Classification*, and a formal agreement has now been reached between the Bliss Classification Association and the UDC Consortium to enable each to exchange the semantic structure of their classification with the other. As a direct result of this, work is presently in progress on converting the Bliss Class H into a UDC classification for Medicine (Williamson, 1994) and the new table should be published in 1996. This new classification will be accompanied by a thesaurus.

Other parts of the scheme are also being looked at with a view to their "thesaurification." Experiments using the tables for Sociology have been undertaken in Amsterdam (Riesthuis & Bliedung, 1990) and one of the classes currently under revision, Astronomy, is being revised so as to complement the International Astronomical Union's Astronomy Thesaurus (Shobbrook & Shobbrook, 1993). Nowadays, most users prefer to search using their own words, or the nearest that they can get to them. Searching systematically up and down hierarchies transcends the boundaries of language and it also enables a search to be widened or narrowed much more freely. There is a major problem of relying on words alone in retrieval systems, and particularly in systems designed for people who can read in more than one language. The structure of a classification is a major adjunct to searching in these circumstances, and this is where UDC has a great deal to offer since it is available in texts of varying fullness in a large number of languages.

Use of UDC as an International Retrieval Tool

Similarly, the routine provision of a UDC number on documents in certain subject areas, such as the building industry, or its use in bibliographies and indexing services (e.g., *Bibliographie Météorologique*, *British National Film and Video Catalogue*) or major libraries (e.g., Netherlands Agricultural University at Wageningen; Imperial College of Science and Technology, University of London) in a specific discipline, has provided a valuable service and influenced the very widespread use of the classification in subject areas such as film, architecture, and a range of sciences and technologies. Nowadays, the concern is more with information online and here again UDC is serving a useful function. It is used, for instance, as the structure for the subject trees of the BUBL bulletin board (Bulletin Board for Librarians)¹⁰ and for other current awareness services available over the Internet, either locally or internationally (Buxton, 1993).

This use in an automated world brings its own prob-

¹⁰ <http://www.bubl.bath.ac.uk>

lems to the UDC and is creating a situation where it has to change its practices and take on board the influences of others, or develop some of its own strengths to handle the present day situation. One of its greatest advantages has always been held to be its flexibility. In an automated system where information is being exchanged between different institutions and between different countries, there must be some predictability. This means that where, at present, more than one way of expressing a concept is possible, in future, that situation must cease. It is not a problem of citation order, for citation order ceases to be a problem in an online situation where each part of a number can be searched independently. But in order to be able to search each part of a number independently, that part must first be clearly identifiable. This means that the use of parallel subdivision creates a problem. This occurs, for example, in class 61 where the same notation is used to express a part of the body in Anatomy, Physiology, Pathology, etc. This is not clearly discernible by a machine.

611.3	Digestive system. Alimentary canal
612.3	Alimentation. Eating. Digestion. Nutrition
616.3	Pathology of the digestive system

The eye can quickly recognize the pattern that the 3 is standing here for “digestion” in all cases, but 3 stands for many things in the classification, such as fiction, social sciences, economics, and without a distinguishing mark, information cannot be retrieved with confidence by someone requiring all documents on the digestive system. Critics may suggest that this is not a problem because it can be overcome by searching on keywords. That overlooks the fundamental advantage that the use of a classification scheme has over searching on words alone. The UDC is intended for a multi-lingual world, not a world that speaks English, and therefore its greatest advantage is that it can break the barriers of language and act as a retrieval tool irrespective of vocabulary. Slowly, the use of parallel subdivision is being eliminated. Its use in class 9—Geography and History has now ceased, and both Classes 8 and 9 are now fully faceted. Compounds can be searched in these classes either as whole numbers or through parts of a number, so everything on one area of the world, for example, be it history, geography, economics, or any other topic with a geographic designation, can now be retrieved by searching on one number, rather than having to search at least three.

Conclusion

So, the UDC can be seen to have been one of the schemes that, throughout the century of its existence, has been in the forefront internationally, and especially in the non-English speaking world, as a tool for subject retrieval, particularly for situations where a great deal of minute detail requires specification. Those responsible for its

maintenance are aware of this advantage that it possesses and are endeavoring to correct and eradicate some of its outmoded or inconsistent practices and to bring it in line with the requirements of today. The old problem identified by Dewey as “integrity of numbers” versus “keeping pace with knowledge” remains, but with the advent of automation, it is much easier to develop the scheme for uses other than simply shelf arrangement, and this is now happening.

Acknowledgment

All examples in English from UDC tables are taken from the International Medium edition: English text, *Universal Decimal Classification* (1993).

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Bibliographical Note

Since September 1993, *Extensions and Corrections to the UDC* has been published in a new format. It consists of articles, communications, and a bibliography of recent writings on the UDC in addition to corrections to the classification and approved new tables. This provides the most recent ongoing listing of writings on the classification. The most recent editions of the classification, other than those cited as references, are:

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