The DEEDS Database of Mediaeval Charters: Design and Coding for the RDBMS Oracle 5

Michael Gervers, Gillian Long, and Michael McCulloch

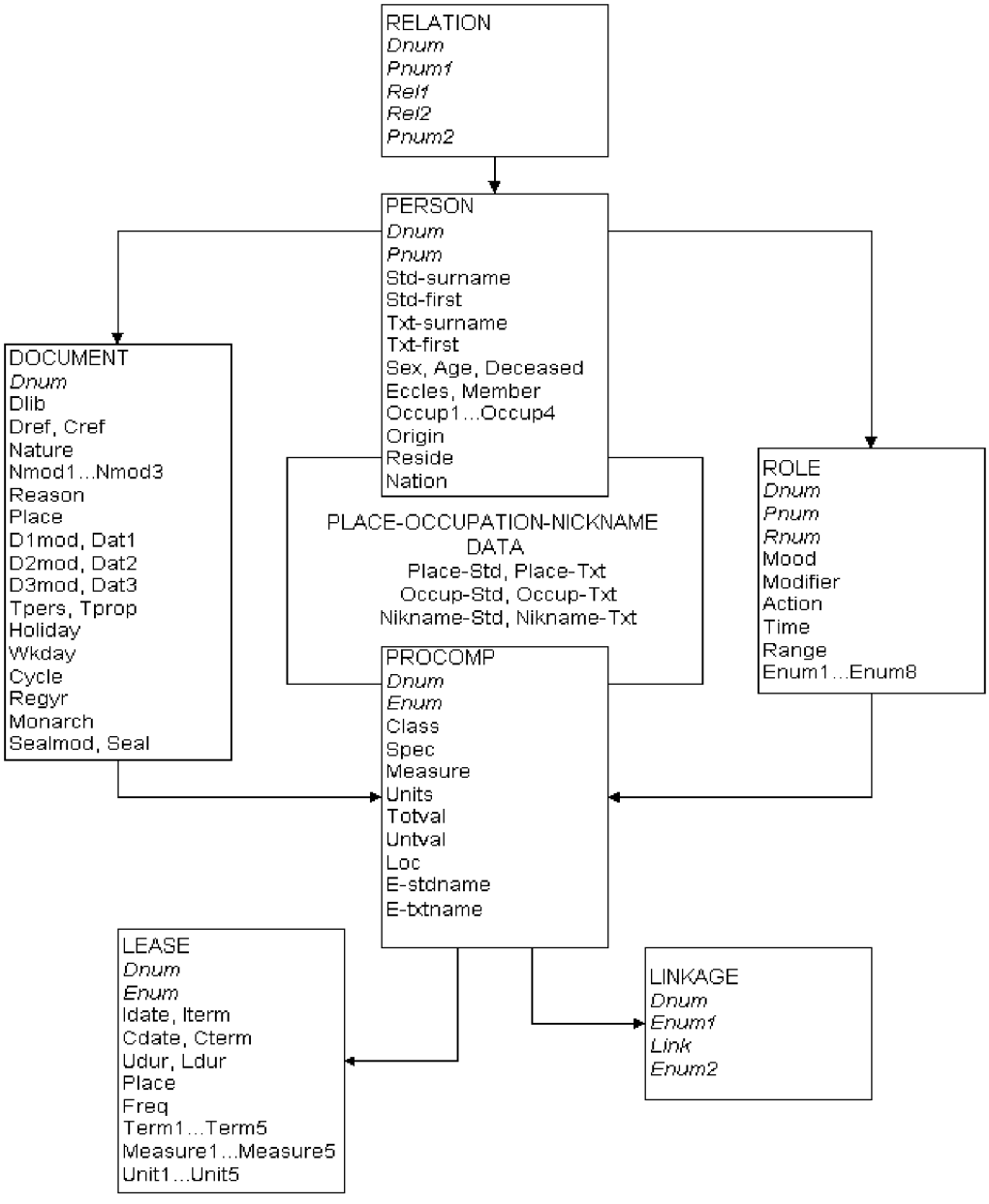
Records of property transfer are as ancient as writing itself. Consequently, the deed, or conveyance, represents the most continuous form of legal documentation available to the historian. The DEEDS Project, founded at the University of Toronto in 1975, has as its objective to provide computerized access to the content of twelfth- and thirteenth-century conveyances concerning the county of Essex, England. DEEDS uses the RDBMS ORACLE 5.1B on a 386-33 PC as a means of organising data for subsequent analysis. The success of this undertaking, and any other one like it, depends on the researcher's ability to 'translate' the content of an historical text into machine-readable form. The present article describes how such translation is achieved at the data-entry level in terms of a linguistically based coding 'language'. Three types of 'sentences' are used to describe connections between 1) two people, 2) two pieces of property and 3) persons and property. Actions, tense, number and mode are similarly coded. The information used to write the 'sentences' is located in seven main tables (DOCUMENT, PERSON, PROPERTY/COMPENSATION, LEASE, RELATION, LINKAGE, ROLE) and a variety of supporting code tables. The first four principal tables contain data extracted from the original document, while the last three express the connections between persons (RELATION), properties (LINKAGE) and persons and property (ROLE). The coding system is infinitely flexible and can be adapted as the need arises.

Flexibility is a prime criterion of any database. It is, however, particularly difficult to achieve within a database for mediaeval history because of the basic rigidity created by a context which assigns different levels of meaning to identical pieces of information. Nevertheless, conceptual hierarchy is not incompatible with a flexible structure, provided that a system of computer coding is used which can preserve structured information within a database whose relational design allows the greatest possible flexibility in posing queries. The approach to database design and coding outlined here has been developed for the DEEDS (Documents of Essex England Data Set) Project at the University of Toronto[1]. The project is a computer-assisted analysis of property conveyances, or charters, which stores information extracted by researchers in the ORACLE 5-SQL relational database management system. The statistical package SAS is used in conjunction with ORACLE as an additional means of analysing the wealth of social and economic information which is to be found in the charters. Topographically related data can now be plotted on a digitized map of Essex[2] using PC-GIMMS[3].

Information in the DEEDS database has been extracted from a range of mediaeval manuscript and printed sources concerning property conveyances in the county of Essex, England, from the twelfth through the fourteenth centuries. Among these are nearly 1,200 charters in the Cartulary of the Order of the Hospital of St. John of Jerusalem,[4] approximately 2,800 records known as the Feet of Fines for Essex,[5] and some 300 entries concerning Essex from the royal Inquisitions Post Mortem.[6] These documents describe often complex patterns of property holding and transmission. Such transfers reflect the exchange of layers of rights and obligations with or without a range of attributes, rather than the transfer of absolute and discrete entities. Consequently, the meaning and function of such terms as manor, messuage or tenement vary upon the terms of tenure, the status of the individuals and the social setting identified by the document. This essential aspect of mediaeval, feudal society is reflected in our coding 'language', which can express a multiplicity of detail and temporal nuances. This new coding 'language' was developed by McCulloch. The word 'language' is used deliberately because the structure of the coding system is

linguistic, naturally enough since we are 'translating' a text from Latin, English or mediaeval French into a series of computer codes.[7] In the DEEDS coding system there are three types of 'sentences'. One describes the connection between two people, the second describes the connection between two pieces of property, and the third describes the connection between person and property. Actions are expressed in a manner modelled on an inflected language, with fields qualifying basic codes in order to express tense, number and mood.

The data needed to write the 'sentences' is contained in seven main tables, and in auxiliary code tables which store the two or four digit codes used to identify such things as places, occupations, property or concepts. The connection between the various tables is demonstrated by the Overview of the DEEDS Relational Data Base (Table 1).



Designed and implemented by Norman Ho. DBA.

Table 1. Overview of DEEDS database

These seven main tables are:

DOCUMENT

PERSON

PROPERTY/COMPENSATION

LEASE

RELATION

LINKAGE

ROLE

The fields contained within these tables are described briefly in Figure 1.

Figure1. Brief explanation of fields within DEEDS database.

PLACES-OCCUPATION-NICKNAME (DATA PL DATA)

Contains textual forms as well as modern equivalents of names, geographical & bibliographic information, and codes.

DOCUMENT

DNUM	Unique number assigned to each document.
DLIB, DREF & CREF	Bibliographic reference to original, including current location of manuscript.
NATURE	Type of document, ea. transfer, agreement.
NATURE-MOD.	Detail(s) of type, ea. quitclaim, inquest.
REASON	Eg. for love of God (04), payment of fine (14).
PLACE	Place where transaction issued, if known.
DMOD	Date modifier, eg. circa
DATE	Date(s) of transaction, if known.
TPERS	Number of persons involved.
TPROP	Number of properties involved.
HOLIDAY	Eg. Michaelmas, Trinity, Hilary.
WEEKDAY	Eg. Saturday after St. Michael.
CYCLE	Lunar cycle: dominical letter, epact etc.
REGYR	Regnal year, eg. 3 Henry III.
MONARCH	Reigning monarch.
SEALMOD	Type of seal, own, other, if used.
SEAL	Was document sealed or unsealed?

PERSON

DNUM	Assigned in DOCUMENT.
PNUM	Number identifying person, unique within doc.
STD-SURNAME	Modern equivalent of last name.
STD-FIRST	Modern equivalent of first name.
TXT-SURNAME	Textual spelling of last name.
TXT-FIRST	Textual spelling of first name.
AGE	If known, may be imprecise, eg. " of full age".
DECEASED	Y entered only if person is dead.
ECCLES	Y entered if person is an ecclesiastic.
MEMBER	Eg. Hospitaller, Benedictine.
OCCUP(4)	Occupation(s) or Title(s) eg. CXBI=BISHOP
ORIGIN	Eg. Peter of TOPPESFIELD.
RESIDENCE	Eg. Robert, Abbot of TILTY.
NATIONality	If not English.

RELATION

DNUM	Assigned in DOCUMENT.
PNUM1 & 2	Assigned in PERSON.
REL1 & 2	Eg. FATHer, DAUGhter.

PROPERTY

DNUM	Assigned in DOCUMENT.
ENUM	Number identifying property, unique within doc.
CLASS	Modifies property, eg. EX = in EXchange.
SPEC	Specific code for property, eg. BDHO = HOUSE.
MEASURE	Number or quantity of property.
UNIT	Eg. AC=ACre, HL=Horse Load.
TOTVAL	Total value of property.
UNTVAL	Value per unit of property.
LOC	Specific code for location, eg. CAME = CAMBRIDGE
ESTDNAME	Standardized version of fieldname etc.
ETXTNAME	Textual spelling of fieldname etc.

LINKAGE

DNUM	Assigned in DOCUMENT.
ENUM1 & 2	Assigned in PROPERTY.
LINK	Code links two ENUMS, eg. Compensation, Boundary.

LEASE

DNUM	Assigned in DOCUMENT.
ENUM	Assigned in PROPERTY.
IDATE	Starting date of lease.
ITERM	Starting term, eg. EASTer.
CDATE	Concluding date.
CTERM	Concluding term.
UDUR LDUR	Duration, eg. Y 020 = 20 years.
PLACE	Place of payment, differs from location of ENUM.
FREQUENCY	Of payments or events.
TERM 1-5	Regular payment dates, usually feastdays.
MEASURE 1-5	Amount of installment payments per date.
UNIT 1-5	Eg. penny = DE.

ROLE

DNUM	Assigned in DOCUMENT.
PNUM	Assigned in PERSON.
RNUM	Generated by computer.
MOOD	Affirmative or Negative.
MODIFIER	# of persons sharing in action.
ACTION	"Verbal" code, eg. TRR = transfer.
TIME	Past, present, future, etc.
RANGE	Denotes whether or not properties are inclusive.
ENUM 1-8	Assigned in PROPERTY.

Of these tables, the first four contain data obtained from the document and the last three express the connections between persons, properties, and persons and properties. The largest code table, PLACE-OCCUPATION-NICKNAME DATA (PLDATA), is an encyclopedic resource table which contains the textual forms of place names, a standardised modern version of those names, geographical information about them, bibliographic references for the standardisation, and a unique four letter code for each one.[8] For instance, TOPP refers to Toppesfield, a parish in Hinckford Hundred in the County of Essex. Occupational names are also included in PLDATA. In their case, the first two letters of the code serve to classify the occupation. Thus PFCO identifies a cook, wherein PF.. identifies a Processor of Food, and ..CO stands as a mnemonic abbreviation for COok.

The first table to be entered is DOCUMENT. This is the hinge which links the entire database together. Each document is assigned a unique number (DNUM). This number is the common reference point for information derived from that document throughout the database, and will appear on all tables relating to that document. Also stored in DOCUMENT is information about the date[9] of the charter, its legal nature, purpose, and present location. Obviously the amount of information stored in this table could vary greatly depending on the objectives of the researcher. The PERSON table stores all information available within a particular document about the name, occupation and lineage of every individual or institution mentioned. Each is assigned a person number (PNUM), unique within the document. The textual spelling of the name, along with the standardised version of that name and any available information about the person's sex, age, occupation(s) and/or titles, places of residence and origin, nationality and civil status are recorded.

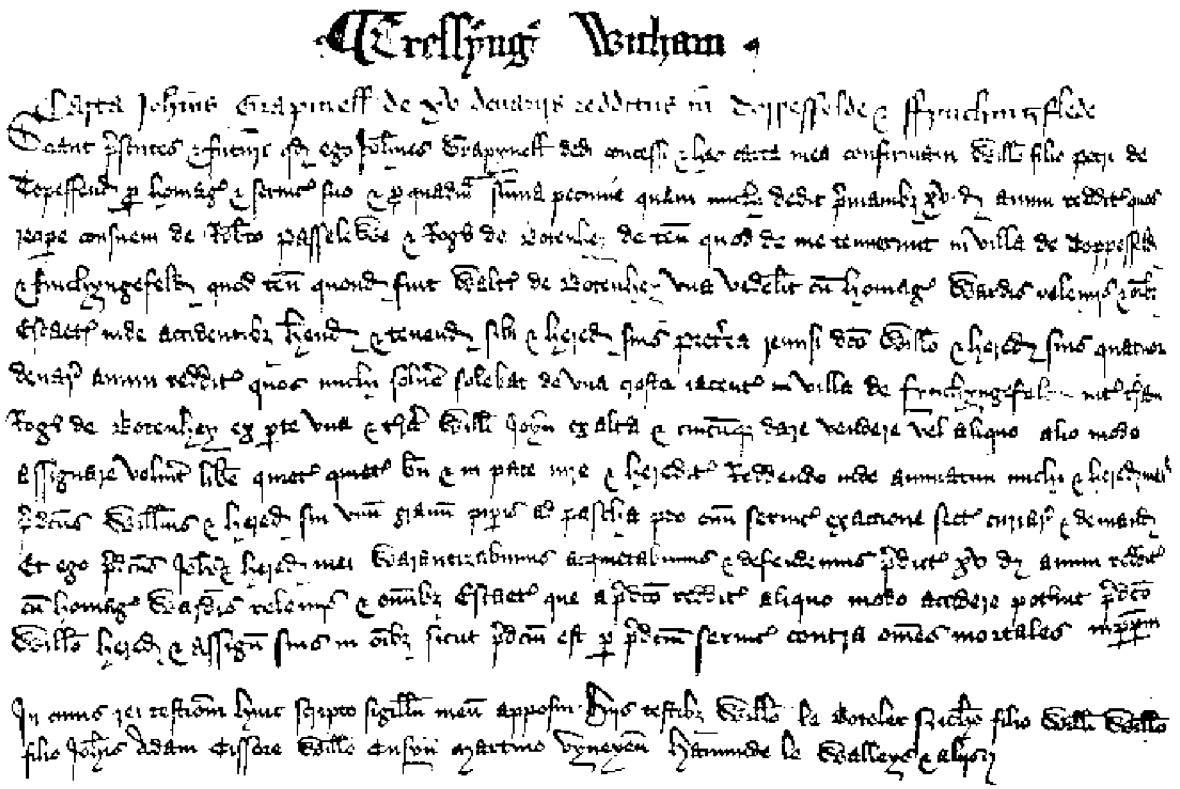
Valid codes for the places and occupations are drawn from PLDATA. The PROPERTY/COMPENSATION table stores information about the properties, tangible and intangible, mentioned in a given document; those alienated and those received back in compensation, as well as any boundary properties mentioned. Like the persons, each property receives a unique element number (ENUM) assigned sequentially throughout the document. Our property code list, which now contains well over five hundred types of property, is stored in a table called SPECIFIC PROPERTY (SPECPROP). As with the PLDATA occupation codes, the first two letters identify one of about fifty general categories. For instance, LA.. identifies LAnd. Thus, LAAR is ARable land. The information stored in PROPERTY/COMPENSATION includes the measure and unit, total value, value per unit, topographical location (with codes drawn from PLDATA) and the class code. This last field fulfills a modifying role indicating special features of the property, eg. SS indicates that it is 'on the Sunny Side', or MY that it was transferred MonthlY. Topographical labels such as field names are entered under 'textname'. Standard names have not yet been assigned to such topographical names.

Additional information about the temporal dimension of certain properties is contained in the LEASE table. Fields are provided to record such details as duration of an agreement, amounts of rent payable at specific Feast-days (which have their own four letter codes), and starting and ending dates of an agreement, if known.

The remaining tables reflect the three sentence types mentioned earlier in this paper. They contain no data as such, but are used to connect people to people, properties to properties and people to properties. The first and simplest of these is RELATIONSHIP which is used to record the different personal relationships which can exist between individuals : familial, feudal and institutional, if specifically mentioned in the document. The LINKAGE table is more complex. It is used to express the connections between items of property, insofar as they can be determined, given the fact that the mediaeval idea of property was very different from our own.[10] Codes here include Master (M), indicating either a natural principal unit such as a manor, or an artificial group (GRPR = GRoup PRoperty) created by the coder, (used when a number of unconnected properties are exchanged for a single compensation or group of compensations) and Serf (S) which denotes a subsidiary part of the master unit. This is one of the most flexible coding tables, enabling one to express property relationships in a number of ways while it remains clear that reference is being made to one and the same property. Thus we can indicate that the same wood is a Boundary (B) to several properties, and also a Serf part of a manor. All details recorded about the wood, except the LINKAGE code and ENUM to which it is linked, must remain the same. LINKAGE provides a logical, although not structural, hierarchy among properties; it is an attempt to retain feudal concepts in a modern relational database. There will be further discussion below of this most useful field, which is deliberately kept as skeletal as possible.

Perhaps the most important of these three non-data tables is ROLE, which describes the connection between a person and a property. DEEDS presently has about thirty codes to denote differing types of action in conveyances, for instance, transfer (TRR), receive (TRE), claim (CLR), claimed from (CLE). TRD is a frequently used code, describing a person of low social status whose person or holdings were transferred from one lord to another, without reference to the individual himself.

We use the text editing software package KEDIT for the initial data entry, and then convert the flat files thus created into ORACLE when each section has been completed. Although it is possible to code directly into ORACLE, using screens, we prefer to use those screens only for updating code tables or making corrections. This is because of the capacity of KEDIT to allow copying and moving blocks of text, and also viewing of large segments of data at the same time. Our researchers have found it easier to relate the different 'sentences' to each other using the larger screens of KEDIT. For this reason the LINKAGE table is combined with PROPERTY/COMPENSATION while the data is in KEDIT, and separated when the conversion into ORACLE takes place. Our system is best reflected in the coding of an actual document:[11]



A grant by one John Grapnell to William, son of Peter of Toppesfield, of 15 pence of rent, with accompanying homages, wardships, reliefs and escheats, payable by Robert Paslow and Roger of Butney for the tenement, once Walter of Butney's, which they held of John in Toppesfield and Finchingfield. For this, William gives John his homage and service and an undisclosed sum of cash down. John promises to warrant this rent in the future against all men. In addition, John remits to William the 4d. rent which the latter used to pay for a croft in Finchingfield, bounded by the lands of Roger of Butney and William Joy. William, son of Peter, promises to pay one peppercorn every Easter for all service, exaction, suit of court and secular demand. There are seven named witnesses to this agreement.

Latin Text

Sciant presentes et futuri quod ego Iohannes Grapynell' dedi, concessi et hac carta mea confirmavi Willelmo filio Petri de Topesfeud', pro homagio et servicio suo et pro quadam summa pecunie quam michi dedit premanibus, 15d. annui redditus quos recipere consuevi de Roberto Passelewe et Rogero de Botenhey de tenemento quod de me tenuerunt in villa de Toppesfeld" et Finchyngefeld", quod tenementum quondam fuit' Walteri de Botenhey, una videlicet cum homagiis, wardis, releviis et omnibus escaetis inde accidentibus; habendos et tenendos sibi et heredibus suis; preterea remisi dicto Willelmo et heredibus suis quatuor denarios annui redditus quos michi solvere solebat de una crofta iacente in villa de Fynchyngefeld" inter terram Rogeri de Botenhey ex parte una et terram Willelmi Joyn' ex altera, et cuicumque dare, vendere vel aliquo alio modo assignare voluerit libere, quiete, bene et in pace, iure et hereditarie; reddendo inde annuatim michi et heredibus meis predictus Willelmus et heredes sui unum granum piperis ad Pascha pro omni servicio, exaccione, sectis curiarum et demandis. Et ego predictus Iohannes et heredes mei warantizabimus, acquietabimus, et defendemus predictos 15d.. annui redditus cum homagiis, wardis, releviis et omnibus escaetis que a predicto redditu aliquo modo accidere poterint predicto Willelmo, heredibus et assignatis suis in omnibus sicut predictum est per predictum servicium contra omnes mortales in perpetuum. In cuius rei testimonium huic scripto sigillum meum apposui. Hiis

testibus: Willelmo le boteler, Nicholao filio Willelmi, Willelmo filio Iohannis, Adam cissore, Willelmo Cusyn', Martino Vyveyen', Hamunde le Walleys et aliis.

Table 2. Coding of document

Table: DOCUMENT

DNUM	DLIB	NA	NM	RE	D	DAT1	D	DAT2	D	DAT3	SE
10069	BLCNE6FO299VO2	TR	GT	08	C	00/00/1290	+	00/00/1270	-	00/00/1290	Y

Table: PERSON

DNUM	PNUM	STD_SURNAME	STD_FIRST	TXT_SURNAME	TXT_FIRST	S	OCCU	ORIG	NATI
10069	1	GRAPNELL	JOHN	GRAPINELL'	IOHANNES	M			
10069	2	SON OF PETER OF TOPPESFIELD	WILLIAM	FILIUS PETRI DE TOPESFEUD'	WILLELMUS	M		TOPP	
10069	3	PASLOW	ROBERT	PASSELEWE	ROBERTUS	M			
10069	4	BUTNEY	ROGER OF	BOTENHEY	ROGERUS DE	M		BUTN	
10069	5	BUTNEY	WALTER OF	BOTENHEY	WALTERUS DE	M		BUTN	
10069	6	JOY	WILLIAM	JOYN'	WILLELMUS	M			
10069	7	BUTLER	WILLIAM	LE BOTELER	WILLELMUS	M	DDBU		
10069	8	SON OF WILLIAM	NICHOLAS	FILIUS WILLELMI	NICHOLAUS	M			
10069	9	SON OF JOHN	WILLIAM	FILIUS IOHANNIS	WILLELMUS	M			
10069	10	TAILOR	ADAM	CISSOR	ADAM	M	MTTA		
10069	11	COSIN	WILLIAM	CUSYN'	WILLELMUS	M			
10069	12	VIVIAN	MARTIN	VYVEYEN'	MARTINUS	M			
10069	13	WALES	HAMON	LE WALLEYS	HAMUND	M			WALS

Table: RELATION (No Entry)

Table: PROCOMP

DNUM	ENUM	CL	SPEC	MEASURE	UN	LOC	E_TXTNAME
10069	1		LDTE	1			QUONDAM FUIT WALTERI DE BOTENHEY
10069	2		LDTE			TOPP	
10069	3		LDTE			FINC	
10069	4		PGRE	15	DE		
10069	5		JUHG				
10069	6		JUWR				
10069	7		PTRF				
10069	8		JUES				
10069	9		PGRE	4	DE	FINC	
10069	10		LACR	1		FINC	
10069	11		LALA			FINC	ROGERI DE BOTENHEY
10069	12		LALA			FINC	WILLELMI JOYN
10069	13		PGGS				
10069	14		JUHG				
10069	15		SISV				
10069	16	YE	OPPP	1		FINC	
10069	17		SISV				
10069	18		PGEX				
10069	19		SISC				
10069	20		JUSD				
10069	21		GRPR				

Table: LINKAGE			
DNUM	ENUM1	L	ENUM2
10069	1	P	4
10069	2	L	1
10069	3	L	1
10069	4	M	4
10069	5	S	4
10069	6	S	4
10069	7	S	4
10069	8	S	4
10069	9	O	10
10069	10	F	10
10069	11	B	10
10069	12	B	10
10069	13	C	4
10069	14	O	4
10069	15	O	4
10069	16	O	9
10069	17	S	21
10069	18	S	21
10069	19	S	21
10069	20	S	21
10069	21	E	16

Table: ROLE									
DNUM	PNUM	RNUM	M	MODIFIER	ACT	TI	R	ENUM1	ENUM2
10069	1	1	A	1	TRE	P	Y	4	9
10069	1	2	A	1	TRR	P	Y	1	3
10069	1	3	A	1	VWE	F	Y	4	8
10069	1	4	A	1	SER	N			
10069	1	5	A	1	TRE	N	Y	13	16
10069	1	6	A	1	TRR	N	Y	4	9
10069	2	7	A	1	TRR	N	Y	13	16
10069	2	8	A	1	TRE	N	Y	4	9
10069	2	9	A	1	TRR	P	N	9	
10069	3	10	A	1	TRE	P	Y	1	3
10069	3	11	A	1	TRD	N	Y	4	8
10069	4	12	A	2	TRE	P	Y	1	3
10069	4	13	A	1	HLR	N	N	11	
10069	4	14	A	2	TRD	N	Y	4	8
10069	5	15	A	1	HLR	P	Y	1	3
10069	6	16	A	1	HLR	N	N	12	
10069	7	17	A	1	WIT	N			
10069	8	18	A	2	WIT	N			
10069	9	19	A	3	WIT	N			
10069	10	20	A	4	WIT	N			
10069	11	21	A	5	WIT	N			
10069	12	22	A	6	WIT	N			
10069	13	23	A	7	WIT	N			

Table: LEASE		
DNUM	ENUM	TERM
10069	16	EAST

Notes on the Coding of this Document

DOCUMENT

A DNUM (10069) is assigned which will identify this particular document throughout the entire database. In this case, it is 69 in a series of documents which we refer to as the 10,000s. DLIB BLCNE6FO299VO2 records that the original is in the British Library, Cotton ms. Nero E 6 Folio 299 Verso 02. The nature, nature modifier and reason codes convey the information that it is a TRansfer, a

GranT between persons for which compensation was given. The possible dates are coded, and Yes indicates that the document was sealed.

PERSON

Person numbers (PNUM) are assigned in order of appearance. It is important that the list of witnesses should remain in the order in which they appear in the document because that may reflect their social and economic standing.[12] The given PNUMs will remain constant throughout the coding of the document. As many fields as possible are entered. For instance we know Adam the Tailor's occupation (MTTA - the prefix MT.. indicates someone who Manufactures from Textiles or cord, while ..TA is a mnemonic abbreviation from TAilor), but not his place of origin, whereas Hamon is said to be a Welshman, but his occupation is not given in this document. PLDATA has been consulted to provide valid codes for all place names and occupations. Note that names which form part of a patronymic, such as (William, son of) Peter of Toppesfield are not coded as separate people unless they perform a unique role in the document. ORACLE has the capacity to find Peter if it should ever be required.

RELATION

There are no given relationships in this document. However, if we had been told that Roger and Walter of Butney were son and father, for instance, the entry in this table would read

(PNUM) 04 SONN FATH 05

PROPER TY/COMPENSATION/LINKAGE

Each property, tangible or intangible, has been assigned an element number (ENUM) which will identify it throughout the document. Codes for the properties have been drawn from the SPECPROP table, which is growing steadily as new material is coded. New codes created must be fitted into the general categories described earlier. For instance, PG.. indicates a Payment of a General nature (PGRE = a REnt payment), whereas OP.. must be an Organic Product (OPPP = PePpercorn). The convenience of combining the LINKAGE codes becomes apparent at this stage. As an example, ENUM 4 (15 pence of rent) and its accompanying benefits of homage, wardship etc. are Produced by ENUM 1 (a tenement) which has its Location in both Toppesfield and Finchingfield. The Location code is particularly useful in cases where exact land divisions are unknown; for instance, if the text had read 'nine acres of land in Toppesfield and Finchingfield' the coding would read

ENUM 1 M 1 LALA 9.00 AC

ENUM 2 L 1 LALA TOPP

ENUM 3 L 1 LALA FINC

This is done to make it clear that there was only one nine acre parcel of land, divided between two locations.

The code C indicates a one-time COMPENSATION, whereas 0 = Ownership is used for continuing recompense such as annual rent payments. Master and Serf share the same compensations. If there is no natural Master element the code GRPR (GRoup PRoperty) is used to create a link when several properties share one compensation. This is also done when a single property receives a number of

compensations, to avoid giving undue weight to any one individual. A particularly useful LINKAGE which does not appear in this document is Tranche, meaning a part of the whole. If, for instance, only three out of the aforementioned nine acres of land were being conveyed, the T link would be used to avoid any possible confusion that an additional three acres were under discussion, and the coding would be

ENUM 4 T 1 LALA 3.00 AC.

AC = acre is a code from our unit of property table.

Class codes are extremely useful and flexible. They perform a modifying function. The only instance in this document is a YEarly payment of one peppercorn. The list is continually growing and includes such useful codes as DO = held by DOwer right (a widow's right to a portion of her late husband's property, for her life), and 0E = at one's Own Expense. The textname field is used to preserve such details as the local names of topographical features, which do not yet appear in PLDATA, or to facilitate coding of ROLE by recording holders of property, particularly boundary properties, in this instance, Roger of Butney and William Joy.

The LEASE table contains additional information about specific properties, if available. In the present case we record that ENUM 16 (one peppercorn) is paid every year at EASTer as compensation for the remission of ENUM 9 (4d. of rent formerly paid for ENUM 10 = one croft).

ROLE is the last table to be coded since it records the connections between the people and property detailed in PERSON and PROPERTY/ COMPENSATION. DNUM, PNUM and ENUM link us to other tables. The mood field indicates whether or not an action actually took place (Affirmative or Negative). Modifier shows how many people performed the same action, eg. seven people (PNUMs 7-13) witnessed this transaction. Action is 'the verb' in our sentence. Time records the tense of the verb. Ten stages of Past action can be recorded (P-P9), a similar number of Future actions (F-F9), Now, Unknown and Conditional. This last is most commonly used in conjunction with Negative mood; for instance, if person A does not produce a legitimate heir the property will pass to person B. Range indicates whether or not the ENUMs are inclusive, i.e. Y 4 8 indicates that they are, N 4 8 that only those two properties are referred to.

Unlike ORACLE, KEDIT does not have the capacity to detect errors such as incorrect codes or inaccurate spacing. Therefore it is incumbent upon the researcher to exercise great care in entering data so that the transition into the database can be made as swiftly as possible. We use ORACLE SQL/REPORT to extract information from the database. However the computer can only give meaningful answers to informed questions, so the historian must have detailed knowledge of the workings of the coding system to ensure accurate and full answers to his queries. Similarly, of course, the researcher must endeavour to include as much information as he can glean from sometimes confusing and complicated legal documents.

One of the advantages of a relational database is the ease with which new tables can be created. At this moment, two additional tables are under development at the DEEDS Project. One is an index which would link together information about individuals that appears in different documents. The second would perform the same function for properties. The generation of these tables, requires close collaboration between the historian and the computer expert. They can be generated from data already stored in the system, but obviously will be enhanced by the information added as each 'new' document is coded.

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Notes

[1] Research and computing for the D.E.E.D.S. Project has since 1975 been variously supported by the Social Sciences and Humanities Research Council of Canada, the University of Toronto (especially the Centre for Computing in the Humanities), IBM Canada, and the Canadian Job Strategy Programme (a division of Employment and Immigration Canada).

[2] A parish map of the county of Essex was generated by tracing the boundary segments of each parish and Hundred using a digitiser provided by the Department of Geography at the University of Toronto. The process took two personmonths and resulted in a 25,000-line text file containing for each boundary segment a list of (x,y) coordinates. This file was then processed by GIMMS to generate segment and polygon files (of which there are approximately 475). These can be used for reproducing the map or selected parts of it on a plotter or displaying it on a screen in arbitrary sizes and orientations. At the development stage, we used a CALCOMP plotter, a personal computer running a Tektronix 4014 emulator, and a Sun workstation as output media.

[3] PC-GIMMS is a carbon copy of the mainframe version. It has recently been rendered more user-friendly with the introduction of a menu-driven system.

[4] British Library, Cotton ms. Nero E Vl.

[5] R. E. C. Kirk, ed., Feet of Fines for Essex, 3 vols., Colchester: Essex Archaeological Society, 1899-1949.

[6] Calendar of inquisitions post mortem and other analogous documents preserved in the Public Record Office, vols. 1-4 (Henry III--35 Edward 1), London: Public Record Office, 1904-13.

[7] Another grammatically structured approach was proposed for the mainframe analysis of medieval charters a generation ago: L. Fossier and M. Crehange, 'Un essai de traitement sur ordinateur des documents diplomatiques du moyen age,' Annales: E.S.C., 25 (1970), pp. 249-84; see also L. Fossier, A. Vauchez, and C. Violante, eds., Informatique et histoire medievale, Collection de l'Ecole francaise de Rome no. 31, Rome, 1977.

[8] The standard source for the identification of historic place names in Essex is P. H. Reaney, The Place-Names of Essex, English Place-Name Society, vol. 12, 1935 (reissued 1969). Many other sources had to be consulted, however, in order to produce the PLDATA table.

[9] English medieval charters are rarely dated before the early fourteenth century. This imprecision is a source of constant compromise for the researcher, although relatively accurate dates can usually be determined from internal information. The best clues lie in the appearance of individuals who occur in dated documents elsewhere. Where names are few, usually due to the absence of witness lists, it has been possible to date documents by identifying the changing nature of vocabulary, legal formulae and word strings. For an attempt to date medieval charters with the assistance of the computer, see L. Kordecki, 'Computer techniques and medieval land transfers: the DEEDS project,' Journal of the Society of Archivists, 7: 5 (April, 1984), pp. 299-311.

[10] On mediaeval property and conveyancing, see W.S. Holdsworth, A History of English Law, vol. 3, 5th ed., London, 1942 (rpt. 1966), A.W.B. Simpson, A History of the Land Law, 2nd ed., Oxford, 1986; E.Z. Tabuteau, Transfers of Property in Eleventh-Century Norman Law, Chapel Hill and London, 1988.

[11] From M. Gervers, ed., The Cartulary of the Knights of St. John of Jerusalem in England, secunda camera, Essex, British Academy, Records of Social and Economic History, n.s., vol. 6 (1982), no. 69 (pp. 41-42).

[12] See the discussion of data structure in M. Thaller, 'Methods and Techniques of Historical Computation,' in History and Computing, eds. P. Denley and D. Hopkin (Manchester, 1987), pp. 147-56 (148-49).

Michael Gervers is the director of the DEEDS Project and Professor of History at the University of Toronto. A recent article, *'The textile industry in Essex in the late 12th and 13th centuries: a study based based on occupational names in charter sources'* ((**Essex Archaeology and History**) 20 [1989]) was prepared largely from the content of the DEEDS database.

Gillian Long, who holds an M.A. in Classics from Edinburgh University, is Project Supervisor.

Michael McCulloch holds a B.A. in Classics and a Ph.D. in Canadian History from the University of Toronto.

The database was implemented by Norman Ho.