Statistical databases in theory and practice Part III: Modelling the contents and structure of official statistics

> Bo Sundgren 2010

# A generic conceptual model of society as reflected by official statistics (1)



# A generic conceptual model of society as reflected by official statistics (2)



Figure 3. Generic model, covering all statistical domains.



Figure 2a. Population statistics: Basic model.



Figure 2b. Person statistics.



### Figure 2c. PersonEvent statistics.



Figure 2d. Household statistics.



Figure 2e. Dwelling statistics.



Figure 2f. Population statistics: Split vision model.



Figure 4. Household economy statistics.



Figure 5. Education statistics.



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Figure 6. Health statistics.



Figure 7. Judicial statistics.



Figure 8. Labour market statistics.



Figure 9. Business statistics.



Figure 10. Housing and construction statistics.



Figure 12. Agriculture statistics.



Figure 11. Energy statistics.



Figure 13. Transport statistics.



Figure 14. Environment statistics.



Figure 16. National accounts.



Figure 17. Financial statistics.



Figure 15. Trade statistics.

What can a statistical agency do, in order to help a user

- find potentially relevant statistical data?
- judge the relevance of data retrieved?
- Provide overviews of available data
- Provide search tools
- Provide informative metadata

### Contents By Example (based on a simple generic model)



All Actors	All Topics	□ All Utilities	
□ Person □ Student	Topic: Population	□ NaturalResource □ Land	
□ Employee □ Patient	Topic: Education	□ CardinalResource	
🗆 Client	□ Topic: Health	□ Locality □ RealEstate	
🗆 Household	🖬 Topic: Law		
🗆 Organisation	🖬 Topic: Labour Market		
Enterprise AgriculturalEnterprise	🖬 Topic: Business Activities	- Product	
Institution Establishment	De Topic: Housing and Construction	□ Commodity □ Service	
BusinessActor	🗆 Topic: Agriculture	⊥ □ AccountingItem	
□ Producer □ Seller	🖬 Topic: Energy	□ CashFlowitem □ Resultitem	
□ Buyer □ Provider	□ Topic: Transports	🗆 Balanceltem	
□ Customer □ Subject	□ Topic: Environment	□ Welfareitem	
□ CounterSubject □ Owner	Topic: National Accounts	□ Health □ Wealth	
□ Possessor □ Employer	🛛 Topic: Financial markets	□ Security	
□ Employee	🗅 Topic: Trade		

Examples of data sets that may be specified/retrieved/exchanged on the basis of this conceptual (sub)model:

- 1. Number of births by sex and home location of the child and age of the mother. (4-dimensional frequency macrodata cf underlying microdata.)
- 2. Number of migrations by sex, age, and occupation of migrant and place moved from and to. (5-dimensional frequency macrodata.)
- 3. Average income of persons by sex and education level. (2-dimensinal summarised macrodata.)

	Topic: Population	
× Percen	# Birth[y Dereen]	
	* Diruti A Personi	
X Sex	X AgeOtMother. A geGrouping	
o Age		Building
x HomeLocation.RegionalCode	Death[Person]	Dwelling
WorkLocation		
MaritalStatus	GetMarried[Person]	
Income(bvKind)	GetMarried[Person]	
n Wealth(byKind)		
a Education level	- CetDivorced[Person]	
	- CetDiverced[Percen_Percen]	
Bloccupation	a decorvorce d[reison, reison]	
🛛 Household	SeekAsvium[Person]	
n Size	□ GetAsylum[Person]	
n Homel ocation	a oodiojianiji a oonj	
= loome(bul(ind)	- SeekCitizenshin[Dereen]	
	CatCitinanahin[Danan]	
E Wealth(Dykind)	GetCluzenship[Person]	
	n Membership[Person, Household]	
	n MarriedTo(Person Person)	
	- ChildOf[Dereon Dereon]	
	□ Residence[Person, Locality]	
	- Commute Derson Locality From Locality Tol	
	Minertie (Descent Levelity From Levelity To)	
	Dimigration[Person, Locality.From, Locality.To]	
	Immigration[Person, Country.From, Locality.To]	
	D Keason	
	🛛 🖬 Birth Country	
	Emigration[Person, Locality.From, Country.To]	
	BirthCountry	

#### Example of data set:

1. Number of births by sex and home location of the child and age of the mother. (4-dimensional frequency macrodata – cf underlying microdata.)

Т	De Topic: Population	
	- Pirth(Percen)	XX Locality
Sev Sev	- Age OfMether	- DealEstate
	BAgeolimother	
X Age. Age. Grouping	- Death(Dereen)	- Building
	b beautipersonj	Dweiling
– Werite Statue	- CotMarried[Decool]	
n Incorpe(byl(ind)	n GetMarried[Person] n GetMarried[Dereon Dereon]	
n Meelth(hykind)	b octival neutra son, rei sonj	
- Education level	n GetDivorced[Person]	
• Occupation Occupation Code	n GetDivorced[Person, Person]	
a occupation. occupation out	a ocumente all crown	
n Household	SeekAsvium[Person]	
o Size	g GetAsvium[Person]	
- HomeLocation		
Income(byKind)	BeekCitizenship[Person]	
□ Wealth(byKind)	GetCitizenship[Person]	
	Membership[Person, Household]	
	MarriedTo[Person, Person]	
	ChildOf[Person, Person]	
	Residence[Person, Locality]	
	Commute[Person, Locality.From, Locality.To]	
	# Migration[x Person, x Locality.From, x Locality.To]	
	Immigration[Person, Country.From, Locality.To]	
	□ Reason Bith Country	
	- Emigration[Dereon, Leaslity From, Country, To]	
	Birth Country	

#### Example of data set:

2. Number of migrations by sex, age, and occupation of migrant and place moved from and to. (5-dimensional frequency macrodata.)

	Text for Device How	
	D Topic: Population	
		D Locality
x Person	🛛 Birth[Person]	🛛 Location
x Sex	AgeOfMother	RealEstate
o Age		Building
HomeLocation	Death[Person]	Dwelling
WorkLocation		-
ם MaritalStatus	GetMarried[Person]	
m Income(byKind)	GetMarried[Person, Person]	
Vealth(byKind)		
x EducationLevel	GetDivorced[Person]	
Occupation	GetDivorced[Person]	
n Household	n SeekAsvlum[Person]	
n Size	n GetAsylum[Person]	
n Homel ocation		
a locome(bykind)	- SeekCitizenshin[Person]	
a Meetth(bykind)	- CetCitizenebin[Person]	
B Wealth(byRind)	D decentizenanip[relatin]	
	- Membershin/Derson, Household	
	- MarriedTo[Dereon_Dereon]	
	- ChildOff Dereon, Dereon)	
	- Desidence[Dereon   ocality]	
	- Commute/Person, Locality From Locality Tol	
	Minute Person, Locality From Locality Toj	
	□ Migration[Person, Locality.From, Locality.Fo]	
	Immigration[Person, Country.From, Locality.10]	
	Bith Country	
	Emigration[Person, Locality.From, Country.To]	
	BirthCountry	

#### Example of data set:

3. Average income of persons by sex and education level. (2-dimensinal summarised macrodata.)



- survey documentation

## Part III: Extra material

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1 T =		
	D Topic: Education	
<ul> <li>Person</li> <li>Sex</li> <li>Age</li> <li>HomeLocation</li> <li>MaritalStatus</li> <li>Student</li> <li>EducationLevel</li> <li>ParentsEducation</li> <li>NationalBackground</li> <li>FinancialSupport</li> </ul>	<ul> <li>EducationActivity[Institution, Education, #]</li> <li>EducationYearSemester</li> <li>Participation[Student, EducationActivity]</li> <li>Exam[Student, EducationActivity]</li> </ul>	WelfareItem Education Type Subject Level Duration
Organisation Institution School Location Type Owner		

	□ Topic: Health	
□ Person I	🗆 DiseaseDiagnosis[Patient, Disease]	□ Welfareitem □ Health
□ Age □ HomeLocation	• VisitToPhysician[CareProducer, Patient] • Reason	Disease
□ WorkLocation □ MaritalStatus □ <b>Patient</b>	<ul> <li>HospitalTreatment[CareProducer, Patient]</li> <li>BedDays</li> </ul>	
<ul> <li>Organisation</li> <li>CareProducer</li> <li>Location</li> <li>PublicPrivate</li> <li>GeneralSpecialized</li> </ul>	□ DeathDiagnosis[Patient, Disease]	

	D Topic: Law	
D Person	CrimeReport[PoliceAuthority, Crime.Type]	□ Welfareltem □ Security
o Age	Conviction[Court, Crime.Type]	□ Crime
□ HomeLocation □ MaritalStatus		_ Туре
□ Income(byKind)		<b>,</b>
SocioEconomicGroup		
□ CriminalStatus		
D NationalBackground		
Organisation		
DeliceAuthority		

	🗖 Topic: Labour Market	
🗆 Person	EmploymentEvent[Person, Establishment]	🗆 Locality
🗆 Sex	□ PartTimePercentage	🖬 Location
🗆 Ager	□ EmploymentForm	□ RealEstate
🛛 HorrieLocation	PersonnelCategory	🗆 Building
WorkLocation	🗅 Salary	□ Dwelling
ם MaritalStatus		
□ Income(byKind)	EmploymentRelation[Person, Establishment]	
□ Wealth(byKind)	□ PartTimePercentage	
EducationLevel	EmploymentForm	
Profession	PersonnelCategory	
🗅 LabourForceStatus	🗆 Salary	
NotInLabourForce	🖬 SalaryChange	
🗖 Reason	🗆 OnSickLeave	
PossibilityWish		
InLabourForce	Residence[Person, Locality]	
🗆 Employed		
MainOccupation	Residence[Establishment, Locality]	
SideOccupation		
□ Absent	Commute[Person, Locality.Home, Locality.Work]	
TimeOfAbsence		
ReasonOfAbsence		
🗆 Working		
WeeklyWorkingTime		
Unemployed		
UnemploymentStatus		
Unemployment Time		
- Organization		
□ Organisation □ Fetablishment		

	n Topic: Business Activities	
<ul> <li>Organisation <ul> <li>Enterprise</li> <li>Establishment</li> <li>Location</li> <li>KindOfActivity</li> </ul> </li> <li>BusinessActor <ul> <li>Location</li> <li>Sector</li> <li>KindOfActivity</li> </ul> </li> <li>Producer <ul> <li>Seller</li> <li>Buyer</li> <li>Provider</li> <li>Customer</li> <li>Subject</li> <li>Owner</li> <li>Possessor</li> <li>Employee</li> </ul> </li> </ul>	<ul> <li>Topic: Business Activities</li> <li>Residence[Establishment, Locality]</li> <li>Business transactions and balances (real)</li> <li>ProductionTransaction[Producer, Product]         <ul> <li>Volume</li> <li>Value</li> </ul> </li> <li>SalesTransaction[Seller, Buyer, Product]         <ul> <li>Volume</li> <li>Volue</li> <li>Volue</li> <li>Volue</li> <li>Volue</li> <li>Value</li> <li>InvestmentTransaction[BusinessActor, InvestmentItem]</li> <ul> <li>Value</li> <!--</td--><td><ul> <li>Locality <ul> <li>Location</li> </ul> </li> <li>Product <ul> <li>Commodity</li> <li>Service</li> </ul> </li> <li>AccountingItem <ul> <li>CashFlowItem</li> <li>IncomeItem</li> <li>ExpenditureItem</li> <li>ConsumptionItem</li> <li>InvestmentItem</li> </ul> </li> <li>ResultItem <ul> <li>CostItem</li> <li>RevenueItem</li> </ul> </li> <li>BalanceItem <ul> <li>Asset</li> <li>Liability</li> </ul> </li> </ul></td></ul></ul></li></ul>	<ul> <li>Locality <ul> <li>Location</li> </ul> </li> <li>Product <ul> <li>Commodity</li> <li>Service</li> </ul> </li> <li>AccountingItem <ul> <li>CashFlowItem</li> <li>IncomeItem</li> <li>ExpenditureItem</li> <li>ConsumptionItem</li> <li>InvestmentItem</li> </ul> </li> <li>ResultItem <ul> <li>CostItem</li> <li>RevenueItem</li> </ul> </li> <li>BalanceItem <ul> <li>Asset</li> <li>Liability</li> </ul> </li> </ul>
	<ul> <li>Value</li> <li>AssetLiabilityBalance[BusinessActor, BalanceItem]</li> <li>Value</li> </ul>	

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	Topic: Housing and Construction	
<ul> <li>Person <ul> <li>Sex</li> <li>Age</li> <li>HomeLocation</li> <li>WorkLocation</li> <li>MaritalStatus</li> <li>Income(byKind)</li> <li>Wealth(byKind)</li> </ul> </li> <li>HomeLocation <ul> <li>Income(byKind)</li> <li>Wealth(byKind)</li> </ul> </li> <li>Organisation <ul> <li>Enterprise</li> <li>Establishment</li> <li>Location</li> <li>KindOfActivity</li> </ul> </li> <li>BusinessActor <ul> <li>Location</li> <li>Sector</li> <li>KindOfActivity</li> <li>Constructor</li> <li>Seller</li> <li>Buyer</li> <li>Owner</li> </ul> </li> </ul>	<ul> <li>RealEstateOwnership[Owner, RealEstate]</li> <li>OwnershipShare</li> <li>RealEstateSalesTransaction[Seller, Buyer, RealEsstate]</li> <li>Price</li> <li>ConstructionEvent[Constructor, Building]</li> <li>NumberOfDwellings</li> <li>EventType</li> <li>Permit</li> <li>NewConstruction</li> <li>Reconstruction</li> <li>Destruction</li> <li>I</li> </ul>	<ul> <li>Locality <ul> <li>Location</li> <li>RealEstate</li> <li>Building</li> <li>Dwelling</li> </ul> </li> <li>Product <ul> <li>Commodity</li> <li>Service</li> </ul> </li> <li>AccountingItem <ul> <li>CashFlowItem</li> <li>ResultItem</li> <li>BalanceItem</li> </ul> </li> </ul>

	D Topic: Agriculture	
<ul> <li>Organisation</li> <li>Enterprise</li> <li>AgriculturalEnterprise</li> <li>Location</li> <li>KindOfActivity</li> <li>BusinessActor</li> <li>Producer</li> <li>Seller</li> <li>Buyer</li> </ul>	<ul> <li>Residence[AgriculturalEnterprise, Locality]</li> <li>Ownership[BusinessActor, AgriculturalEnterprise]         <ul> <li>Work[BusinessActor, AgriculturalEnterprise]</li> <li>KindOfWorker</li> <li>KindOfWork</li> <li>Hours</li> </ul> </li> <li>LandUse[AgriculturalEnterprise, Land, Crop]         <ul> <li>Area</li> </ul> </li> </ul>	<ul> <li>Locality         <ul> <li>Location</li> </ul> </li> <li>NaturalResource         <ul> <li>Land</li> </ul> </li> <li>Product             <ul> <li>Commodity</li> <li>Crop</li> <li>Livestock</li> <li>Service</li> </ul> </li> </ul>
<ul> <li>Customer</li> <li>Owner</li> <li>Possessor</li> <li>Employer</li> <li>Employee</li> </ul>	<ul> <li>Production[AgriculturalEnterprise, Commodity]         <ul> <li>Volume</li> <li>Value</li> </ul> </li> <li>FinancialBalance[AgriculturalEnterprise, FinancialResource]             <ul> <li>Value</li> </ul> </li> <li>CostRevenueTransaction[AgriculturalEnterprise, ResultItem]                 <ul> <li>Value</li> </ul> </li> <li>InvestmentTransaction[AgriculturalEnterprise, InvestmentItem]                 <ul> <li>Value</li> </ul> </li> </ul>	<ul> <li>AccountingItem</li> <li>CashFlowItem</li> <li>Incomeltem</li> <li>ExpenditureItem</li> <li>ConsumptionItem</li> <li>InvestmentItem</li> <li>ResultItem</li> <li>CostItem</li> <li>RevenueItem</li> <li>BalanceItem</li> <li>Asset</li> <li>Liability</li> </ul>

	🗆 Topic: Energy	
BusinessActor	Production[Producer, EnergyResource]	🗆 NaturalResource
🗖 Location	🗖 Volume	EnergyResource
🗆 Sector	🗆 Value	🗆 Electricity
KindOfActivity		🗆 Fuel
🗆 Producer	Usage[Customer, EnergyResource]	
🗆 Seller	🗆 Volume	
🗆 Buyer	🗖 🗖 Value	
🗆 Provider		
🗆 Customer		
🗆 Subject		
CounterSubject		
🗆 Owner		
Possessor		
🗆 Employer		
🗆 Employee		

<u>, 1</u>	-	
	D Topic: Transports	
🗆 PersonT	vehichleRegistration[Authority, Owner, Vehicle]	□ NaturalResource
🗆 Student	NewRegistration	🗆 Land
🗆 Employee	Annualation	
🗆 Patient		🗆 CardinalResource
🗆 Client	Transport[Provider, Customer, Vehicle, Product]	🗆 Locality
	🗆 Weight	🗖 Location
🗆 Organisation	Distance	RoadSegment
🗆 Enterprise	🗆 LocationFrom	🛛 🗖 Туре
🗆 Institution	🗆 LocationTo	
Authority		🗆 Vehicle
🗆 Establishment	RoadAccident[RoadSegment]	🗆 Туре
	🗆 Time	
BusinessActor	WeatherCondition	Product
Producer	RoadCondition	🗆 Commodity
🗆 Seller		Service
🗆 Buyer	PersonInRoadAccident[RoadAccident]	
🗆 Provider	PersonRoleInAccident	
Customer	PersonCondition	
Subject	PersonConsequences	
CounterSubject		
🗆 Owner	VehicleInRoadAccident[RoadAccident]	
Possessor	VehicleRoleInAccident	
🗆 Employer	VehicleCondition	
🗆 Employee	VehicleConsequences	

	Topic: Environment	
🗆 Person	LandUse[Actor, Land]	□ NaturalResource
□ Student	🗖 LandUseCategory	□ Land
n Employee		
D Patient	□ Emission[Actor, Land, Substance]	n location
n Client	n Amount	n Area
	5 Finissin	n NumberOfBuildings
- Hawaahald	□ Situation[] ocality_I and]	
🗆 nousenola	a shadon[Eocandy, Edna]	
0	- Ownership[Owner_Locality]	
D Organisation	Downership[owner, Locality]	
🗆 Enterprise		□ Island
AgriculturalEnterprise		
Establishment		- VindOfBrotection
BusinessActor		CardinalDecourse
Producer		
□ Seller		
🗆 Buyer		
🗆 Provider		
🗆 Customer		
🗆 Subject		D Vehicle
CounterSubject		
owner		- Product
Possessor		Commodity
🗆 Employer		□ Substance
🗆 Employee		
- <b>-</b>		AccountingItem
		CashFlowItem
		□ Resultitem
		□ BalanceItem
		· ·

	Topic: National Accounts	
<ul> <li>BusinessActor</li> <li>Location</li> <li>Sector</li> <li>KindOfActivity</li> </ul>	<ul> <li>ProductionTransaction[BusinessActor, Product]         <ul> <li>Value</li> </ul> </li> <li>ConsumptionTransaction[BusinessActor, Product]         <ul> <li>Value</li> <li>Value</li> <li>InvestmentTransaction[BusinessActor, InvestmentItem]</li> <li>Value</li> </ul> </li> <li>WorkTransaction[BusinessActor, AccountingItem]         <ul> <li>Hours</li> </ul> </li> </ul>	<ul> <li>Product</li> <li>Commodity</li> <li>Service</li> <li>AccountingItem</li> <li>CashFlowItem <ul> <li>IncomeItem</li> <li>ExpenditureItem</li> <li>ConsumptionItem</li> <li>InvestmentItem</li> </ul> </li> <li>ResultItem <ul> <li>CostItem</li> <li>RevenueItem</li> </ul> </li> <li>BalanceItem <ul> <li>Asset</li> <li>Liability</li> </ul> </li> </ul>

• Topic: Financial markets       • AccountingItem         • BusinessActor       • FinancialTransaction[Subject, CounterSubject, AccountingItem]       • AccountingItem         • Subject       • RunTime       • CashFlowItem         • Location       • Purpose       • Incomeltem         • CounterSubject       • Security       • ExpenditureItem         • Location       • ValuationPrinciple       • CostItem         • Sector       • Value       • ResultItem         • Docation       • Value       • ResultItem         • Sector       • Value       • RevenueItem         • Sector       • Value       • BalanceItem         • Sector       • Value       • Location         • Value       • Value       • BalanceItem			
Image: Security       Image: Security         Image: Security       Image: Security	BusinessActor BusinessActor Subject Cocation Sector CounterSubject Location Sector Sector	<ul> <li><i>Topic: Financial markets</i></li> <li>FinancialTransaction[Subject, CounterSubject, AccountingItem]</li> <li>RunTime</li> <li>Purpose</li> <li>Security</li> <li>Currency</li> <li>ValuationPrinciple</li> <li>Value</li> </ul>	<ul> <li>AccountingItem</li> <li>CashFlowItem</li> <li>IncomeItem</li> <li>ExpenditureItem</li> <li>ResultItem</li> <li>CostItem</li> <li>RevenueItem</li> </ul>
	□ Sector	<ul> <li>Value</li> <li>FinancialBalance[Subject, CounterSubject, AccountingItem]</li> <li>RunTime</li> <li>Purpose</li> <li>Security</li> <li>Currency</li> <li>ValuationPrinciple</li> <li>Value</li> </ul>	□ Revenueltem □ Balanceltem □ Asset □ Liability

Image: Sector       Image: Trade         Image: Location       Image: Trade         Image: Location       Image: Volume         Image: Sector       Image: Volume         Image: Volume       Image: Volume         Image: Volu	L		
	<ul> <li>BusinessActor</li> <li>Location</li> <li>Sector</li> <li>KindOfActivity</li> <li>Seller</li> <li>Buyer</li> </ul>	<ul> <li><i>Topic: Trade</i></li> <li><b>TradeTransaction[Seller, Buyer, Product]</b></li> <li>Volume</li> <li>Value</li> </ul>	□ Product □ Commodity □ Service