



# Metadata-driven Scientific Use File data management

An approach for integrated data edition and dissemination

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- 1 Motivation and definition
- 2 Structuring data edition
- 3 Defining collaboration interfaces
- 4 Automating procedures

## 1 Motivation and definition

## 2 Structuring data edition

## 3 Defining collaboration interfaces

## 4 Automating procedures

# Who I am and what I do

## Daniel Bela:

- social scientist
- works for the NEPS at LIfBi
- data manager
- responsible for operative implementation of NEPS data edition processes

## NEPS:

- German National Educational Panel Study
- six panel cohorts (from Early childhood to Adult Education)
- each cohort surveyed at least once a year
- team of specialists for data edition at the Research Data Center

# What I want to talk about

traditional data edition scenario in research projects:

- one or two PhD students are confronted with a bunch of data
- they do their best
- they produce a result dataset
- they (and maybe a few others) make analyses and publish papers
- their PI is happy, the project concludes

# What's the issue with this

result of data edition scenario in research projects:

- usable data (👍!)
- data edition is buried in badly documented syntax files
- even if it is not buried, it is hardly readable for others
- the end data is not replicable
- in case an add-on project (or a follow-up panel wave) happens, someone has to start over again

# How can we do better?

NEPS data edition orchestrated as collaborative work by:

- structuring data edition
- defining interfaces for collaboration
- automating procedures

- *by using structured metadata*

structured metadata:

- any human readable information that is also machine-interpretable
- this may be SQL databases
- this may be CSV files
- this may be other tabular information

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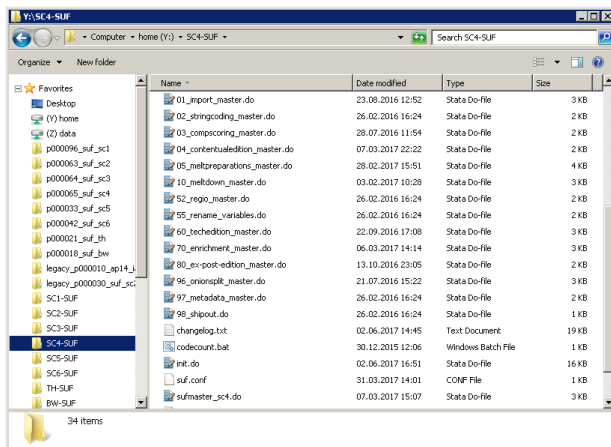
# Defining data edition milestones I

this may be something like:

- 1 data import / gathering
- 2 coding of string information
- 3 data compression (i. e. melting down data files)
- 4 variable renaming
- 5 data enrichment
- 6 labeling and exporting data

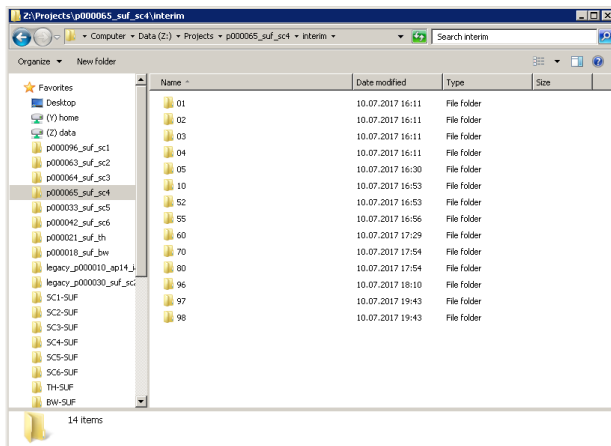
# Defining data edition milestones II

the obvious master-slave structure of code files:



# Defining data edition milestones III

the not-so-obvious milestone structure of data files:



# Defining data edition milestones IV

## separation of milestones:

- separate code into steps for each milestone
- also separate (intermediate) datasets for each milestone
- version-control code
- implement *each and any* procedure exclusively in code
- each milestone should be able to be processed standalone (given all defined prerequisites are met)
- clearly define features of datasets output by a milestone (e.g. “all variables have been renamed to the target format”)

# What's the gain?

true centralized, but collaborative environment:

- work on different milestones can be done in parallel by different persons
- automated tests checking milestone results can be implemented
- when everything is finished, a central wrapper script (“master file”) can execute the whole process

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# Low-level interfaces for collaborators I

issue:

- data edition scripts for complex data have to be complex
- some collaborators won't want to deal with this
- other collaborators won't want to bow to software / platform choices
- but collaboration is necessary to handle complex data edition projects

# Low-level interfaces for collaborators II

## solution:

wherever collaboration with non-expert collaborators is necessary...

- ...define common human readable (table-based?) interface formats
- ...write a short documentation about these formats
- ...collaborators only need to deal with these tables
- ...resulting tables can be automatically interpreted, and results written to the datasets



# Low-level interfaces for collaborators III

example:

sourcedir	sourcefile	targetdir	target	waveind	operation
A48	A48_T_Erst.dta	A48	pTarget	3	append
A48	A48_T_Erst_BB.dta	A48	pTarget	3	append
A48	A48_T_Erst_IndNV.dta	A48	pTarget	3	append
A48	A48_T_Panel.dta	A48	pTarget	3	append
A48	A48_T_Panel_BB.dta	A48	pTarget	3	append
A48	A48_T_Panel_IndNV.dta	A48	pTarget	3	append
A48	A48_T_Statusupdate.dta	A48	pTarget	3	merge 1:1 ID_t wave

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# Establishing maintainability

complex and / or panel data edition scripts:

- have to work in the long run
- have to be maintained in the long run

how to achieve this:

- *any* information changing over time should be held in interfaces
- scripts are there to automatically interpret interfaces' content
- repeated operations should be encapsulated in functions
- “don't repeat yourself”

# Recap

## NEPS data edition approach:

- NEPS data edition is semi-automated
- this is made possible by transferring data edition logic to structured metadata
- data edition routines only interpret and execute these metadata
- certain interfaces enable collaboration despite not all collaborators being tech savvy
- this enables NEPS to disseminate more than six Scientific Use Files per year (on average)

## broader perspective:

- structured metadata can be used to:
  - automate data edition procedures
  - define interfaces for collaboration
  - separate edition logic from its implementation

# Questions?

## Please discuss!



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