National Data Centre and Financial Statistics Office: A Conceptual Design for Public Data Management

Cakir, Murat

Central Bank of the Republic of Turkey

20 January 2014

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

Asia-Pacific Economic Statistics Week
Seminar Component
Bangkok, 2 – 4 May 2016

Name of author: Murat Cakir (Co-author: Merve Artman)

Organization: Central Bank of the Republic of Turkey / Statistics Department

Contact address: T.C. Merkez Bankası Idare Merkezi Istiklal Cad. No: 10 Ulus/ANKARA

Contact phone: +90 312 507 6974, E-mail: Murat.Cakir@tcmb.gov.tr

Title of paper

"National Data Centre and Financial Statistics Office: A Conceptual Design for Public Data Management"

Abstract

Data processes run by states, governments and the like have been a great deal and as old as the modern human history. Data had always been important. Tons were collected and siloed, but never in the past had its importance been felt as much as it had been when the last crisis broke out in 2008. Because these tons of data either, as some were redundant and occupying large spaces with huge storage costs, were not useful given the processing power and due to outdated mind-sets, or were not even the tiniest portion of the data necessary to do analysis[1], the experts realised.

With the advances in the digital world dealing with data has become easier. Combined with the urgent needs and demands from the bottom up and top down there now is more enlightened and educated perception of data and whatever its extensions are, and its / their potential use, though a little bit late. In the late 90s, however, things were not as computerised and Data^{eXve} (DataExhaustive[2]) was not as Big as it is today, and manual operations dominated the automated ones. There were definitely inefficiencies in Data^{eXve}. Still, even then, there were attempts to improve these processes.

This work focuses on one of those early attempts, in an effort to give a conceptual framework of how data management by public institutions can be handled by centralising rather than sharing the sparse individual databases throughout a national data system by visiting an almost two decade old design.

[1] Backcasting, forecasting, nowcasting whatever routine you might see fit in there.

[2] Term was made up by the author, to abbreviate *data exhaustive*; which is all there is about or relating to data, i.e. processes, management, governance etc.

I. Contents

II. Introduction - An Early Attempt!

Almost 2 decades ago, in the late 90s, while computerisation was not as spread as it is today, the data needs of government agencies were mostly catered by using paper based forms, as were the reports being prepared mostly manually rather than using office suites, though due to high costs only those agencies were the ones to afford these suites. Therefore, all sorts of processes based on this data feeding format had to be performed almost manually; data collection, data entry, and report production were all alike.

Obviously, these processes were *not user friendly*, data collection and entry were painful, and data were more *error prone*. Therefore the data collection and processing in the public sector by the public authorities were *inefficient* and *ineffective*, because of

1. Redundancies stemming from the data providers' obligation to report to multiple users, for example banks, tax authority, Central Bank etc., which was in turn an overburden to the data providers This had resulted in multiple and dissimilar reports of the same financials and therefore there were inconsistencies and lower integrity in the same and/or similar datasets.

2. Data collection and IT *costs* that were *higher* than they could be for the whole system, as data of the same category were being collected and stored in more than one places (collection, storage, processing and miscellaneous costs).

3. *Lower speed* of data collection process. Data provision and reporting to authorities and policymakers therefore were slow, resulting in lagged policy reactions.

This inefficiency could be eliminated provided that the *overburden* over the

1. *Data providers*, was lessened by *unifying the reporting* through a unified reporting package on the basis of "*one report to one collector*" principle (later found costlier hence replaced with "one report to multiple collector" principle). This package was supposed to be interconnected with the accounting and enterprise information systems if the user chose to use it so, and

2. *Data collectors*, was lessened by data sharing, which was confronted with secrecy and confidentiality reasons!

These reasons, though logical given the legislative framework, could only be overcome and a more and more efficient and effective system could be established, just by *centralising* rather than *sharing* the data. Centralisation of different institutional databases would have been more efficient and effective, as

1. While the lowest cost of sharing would be equal to the cost of data storage in *at least two places*, in centralisation the data had to be stored *only in two places*, in data feeders' database and in the data centre. Theoretically, the highest potential cost for the system would be equal to the storage in two databases,

2. In sharing due to potential coordination pitfalls (e.g. decision changes by the original data providers whether to share or not) there would be *operational risk*, whereas in centralisation as individual data feeders would be responsible by legislation for their datasets, this risk *could not exist*,

3. Individual institutional data providers (data feeders hereinafter) would be held responsible for one or a couple of *unique datasets* or *partial datasets, data collection would be faster*, and

4. *Unique instances of each record* for different datasets would be practically possible, with lower total storage costs and more correct data with less processing costs.

Note that the data centre must not have been directly reported to, as data responsibility principle for individual feeders would be breached and expertise of each feeder would be bypassed resulting in less qualified data to be stored in the centre. In order to guarantee the data *consistency* and *integrity* dynamic cross checking at random times on the Basic Identity Information Datasets (BIIDS) should have been carried out.

The original design of the data centre was made as early as 2001. Although more crude than this, without some fine tuning and data management terminology added recently, the conceptual basics were almost exactly the same. Unfortunately, it was so early then that, ostensibly, the system and its incumbents were not as ready for such a *radical* and *aggressively confrontational design* (!). Pronounced in several close surroundings, seen as *utopia* by many, *faced with reactions*, and finally found its place in the *inactive work portfolio*.

After the crisis set in and set out in 2008, a couple of decades old concerns of data and statistics professionals had been finally understood and been remade recognised, again thanks to a small number of people, whether the data issues had to be resolved no matter what it takes and whatever it costs, as otherwise, neither supporting policy decisions of the authorities nor informing the public would be possible whatsoever. Ideas concerning the consolidation, integration and sharing have been and are being pronounced more openly in data and statistics gatherings and more excitedly debated on in recent years[3]. The good news is politicians had become finally aware of the need, at a faster pace, with steps further than the authorities, researchers and data people[4].

With the recent urging demands from the politicians and policymakers, this conceptual project design had become again a part of the agenda, and was *resuscitated*; this time combined with the state of the art data and IT theoretical approaches.

III. Data Management Concepts and Definitions: Design Terminology

There is a relationship mapping in the current design. This relationship mapping is depicted in Table 1. There are some overlapping definitions, that is some or all of the individual entities (rows in the table) can be covered by more than one definition. It all depends on how one looks at the table.

Row-wise definitions are:

- *Data stakeholders* are the feeders and users.

[3] Lately, nearly all data and statistics gatherings had involved data issues like governance, big data, integration, sharing and the like.

[4] Dodd–Frank Wall Street Reform and Consumer Protection Act, effective as of July 21, 2010 is an important motivator for the US authorities to focus on the data issues. President Obama's National Big Data Research and Development Initiative (Big Data Initiative for short) was unveiled in 2012, involving 6 Federal departments and agencies, together, promise to greatly improve the tools and techniques needed to access, organize, and glean discoveries from huge volumes of digital data [1], [2]. These two illustrative developments are clear reflections of US Government's approach to and intent with data issues in the aftermath of the 2008 financial crisis.

G20 Data Gaps Initiative (DGI) [5] that relates to overcome problems in all sorts of data processes and looking for a cure is another huge initiative by international organisations. This alone involves huge responsibilities by individual governments, for them to close these data gaps.

- *Data custodian* is the one that stores and keeps the data secure, (here the National Data Centre)
- *Data owners* are responsible for *producing, providing, collecting* and *feeding*, from the data provider to data collector. National Data Centre is *not the owner of* any raw data except for those it produces for its internal use.
- *Data processors collect, feed,* and *keep the data secure*.

Column-wise definitions are:

- *Data feeders* collect the data it is responsible for and feeds it to the data centre.
- *Data users* use the *raw* and *processed data* and *reports* and *queries*.

General principles and definitions are:

- *Data responsibility* is that the collectors / feeders have to *collect data*, *make sure these data are correct* and *transfer the data to the centre.*
- *Reporting burden*, by the help of unified reporting tool / package, is the *responsibility* of the data provider(s) to *report to multiple collectors at once*. Multiple reporting to multiple users can be eliminated by this reporting tool.
- *Data and information provision* is the *providing the users with raw* and *processed data* and *reports* stored at the centre at pre-defined or dynamically changed levels of authority.
- *Security and Authority*: Security of the data at all levels and at each phase has the highest priority for the centre. The use of data is only *possible* according to the *level of authority* the user has vis-à-vis the centre.

Table.1 Data Relationship Mapping

DATA	FEEDER	CENTRE	USER
STAKEHOLDER	YES		YES
CUSTODIAN		YES	
OWNER	YES		YES
PROCESSOR	YES	YES	YES

IV. Proposed Architecture: Design Properties of the Data Centre

In its simplest form the proposed architecture has been designed on three main sub structures; namely, data providers (feeders), data users and the data centre. In this structure,

1. *Data Feeders* are the principal data providers to the centre which are bound to *collect, control*, and *transfer* the datasets that are in their *expertise* area and under their *data responsibility* from the primary reporters (Firms, banks, etc.).

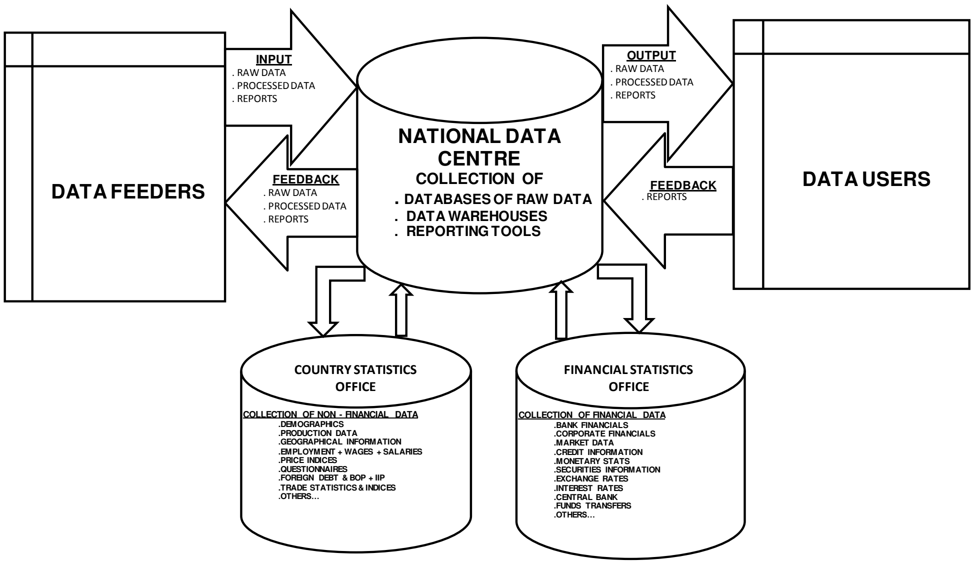
2. *Data Centre*, regarding and considering the *interrelatedness* or *independence* of the datasets provided by the feeders carries out *internal integrity* and *correctness* tests, and after confirming them, stores the raw and processed datasets into its database(s), updates and revisions of which are always possible. With the controls of the cross-checking sets, depending on the frequencies, *processes* the raw datasets and *prepare reports automatically*. This automatic and high speed and batch processing capacity of

high volumes of data, is one of the primary and essential features of the data centre, most stakeholders don't own nor could they afford to have. Data and information provision to the data users is subject to authority levels.

3. *Data Users* can utilise raw and processed data and reports prepared by the centre as long as they comply with the *authorisation rules* and according to their predefined / predetermined *levels of authority*. Queries made and ad-hoc reports created by the users can be stored by the centre in a *query* and *reports repository*, and can be used by other users if authorised by the original user and the data centre, as long as the secrecy and *confidentiality rules are not breached*, and these reports are considered to be publicised *without causing information asymmetry* nor any *strategic risk* for the economy management; otherwise restrictions apply.

A predefined structure for the whole database isn't appropriate as it would put limits on the *creative possibilities* and *potential use* of the queries and reports with regard to raw data. However, a *data warehouse* and an *operational data store* system where reside *pre-run queries* or *pre-established relations* and user run queries that can be revealed for use shall definitely exist. This is necessary for *quick* and *timely* reporting purposes for medium and longer term analyses; still, not sufficient to explore all the possible relationships. All the data usage shall be on the grounds of *pre-granted* and/or *dynamic* and *stratified authority* levels.

Figure.1 Proposed Architecture of the Data Centre



Common characteristics of the data that will be collected, stored, processed, and reported in the data centre are that they are *high frequency* and *very detailed* (*granular*). Besides, due to these high frequencies, the data inflow will be very fast and high volume (real time), and analysis and reporting, depending on the type of the data series, should be almost real time. Therefore, *software* and *hardware* configurations of the centre should be as up-to-date as possible. Here *no specific IT architecture* can be pointed out to, as it all depends on the database, analysis and reporting architectures.

Structurally, data centre has two main departments, one of which was once not separately classified in the original design. They are Country Statistics Office (CSO), responsible for dealing with non-financial datasets and Financial Statistics Office (FSO), responsible for dealing with financial data (Figure.1).

V. Core Competencies: What to Expect from the Centre, and What Can “it” Serve?

Data centre, by design, will be the *unique body* and the *sole provider* of the *public datasets*. Given its hardware and software capabilities what data centre is expected, in data management terms, can then be defined as the ability to:

1. Collect as much data as possible (volume and variety)[5]
    - At the most *optimal levels of cost* for the whole system, from data feeders to data users,
    - In the *shortest time possible* (velocity),
    - With the *lowest levels of error*,
    - With *no redundancy*,
    - With the *least effort* possible, and
    - With the *smallest burden* for the stakeholders.
2. Process the data
    - With the *highest Information Technology capabilities* most stakeholders couldn’t afford,
    - In the *shortest time possible* (velocity), and
    - At the *lowest* possible *cost*.
3. Provide
    - Stakeholders with the most *correct* and *timely* raw data and reports (veracity), and
    - *Custodianship* for the data at the *highest levels of security*.
4. Increase the *quality* of the data and reports

Thereby, provide the stakeholders with the highest *utility*.

VI. Financial Statistics Office (FSO)

From 2008 on, the need by the economy managements and the policymakers for the *granular* data, with the *highest frequencies*, for their analyses and policy designs, have been felt at a higher pace and intensity. The ever rising demand for such data by the policymakers and the market players led us to, once not classified separately in the original design, come up with a distinctly defined financial database structure added to the original design. Financial Statistics Office has therefore become one of the two main departments of the design of the National

[5] Volume, variety, velocity + veracity are (3Vs+V) the original design to describe Big Data by Gartner and veracity is the 4th V one added to the model [3], [4].

Data Centre. Main financial datasets that are planned to reside in this sub database design basically are:

1. Banks’ financial data
2. Corporate financial data
3. Market data
4. Credit data and information
5. Credit card statistics and data
6. Monetary statistics
7. Securities data and information
8. Exchange rates data and information
9. Interest rates data and information
10. Central bank data
11. Treasury activities
12. Funds transfers
13. Others

Granular high frequency micro datasets belonging to unique credits, securities and financial products collected and stored by the FSO are predicted to find intensive use in[6]:

1. The timely and true identification and evaluation of individual credit risks of financial institutions and total credit risks for the whole system by supervisory bodies, and rating agencies,
2. Monitoring trends in capital markets, and timely intervention when the potential risks that’d discomfort/distress economic stability happen to be true (crisis management),
3. Detailed statistical and economic analyses,
4. By establishing proper credit risk rating systems, providing efficiency in credit markets, and better rationing of credit,
5. Better monitoring of financial innovations,
6. Financial stability analyses and reports,
7. Market efficiency evaluations,
8. Using capital flow informations in monetary policy design,
9. Computing the credit/debit positions and other relations of domestic and foreign actors in the markets,
10. Discovering the inter and intra-company fund transfers,
11. Monitoring fraudulent, money laundering, and illegal activities,

[6] This inexhaustive tentative list has been prepared by using notes taken and presentations made at the IFC Workshop on "Integrated Management of Micro-Databases Adding Business Intelligence to Central Banks' Statistical Systems" at the Bank of Portugal, Porto, on 20-21 June 2013 (Proceedings published on BIS’ web site as IFC Bulletin No 37 January 2014, http://www.bis.org/ifc/publ/ifcb37.htm) blended with authors own knowledge.

12. Tax collection, and designing the fiscal policy-extensions,

13. Determining the buy/sell relationship of the actors for financial products,

14. Calculating statistics related with the activities of the domestic and foreign banks and funds,

15. BOP and IIP calculations,

16. Systemic risk evaluations related to business (real sector), financial sector, and households, and

17. Macro prudential policy making, financial stability and systemic risk evaluations.

VII. Implications and Conclusion

Motivated by a list of factors a design at a conceptual level for a centralisation effort of a group of different datasets with a variety of different attributes from quite a number of sources had been deemed necessary almost two decades ago. Though faced with reactions in the beginning and had to wait inactive for a long while, the emergence of the late global crisis had remade the original design worthwhile and with a set of small adjustments and additions there arose a usable and a functional design update. As mentioned before, there would be potential improvements in the current system of public data management if properly employed. similar examples have been seen from different national systems. Efforts from individual public authorities had also been observed in improving their data efforts and it had been heard almost everybody mention sharing what they had with other organisations. Regrettably, however, no such attempt of effort for improvement via centralisation of those datasets had been conceptualised yet. There is hope though, as a newer stream of thought has emerged lately, discussing the possibility of such a design. Still, it seems there is gonna be another while to wait for these thoughts to mature in order to pass a threshold for potent plausible actions to materialise, hopefully before another exigency.

VIII. References

[1] Kalil, Tom. "Big Data is a Big Deal", White House, (29 March 2012), Retrieved on 15 December 2013

(http://www.whitehouse.gov/blog/2012/03/29/big-data-big-deal)

[2] Executive Office of the President (29 March 2012) "Big Data across the Federal Government", White House, Retrieved on 15 December 2013

(http://www.whitehouse.gov/sites/default/files/microsites/ostp/big_data_fact_sheet_final_1.pdf)

[3] "Gartner Says Solving 'Big Data' Challenge Involves More Than Just Managing Volumes of Data", June 27, 2011, Retrieved on 15 December 2013

(http://www.gartner.com/newsroom/id/1731916)

[4] "What is Big Data?" Villanova University, Retrieved on 15 December 2013

(http://www.villanovau.com/university-online-programs/what-is-big-data/)

[5] "G20 Data Gaps Initiative (DGI) – background", European Commission - Eurostat, Retrieved 15 December 2013

(http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/G20_Data_Gaps_Initiative_(DGI)_%E2%80%93_background)