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6 March 2013

Online at <https://mpra.ub.uni-muenchen.de/88659/>
MPRA Paper No. 88659, posted 31 Aug 2018 21:33 UTC

Industrialisation in official statistics: a view on quality reporting and sufficient quality

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Abstract

We don't make them like that anymore, and it's a good job too!

Industrialisation and standardization lead to constant product quality in time. In official statistics, just as in car manufacturing, intermediate statistical products and final statistical products should have a constant quality level according the pre-set specifications. These specifications include the quality level and their allowed tolerances. This way individual quality reporting is not needed anymore because every product is according the specifications. The required quality level depends on the intended use. Based on ideas of the accountancy world about sufficient quality we could say:

The quality of statistical information is insufficient if a better figure resulted into another decision.

If there is a need to improve quality we should make a distinction between process and product quality. Improving product quality during a production cycle is only allowed if they do not meet yet the pre-set specifications. Improving process quality should lead to more efficiency and more robust product quality. Changing product specifications, including the pre-set quality level, leads to product and process redesign and to explicit communication with users.

The producer of statistical information informs the users about the intended use. The quality level is sufficient for this intended use. Actual use is monitored to avoid miss-use.

Keywords: Intended use, actual use, quality level

1. Introduction

International efforts like the Generic Statistical Business Process Model (GSBPM) and the Generic Statistical Information Model (GSIM) are meant to modernise the way official statistics are compiled. These efforts are supported and initiated by groups like the High-Level Group for Strategic Developments in Business Architecture in Statistics (HLG-BAS) and the ESS Sponsorship on Standardization (SoS). These new ways of producing statistics will have also impact on our way of managing processes and quality. In this paper we are looking for similarities between the approach of external industrialised production processes, as in the car industry, and the production process of official statistics. The first issue is how to set the quality level or in other words the specifications of the statistical product. What quality is good enough? We will look at some practices in the accountancy, which may give us guidance.

Once the specifications are set in the first two phases of GSBPM, *Specify needs* and *Design*, it is the task of the production department to produce statistical information according these specifications. This means production of constant quality with set and known tolerances. Improvements in the production phase should not lead to changes in the specifications. If a Lada was designed, we do not expect a Mercedes rolling from the assembling line or vice versa of course.

This brings us to the second issue of the paper. If quality is constant in time, there is no need for producing quality reports every time an indicator is produced. The specifications set at the design phase are sufficient to present the quality or properties of the statistical product. Of course there will be a need for the assembling line to test the accordance with the specifications. Only in case of deviations from the specifications some kind of warning is needed.

In the paper this view will be more elaborated and explained and we will see how this leads to guidelines for process management and quality reporting.

2. Recommendations

The aim of this paper is to guide statisticians with the difficult question ‘what is sufficient quality of statistical information?’ Secondly the paper is dealing with the way of quality reporting in an industrialized production process of statistics. Some recommendations are already standard practices in statistics but to be (more) complete they are also included in this section.

To use statistical information, users should be informed about the quality, the intended use and the interpretation. Beside this, they should trust the producer. Producers of official statistics deal with this.

The mark ‘official statistics’ should be similar to ‘trusted statistics’. This so-called **institutional quality** is supported by legislative instruments like national laws on statistics and on the European level the European Code of Practice. To support the institutional reliability, producers of official statistics should be without any interest in the level of the figures itself. In this respect producers of official statistics often can be distinguished from other producers.

Statistical information can be used by different users in many different ways. The question is whether all those heterogeneous users are able enough to understand the specifications and quality reports and can judge whether the quality of the statistical information is sufficient for their use. The producer can be helpful in this regard and present additional information about ‘what can you do with it?’ instead of ‘what is it?’. This way the producer of official statistics is more assisting users. The producer also guarantees that the issued quality is sufficient for this announced intended use. In the quality world this is called ‘**fitness for use**’.

This approach also gives an idea about what should be the minimal needed quality. In the accountancy world annual reports about the financial results are to present a **faithful** view on reality and the quality should such **that (investment) decisions were not be different if the quality of the figures was higher**.

The main recommendations for producers of official statistics are:

1. **The producer has an own responsibility.** The producer sets the specifications after consulting users regarding the intended use. **The quality level is set during the design phase and is part of the specifications.** From the user they expect common sense but no technical knowledge about statistics itself. Users tend towards blind confidence in official statistics. They should not be disappointed.
2. **The quality of statistical information is insufficient if a better figure resulted into another decision.** Implicit this sets the quality level and allowed tolerances. During the design phase of the production process these specifications should be set.
3. **The producer should deliver constant quality.** Every production cycle should result in products of the same and not of maximal product quality. Before dissemination the producer checks the quality level. It is also cost effective to deliver constant quality. Besides this, varying quality over time decreases the overall quality of time series.

4. **Dissemination of statistical information without additional warnings implies the data are according the specifications.** Publication implies automatically that the quality of the statistical information is sufficient for the intended use. This is a kind of guarantee from the producer. Individual reports on quality are not needed in this case. Internally the producer will of course check whether the product is according the specifications.
5. **Figures with a quality level outside the agreed-upon tolerances lead always to actions.** Examples of those actions are: postpone publication, increase internal efforts, withdraw figures, and warn users. Of course before dissemination there are other options if the wrong figures have not already been published. At least there should be an evaluation how to prevent such an accident next time.
6. **The producer monitors actual use.** Improper use will be noticed especially if it is made by policy makers. It is good if the actual use is broader than the intended use, but the specifications should tolerate this. Beforehand as well as afterwards the producer should warn for improper use.
7. **The producer indicates for what kind of use the statistical information may be used.** This is the intended use set at the Specify Needs phase of GSBPM supplemented with the allowed actual use. This is part of the relevance of the information. The producer cannot guarantee the specifications are sufficient for every use.
8. **The output architecture and the way of dissemination statistical information take into account that some information has a certain quality level which makes use for policy making impossible.** The producer should avoid miss-use because of misunderstanding the quality level or not reading the specifications by the users by using other output channels.
9. **Variation of input quality stresses the need for standardisation.** The fundamental difference between producing a car or producing statistics is the possible variation in quality of the inputs. Car producers are able to enforce constant quality over there. Producers of statistics are less powerful to do so. Subject matter knowledge and flexibility in using standard tools is needed to improve the quality as early as possible in the production process to the required quality level.

3. Constant quality with tolerances

Major attempts are nowadays going on to improve efficiency of official statistics. There are different ways doing this. One way is to reduce development costs. Are we able to share methods, software and other tools between statistics and between NSI's? Another way is to reduce human intervention during the production process. We call this *industrialisation of official statistics*. Are we able to produce statistics as in an assembling line? What can we learn from the outside world, where in the past already these industrialized ways of production have been invented?

The key word is 'constant quality' over there. This means that every component and every final product is equal within certain limits. Take as example the car industry. Once designed and once the production line is set up, the task of the production line is to produce every car with exactly the same characteristics according the specifications set during the design phase. Design and development phases are completely separated from the production phase.

Process quality means in this regard the ability to produce in time units with constant product quality according the specifications. Improving processes means lowering costs or improving the robustness of the production process, i.e. make products more equal. It means *not* changing the specifications of the product. In case a process is not able to produce according the specifications, the process has to be redesigned.

Product quality is tested during the production process and at the end of the production line. A quality report is *not* presented to the user. The user has to accept that every car is more or less equal and according the specifications. This is always within certain tolerances. If something is really wrong, there is a guarantee that the producer will make an correction.

Recapitulated, the process should be always having maximum quality to produce products of constant quality. Constant product quality is not equivalent to maximum product quality. The advantage of a car manufacturer is that he could force all his inputs, like steel but also semi-final products like chairs, to be of a constant quality.

In statistics our input is not of a constant quality. We have to deal with item and record nonresponse, varying quality of our data suppliers and other data errors. This is daily business and within certain tolerances not a big problem. Statistics invented scientific methods like editing and imputation to improve the quality of the dataset. There are also special methods to improve the response rate. So it means statistics is able to deliver datasets with a more or less constant or sufficient quality after a certain phase in their production process.

In practice statisticians like to improve their products or semi products every production cycle to the maximum. Examples in the past were unannounced cleaning actions on business registers to improve the quality of the register, but because they were used as sample frame for business statistics the time series were ruined. Another example is to increase the response rate. The comparability in time of an indicator will be decreased if response rates vary in time. So also in statistics we must recognise the importance of the principle of constant quality. Even after publication of the figures, statisticians do not like to throw away later arrived response. This is also the main difference between industrial production and craftsman production. A craftsman wants to improve the quality of his unique product to the limit. Statisticians have to be convinced that improvement actions are not always desirable.

So first we have to set the specifications of our products as good as possible. Starting with the specification of the final product, the specifications of the intermediate products should be derived.

And secondly we have to convince the production department to produce constant quality. The specifications include not only concepts like turnover or classifications like NACE, but also quality indicators like accuracy, response rates and their tolerances. One could even imagine talking about tolerances of the concepts. Are we allowed to use sales as a proxy of turnover? Could we use slightly different statistical units or populations

instead of the ideal ones? Normally we deal with these tolerances during the design phase in the negotiations with our users. Once set and agreed by our users, we assume that the concepts in our specifications are equal to the original target concepts. This step is often forgotten in a redesign phase when new negotiations are done with our users. Is the concept of Consumer price indices for example really the concept users are looking for? Or are they used to this concept and are they (and we) forgotten that this concept was developed in a time there was no other method possible to tell something about inflation? Redesign nowadays often means: make the same in a more efficient way. It is good to step back before starting redesign to take a closer look to the concepts too. If there is a need to improve product quality, it should always start with new consultations of users. In most of the cases change of specifications leads to distortion of time series. Users and producers should be aware of this.

4. Sufficient product quality.

In the previous section the need for constant product quality was elaborated. One could even develop a quality indicator on this as an indicator for comparability. But what quality level is needed? Jumping to conclusions current practice in statistics is that apart from the data, the producers disseminate also specifications, indicators about product quality. Users must make themselves familiar with these quality indicators and decide for themselves whether or not the quality level is sufficient for the intended use.

A better way is to involve important users in the setting of all specifications including the quality level. The intended use statistical information should set the specifications. One could distinguish for instance the following types of use:

1. **Direct actions.** Directly without intervention based on the outcome of a statistical indicator. This could be the amount or rise of contributions or payments according a contract. This could also be the start of administrative procedures.
2. **Policy making.** Indicators are used for policy making or measuring the results of policy making.
3. **Rough impression.** The indicator is used together with other indicators to get an impression about a certain phenomenon.
4. **Scientific** use not for policy making. Based on aggregated information a scientist want to perform some analysis.
5. **Other** explicit use of an indicator.

Each use or kind of use could lead to its specific quality level. To set the quality level the foreseen intended use for the main users should be known. Users and producers should agree on the quality level. The NSI should guarantee that the output of every process run has a product quality sufficient for this intended use. No individual quality report is needed in this case. If the quality is below the specifications including the tolerances, the producer should decide what to do. One could disseminate with a warning or delay the dissemination to improve for instance the accuracy. But even in this case users should be warned because the quality specifications of punctuality or timeliness are violated.

In the accountancy world one is also struggling with the concept of sufficient quality of annual accounts. Their definition of sufficient quality is:

Quality is too low if other decisions were made if better figures were known.

Mostly they talk over there about investment decisions. But also within statistics one could use this way of thinking to set quality levels.

An example is the government deficit and debt. The Excessive Deficit Procedure (EDP) starts when the indicator exceeds 3%. This means the quality of the indicator is too low if

1. The indicator is less than 3%, but the real figure is over 3% or
2. The indicator is over 3%, but the real figure is below 3%.

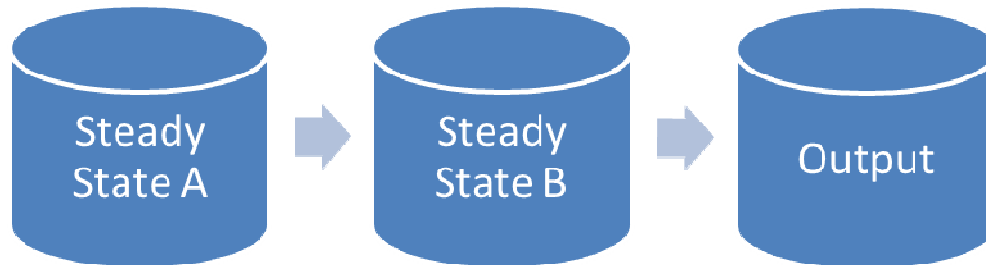
The intended use should be part of the specifications to make users clear what quality level is guaranteed. Often statistical information is also used for other purposes than foreseen during the specify-needs phase. A producer of statistics cannot guarantee that the quality is sufficient for all unforeseen use. But the producer can monitor the actual use of the statistical information. And certainly in case of improper use by the government a Statistical Authority should warn the users. If the quality level appears to be sufficient for an new kind of use, at first unforeseen, the specifications of the statistical information could be adjusted by adding this use to the part of the specifications were the intended use is recorded.

Special attention should be given to statistics solely based on administrative data. The quality of this information should not be based on the accuracy with respect to the administrative source but with respect to the real world phenomenon.

5. Regular production versus ad hoc production

Industrialisation could be very helpful to improve efficiency and quality of the regular production. By regular production we mean the production of statistical information according to a more or less fixed statistical program, the everyday production. Is industrialisation also helpful in decreasing time-to-market of new statistics or answering ad hoc questions of users? Partly this will depend on how the production process is organised. In Statistics Netherlands the concept of **Steady States** has been introduced: during the regular production process, useful in-between products are stored in a central database. If new demands could use an existing Steady State, one could benefit from work already done for other purposes. The concept of industrialisation is helpful because of the constant quality of also the in-between products. Secondly the later in the production line the steady state is re-used, the more consistent are the figures and the concepts used. The next figure represents a regular simple production chain to illustrate:

Figure 1. Production line with steady states



One should prefer to use steady state B instead of steady state A to produce new products like new statistics or ad hoc output. Partly this is already common practice but it is not fully incorporated in the overall business architecture. If time series are disseminated and one wishes to present also seasonal adjusted series, we do not start all over again with the production process. Those new products will need new specifications. The required quality level could be higher or lower compared to the quality level of the 'old' products. It all depends of the intended use. So industrialisation is helpful because of the principle of constant quality within each steady state. Standardisation is helpful because more of the same concepts and classifications are used and the same tools are deployed.

In case concepts are constant in time and if new products could be based on already available steady states, time series of these new products could be more easy constructed in an early stage of their life cycle because of the constant quality of the datasets..

A *fundamental* difference between producing a car or producing statistics is the possible variation in quality of the inputs. Car producers are able to enforce constant quality over there. Producers of statistics are less powerful to do so. Subject matter knowledge and flexibility in using standard tools is needed to improve the quality as early as possible in the production process to the required quality level.