

Data Quality in New Product Portfolio Management

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Twenty years ago, unreliable data was mentioned by well-known researchers as the main problem of portfolio management in new product development. Nowadays, hardly any thorough solution is found to improve the quality of data in portfolio management. Nevertheless, the need for research on data quality has increased further due to the cost of low-quality data in society: unreliable data has cost the US economy around \$3.1 trillion in the year 2016. This paper contributes to a solution to this problem by providing organisations with a six-step guide in how to measure the accuracy of data and how to take the level of accuracy this into account in portfolio decisions.

Introduction

Organisations develop products typically via a product innovation process that includes the three stages ideation, development and launch. This research focusses on the ideation phase because portfolio management is known to be most important in this first phase of the process. In the ideation phase, ideas are generated and selected for the subsequent development phase. The main goal of the ideation phase is to reduce fuzziness, which is linked to data quality because low data quality results in uncertainties and thus fuzziness.

The construct of data quality is divided into many dimensions. Most used dimensions are timeliness, completeness, accuracy, accessibility and relevancy. The accuracy dimension is described as an all-encompassing dimension since early studies on data quality took only this dimension into account. Therefore, it is a common practice to use the term accuracy when referring to whether the data is correct. Because the overall construct of data quality is too comprehensive, this research focusses on the accuracy dimension. In the remainder of this document, this is referred to as data accuracy.

Data Accuracy Defined

Data accuracy is defined as the extent to which the value of the data represents the true value of the attribute in the real world. This definition shows that the assessment of accuracy requires a test with the real-life object, also known as an objective approach to measure data accuracy. However, at the beginning of the new product

development process, most data are forecasts of future conditions. For this data, a test with the real-life object is not possible leading to an alternative approach for data in the ideation phase.

This alternative is a subjective approach, which measures accuracy via a survey among the data collectors or data consumers. Because the level of accuracy is in this approach determined by the people that fill in the survey, it highly depends on the knowledge and skills of the people that fill in the survey. To measure it still as reliable as possible, sub-dimensions can be used. The following five sub-dimensions of accuracy are extracted from earlier performed research on data accuracy and interviews with large Dutch high-tech organisations.

- **Believability.** The extent to which data is regarded as true, correct, and credible.
- **Coherence.** The extent to which data is focused on one topic or one real-world object.
- **Consistency.** The extent to which data is consistent with related data.
- **Objectivity.** The extent to which data is objectively collected, based on facts, and presents an impartial view.
- **Reputation.** The extent to which data are trusted or highly regarded in terms of their content or source.

New Product Portfolio Management

As discussed, one of the main purposes of the ideation phase is the selection of ideas for further development. This selection belongs to the

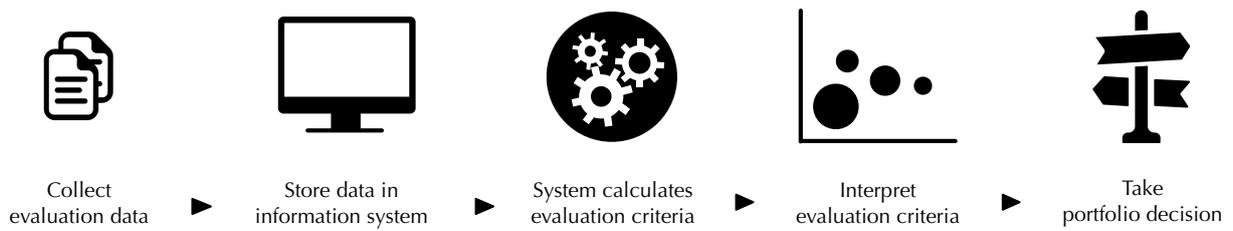


FIGURE 1: THE PROCESS FROM DATA TO DECISION MAKING

construct of portfolio management. Although portfolio management is performed during all phases of the product innovation process, it is most important in the ideation phase because good portfolio management in the ideation phase prevents that resources in the subsequent phases are wasted on ideas that are not successful on the market. Ideas are selected on evaluation criteria (e.g. expected sales, technical feasibility, or time-to-market) that are based on data. This includes that portfolio decisions are based on these evaluation criteria, and thus rely on the data underlying these evaluation criteria: evaluation data. Figure 1 shows the process from evaluation data to portfolio decisions. The data is collected by different people in the organisations. Prior to the portfolio meeting, the data is stored in the information system, which can be both advanced software for portfolio management or a simple spreadsheet. Accordingly, evaluation criteria are calculated from the data and included in graphs. Lastly, the decision makers interpret the graphs of evaluation criteria and take a decision on what projects to transfer to the development portfolio.

Because many organisations struggle with the accuracy of their evaluation data, there are already some organisations that measure the accuracy of this data. Although this results in insight in the accuracy of the evaluation data, the methods also suffer from problems. Most mentioned problems are on the one hand a low reliability of the accuracy level because the

measurement highly depends on the employee that makes the estimation and on the other hand a lack of insights on what data exactly causes a low accuracy. Both problems are solved by using the guide presented in the next paragraph.

Six Steps to Measure Data Accuracy

Because every organisation has a different product innovation process and approach to portfolio management, there is not a single method that every organisation can use to measure data accuracy. Accordingly, this research has developed a six-step guide that supports organisations in the implementation of data accuracy measurements in the process from data collection to decision making. The six activities are depicted in figure 2 and explained below.

First, it has to be defined from what data the level of accuracy has to be measured. This is done by making an inventory of the data that has to be assessed, which can be both qualitative and quantitative data.

Second, the moment of assessment has to be determined. An appropriate moment is when the data is entered into the information system. This because at that moment the data is formalised and the information of the source of the data is expected to be still available. Moreover, this gives the possibility to measure data accuracy again when data is added or updated, leading to a better estimation.

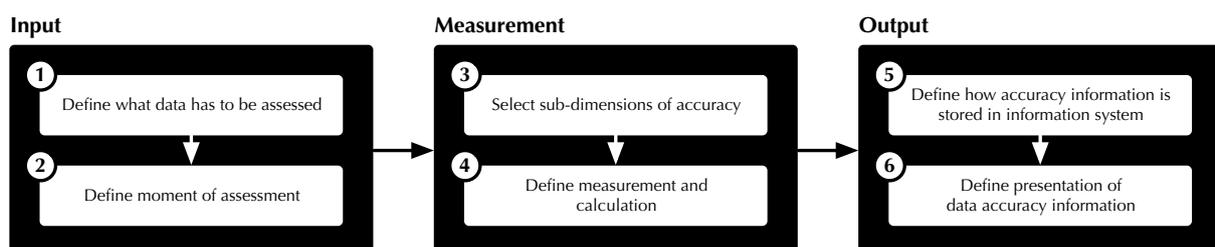


FIGURE 2: SIX STEPS TO IMPLEMENT DATA ACCURACY MEASUREMENT

Data Accuracy Assessment		Low	High			
?	Believability	★	★	☆	☆	☆
?	Consistency	★	★	★	★	★
?	Reputation	★	★	★	☆	☆
Calculated data quality		★	★	★	☆	☆

FIGURE 3: INPUT SCREEN ACCURACY MEASUREMENT

Third, sub-dimensions of accuracy have to be selected from the list discussed earlier to measure data accuracy as reliable as possible.

Fourth, it has to be defined how the data is actually measured. A recommended method is a three or five-point Likert scale whereafter the sub-dimensions are averaged to an overall accuracy level of an evaluation criterion. Figure 3 shows a sketch of the screen in which the level of data accuracy can be measured.

Five, after the measurement, the level of accuracy has to be stored in the information system together with the evaluation data. Since the assessment is done for every evaluation criteria (e.g. expected market size), the accuracy level has to be linked to the concerning evaluation criteria to trace back data with a low level of accuracy.

Six and last, the presentation of the data accuracy has to be defined. Organisations can decide to present data accuracy in the graphs next to the evaluation criteria at a portfolio meeting, consider data accuracy as an additional evaluation criteria, or show for example warning-messages in case of a low data accuracy. During the interviews, organisations mentioned that in the preparation of a portfolio meeting, a low level of data accuracy gets more attention than a high level of data accuracy. Appendix A gives an

overview of the six steps with corresponding recommendations.

Implementing the Steps in the Process

Implementing the six steps in the process from data to decision making causes two small additions to the process at the second and fourth action (shown in figure 4). At the moment the portfolio manager (or data collector) stores the evaluation data in the information system, the system asks to assess the data via several sub-dimensions or accuracy. A sketch of a potential input screen is shown in figure 3. After the data is assessed, the system calculates the overall level of accuracy. This overall level will be presented when the concerning evaluation criteria are retrieved from the system at, for example, the portfolio meeting. Accordingly, the portfolio manager and other decision-makers can take the level of accuracy into account by interpreting the evaluation criteria and taking the portfolio decision.

Conclusion

Portfolio managers should use the six-step guide (figure 2) and corresponding recommendations in appendix A to define and implement accuracy measurements in their organisation. Different studies already proved that taking the quality of data, including accuracy, into account leads to a better decision outcome. The six-step guide supports organisations to exploit this opportunity.

By assessing the evaluation data on accuracy, the information system provides portfolio managers with an indication of what data they can rely on and what data has most potential to improve. Accordingly, actions can be taken to improve the evaluation data in the information system, leading to more accurate evaluation criteria and better decision-making.

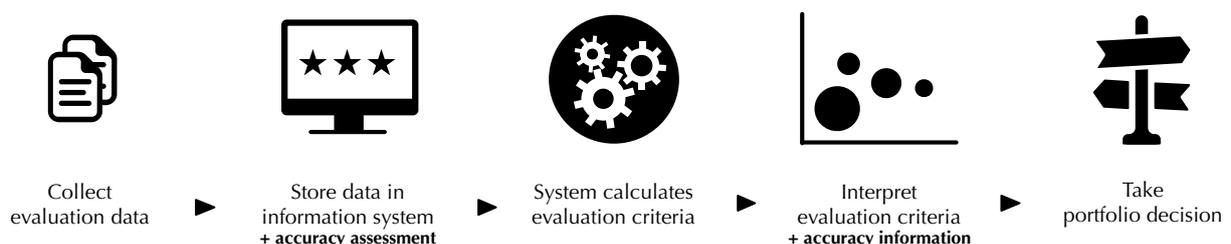


FIGURE 4: ACCURACY ASSESSMENT IN THE PROCESS FROM DATA TO DECISION MAKING

Appendix A: Recommendations Six-Step Guide

Action	Recommendation
1 Define what data has to be assessed	- Make an inventory of the data that has to be assessed, both qualitative and quantitative data
2 Define moment of assessment	- Structure the process of data collection and storage - Assess the accuracy of the data at the moment it is entered into the information system - Assess the accuracy of data when data is complemented or updated
3 Select sub-dimensions of accuracy	- Make a selection out of the sub-dimensions believability, coherence, consistency, objectivity, and reputation
4 Define measurement and calculation	- Use a Likert scale (three or five points) to measure the sub-dimensions - Average the sub-dimensions to establish an overall level of accuracy
5 Define how accuracy information is stored in information system	- Store the accuracy information in the same information system as the evolution data - Store the accuracy information on the level of evaluation criteria in order to trace back a low level of accuracy
6 Define presentation of data accuracy information	- Present the accuracy information next to the concerning evaluation criteria - Focus during the ideation phase on low accuracy levels to take correcting actions - Show during the decision-making both high and low levels of accuracy to compare projects with each other on data accuracy