A Model Driven Engineering Approach to Key Performance Indicators

BURNAY, CORENTIN

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A Model Driven Engineering Approach to Key Performance Indicators: Towards Self-Service Performance Management (SS-PM Project)

Corentin Burnay

University of Namur, PReCISE Research Center, NADI Research Institute
corentin.burnay@unamur.be
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1 Summary of the project

Exploring and analyzing data is a key activity for any modern organization. It is an activity through which various data sources are to be identified, analyzed, transformed and aggregated in order to produce Key Performance Indicators (KPIs), necessary to inform business managers and help them make better decisions. Most existing KPIs, however, have at least two significant weaknesses; (i) they are *opaque to the business* - business managers do not really understand how they are computed - and (ii) they are *owned by the technicians* - any change request on a KPI necessarily passes by the "IT" in order to be treated. This results in KPIs that fail to receive full confidence from managers, who cannot easily assess the actual quality of an indicator exposed to them, who do not see the potential treatments that have been applied to data so as to produce the KPI, who do not grasp the full set of mathematical operations and aggregations used to compute the KPI, and who as a result may not fully trust the indicator. This also results in bottlenecks, because any update on KPIs mandatorily implies the IT. Put together, these weaknesses lead to "Decision Support System" (DSS) with poor return on investment and more critically, to business managers who do not have access to trustworthy information. The SS-PM project investigates the possibility to make the design and implementation of KPIs "self-service".

2 Summary of expected tangible outputs

This proposal is at the intersection between two research areas: Requirements Engineering and Performance Management. It will focus first on the practice of identifying, modeling, analyzing and validating requirements of business managers towards KPIs. Various such models have been proposed in RE ([1], [2] or [3] are three notable examples considered in this project, among many others), but none of them focus specifically on indicators. It will also focus on Performance Management (PM), referring to practices and models used in an organization to track and improve its overall performance, by using famous PM models like the balanced scorecard [4]. Some room exists for improving the RE process of a PM system and to fix part of the problem of KPI's *transparency* and *IT-ownership*, mostly by letting users define requirements by themselves. How so? With three propositions.

A) A new modeling framework for representing KPIs: various methods exist to define KPIs. However, very few of them provide modeling support to actually formalize the KPIs and the process to produce it: which transformation? On which data? Which weights and decision rules? Why? When? This notation should be interpretable by business people, and should ease the implementation of KPIs. Most importantly, it would help business managers to have a clearer and more standard view on the KPIs;
B) A Model-Driven Engineering (MDE) framework for the computation of KPIs; DSS systems rely heavily on the expertise of programmers (i.e., the "IT"), in charge of developing and maintaining the solution. A change in the requirements results systematically in new developments by technicians. This takes money (cost of development) and most importantly time, with a risk of bottleneck. We propose to design and implement a processor for KPIs models (from Proposition A), which code and internal functioning would depend on a business model produced by managers. This model, under the form of simple visual artifacts, would allow managers to adapt their indicators directly, without interference with analysts and technicians, and hence to reduce the cost of implementing changes to indicators. This would also favor trust in the indicators (managers know how the KPI is produced) and would ease comparison with other instances of the same indicator (comparability, fairness, etc.);
C) A new indicator processing visualization technique: MDE as discussed in A and B does solve only part of the problem of trust in KPIs. Consumers of KPIs must have access, somehow, to the mathematical/logical process applied in order to produce it. MDE will drastically increase the trust that owners of the indicator have, but it will not help improve the trust that all consumers of that indicator need in order to make decisions. This project therefore also intends to produce a visualization tool, building on the same MDE approach as in B, that will show to KPIs consumers the process applied to compute an indicator. The visualization tool will not focus on the indicator, but on the manipulations applied to raw data that have been used to produce the indicator, with intermediary steps and values of that indicator.

References

1. Giorgini, P., Rizzi, S., & Garzetti, M. (2008). GRAnD: A goal-oriented approach to requirement analysis in data warehouses. Decision Support Systems, 45(1), 4-21.
2. Horkoff, J., Barone, D., Jiang, L., Yu, E., Amyot, D., Borgida, A., & Mylopoulos, J. Strategic business modeling: representation and reasoning. Software & Systems Modeling, 13(3), 1015-1041 (2014).
3. del Río Ortega, A., Resinas, M., Durán, A., Bernárdez, B., Ruiz-Cortés, A., & Toro, M. (2019). Visual PPINOT: A graphical notation for process performance indicators. Business & Information Systems Engineering, 61(2), 137-161.
4. Kaplan, R. S., & Norton, D. P. (1996). Linking the balanced scorecard to strategy. California management review, 39(1), 53-79.