Data-driven indicator classification and selection for dynamic dashboards: The case of Spanish universities

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Keywords
KPI classification, KPI selection, Dashboard design, Data-driven design, Spanish universities KPI

1. Summary

In the context of business, dashboards are visual tools that display the most important information about the organization needed to help the top management to make decisions. Since it is important to just provide the relevant and objective-oriented information, the number of indicators included in the dashboard must be kept at minimum. Therefore, the crucial aspect when designing dashboards is the selection of the suitable Key Performance Indicators. To help to carry out this task, we propose a classification and selection methodology, based on the values of the own indicators. This methodology is performed in two steps: the classification of the indicators in three categories (emergent, hot and consolidated indicators) and the selection of the suitable KPIs based on the organization strategies. To illustrate this method, we present a practical case of indicator classification and selection for Spanish universities based on the extensive UNIVERSITIC report.

2. STATEMENT OF THE PROBLEM AND BACKGROUND

A dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance (Few, 2006). The main objective of a dashboard is transforming data into information and turn this into knowledge for the business (Eckerson (2010)). For the dashboard to be effective, it must be oriented to achieve specific objectives, fit on a single screen, present updated information, understandable at a glance and specifically tailored to the users requirements (Few, 2006).

Selecting the KPIs that take part in a dashboard is not an easy task. In most cases this task is manual and specific to a particular case. However, there are some research projects that seek to formalize this process: the model-driven dashboard design technique of Chowdhary, Palpanas, Pinel, Chen and Wu (2006); the description language used in a process-oriented dashboard design of Kintz (2012); and the selection of KPIs through machine learning techniques proposed by Keck and Ross (2014).

Our proposal is framed in the area of methodologies for classifying and selecting KPIs. Our final aim is to formally propose a data-driven KPI selection model that will produce more dynamic dashboards.

3. PROPOSAL

Organizations are increasingly collecting and storing a vast amount of data from all their constituent units. Once this information is formalized and measured, the list of indicators is usually too broad to be managed, as well as diverse, and heterogeneous. To select the most suitable indicators to be part of the dashboard, we propose two steps: classification and selection.

The classification is based on two variables: the age of the indicator and its evolution over time. The indicators are classified then into three categories:

- **Emerging indicators**: Those recently incorporated to the catalogue and still with a low value, but with considerable growth.

- **Hot Indicators**: Those that have an intermediate value, but follow a growing evolution.
- **Consolidated indicators**: Stable indicators, with a high value and with no space for growth.

The indicators can be represented graphically as in figure 1. The horizontal axis represents the moment when the measurement is made from the first time the indicator appears in the catalogue. The vertical axis indicates the value of the indicator relative to the maximum possible (percentage).

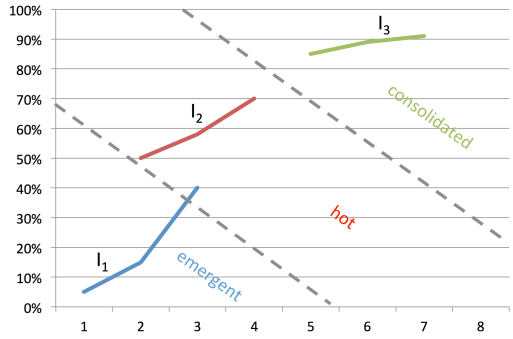

Figure 1. Proposed classification for indicators

In figure 1 it is also possible to define roughly the bands in which the indicators of the different categories will appear. The slope of the curves and their position give additional information.

Once the indicators have been classified, we propose that the selection be made according to the strategies adopted by the organization.

To illustrate and validate the classification and selection method, we present a practical example on the UNIVERSITIC report (Gómez Ortega, 2016, 2017; Píriz Duran, 2015), which is a catalogue with more than two hundred indicators of the Spanish university system.

4. CONCLUSIONS

An indicator classification and selection method has been presented. As a result we have a list of indicators to be candidates for a dashboard based on the values that indicators take over time. This is what we have called data-driven KPI classification and selection. This proposal is performed in two stages: the classification and the selection of indicators according to their values.

The proposal is a first step to automate some stages of dashboard design. In the future, dynamic dashboards will be deployed, incorporating new emerging indicators and eliminating obsolete ones.

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Rafael Molina-Carmona received his B.Sc. and M.Sc. in Computer Science from the Polytechnic University of Valencia, Spain in 1994, and his Ph.D. in Computer Science from the University of Alicante, Spain in 2002. He is a professor at the University of Alicante, and he belongs to the department of Computer Science and Artificial Intelligence. He is also a member of the *Cátedra Santander-UA de Transformación Digital*, devoted to explore new trends in digital transformation. His interests are mainly the applications of Artificial Intelligence to different fields: computer-aided design and manufacture, computer graphics, learning, creativity, information representation and IT gobernance.

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