

Analyzing the Extensibility Options of Business Software Solutions

Marcus Echter

SAP AG
marcus.echter@sap.com

Abstract. Extensibility as a quality attribute plays a significant role in the context of business software. A valuable comparison between the extensibility options of different solutions is crucial for the right purchase decision, but not straightforward. Existing papers describe rather informal analyses that are not based on empirical studies. SAP AG applied the Goal Question Metric approach to develop a generic reference model in cooperation with the University of Karlsruhe. This model can be used for an empirical analysis of the extension options of enterprise software. A case study finally compared SAP's new "Business ByDesign" solution with two other competitors and showed the practical applicability and limitations of the aforementioned model.

1 Introduction

Enterprise software solutions have to be flexible enough to adapt to ever-changing requirements. This is crucial for a company's market success, as today's business processes heavily rely on software and are frequently subject to change. Over the years, SAP AG has developed enterprise software that offers various configuration and extension possibilities explicitly designed into the architecture of the solution. SAP joined the University of Karlsruhe (TH), which is famous for its research in software design and quality, to create a generic model for analyzing extension options of enterprise software. This model can also be used by companies that are willing to buy a new solution and want to know which one fits best to their requirements.

Currently, there are no empirical studies that compare the extension possibilities of enterprise solutions based on a formal model. [Par79] gives an overview on how to generally design software with regard to extensions and modularity. [Dom04] describes some basic adaptation options of ERP (Enterprise Resource Planning) systems with no reference to concrete implementations. [Uns04] and [Hut03] finally compare some select business solutions in an informal way. The aforementioned papers do not imply the usage of any kind of formal model or metrics for their analyses. To fill this gap, we applied the Goal Question Metric (GQM) approach [BCR94] by Basili et al. to design accurate metrics based on defined goals and questions. These can be used for a valuable analysis of extension and adaptation possibilities as shown in a case study.

The contribution of this paper is the presentation of a domain-specific reference model for comparing the extensibility options of enterprise software as well as the se-

lection of questions and metrics it is based upon. Section 2 develops this model, its underlying questions and metrics, discusses the assumptions made and shows its practical applicability by performing an example comparison of three select business solutions.

2 Design of the Reference Model

The GQM approach. The Goal Question Metric (GQM) approach [BCR94] by Basili et al. is a systematic method for a goal-oriented derivation of metrics. These metrics are developed in a top-down fashion based on predefined goals and questions. The concrete values can then be interpreted with regard to the formulated questions. The *goal* defines the conceptual level and consists of three dimensions: *issue*, *object* and *viewpoint*. Moreover, it answers a particular *purpose*. A set of *questions* on the operational level characterize the attributes of the object and refine the examined issue. Each question is assigned a number of *metrics* that answer it on a quantitative level. These metrics contain the actual data of the examination.

Overall Goal and Sub-Goals. The overall goal of our examination is quite straightforward and can be formulated as follows:

Comparison (*Purpose*) between the extensibility options (*Issue*) of enterprise software solutions (*Object*) from the viewpoint of a customer (*Viewpoint*).

In order to manage the complexity of the domain, we decided to split the overall goal into sub-goals which each describe a particular aspect of the respective object. These extension categories have proven their practical relevance. From the viewpoint of a customer, *Business Configuration*, *User Interface* and *Data Model* extensions represent the most important sub-goals. For them, we developed the according questions and metrics which are presented in the next two paragraphs.

Questions. The questions below a certain sub-goal represent extension scenarios that are relevant for the customer according to the viewpoint of the overall goal. They are based on countless interviews with product managers and topic experts.

In the area of business configuration, there are two main questions that have to be answered:

1. Can a key-user configure the system?
2. Can new configuration content be added to the system?

The most complex category considered is user interface extensions. As the user can only interact with the system via some kind of user interface, he expects special adaptation and personalization features. This leads to the following questions:

1. Can a user personalize tables on the screen?
2. Can a user personalize his work environment?
3. Can a key-user adapt screen labels to customer-specific terminology?
4. Can a key-user adapt the page layout?
5. Can a new page with a new sub-menu be added?
6. Can mashups be created?

For data model extensions, we described once more two main extension scenarios:

1. Can a key-user adapt pre-defined business objects?
2. Can a key-user add a new business object to the system?

Metrics. As mentioned above, metrics characterize and quantify several aspects of a particular use case. In this work, we concentrated on ordinal metrics because they enable a relative comparison without complex calculations that are hard to validate, as found with cardinal metrics.

After due consideration, we decided to define five general metrics that are applicable to several questions and sub-goals (cf. Fig. 1).

Metrics	Scale
Feasibility	yes (x), no (-)
Power	++,+,0,-,-
Effort	low, medium, high
Implementation	Customer, Partner, Producer
Implementation (Customer)	End-User, Key-User

Fig. 1. General Metrics

Besides the general availability (*Feasibility*), the developed model places emphasis on the *power* and the realization *effort* of a particular feature. The power can be seen as the weighted set of supported sub-features, evaluated by a scale from “very low” (--) to “very high” (++) . Example sub-features for the feature “Table Personalization” are hiding/rearranging columns, sorting or changing the table design. The effort is estimated by “low”, “medium” or “high”, depending on how easy a user can implement the desired extension scenario. The final two metrics consider the issue *who* can implement a scenario generally (Customer, Partner, Producer) and within a company (End-User, Key-User).

Assumptions/Limitations. It is not easy to model a complex application domain like the extensibility of a software solution. In this paragraph, we explicitly discuss the assumptions made as well as the limitations of the model.

Although the considered sub-goals were formulated separately, they are not independent from each other. For example, an extension field of a business object is quite useless if it cannot be displayed in the user interface. However, a full end-to-end extension consideration as desired by the customer can only be done in a limited fashion with our approach.

Our questions refer to the most important extension scenarios as required by the customer. Further questions could be formulated that are not part of our examination.

Finally, the considered metrics cannot capture each and every aspect of a certain extension scenario. Some aspects like the look-and-feel of a user interface are inherently hard to metricize. In our examination, we therefore focused on the two main aspects “power” and “effort”.

Case Study. After having developed the aforementioned model, we showed its practical applicability in a case study. In this we compared SAP’s new midmarket solution “SAP Business ByDesign” with two competitors – Salesforce CRM and Oracle Fu-

sion – with regard to their extension options. The comparison required a deep understanding of the extensibility features of the different solutions so that the generic template could be filled with concrete data. After all, the developed model proved valuable as a basis for detailed analyses and gave a clear tendency on the supported extension features in the respective categories.

3 Conclusions

We presented a generic model for analyzing the extensibility options of enterprise software solutions. It is based on extension categories that serve as subgoals of the overall analysis. For the three most important categories *Business Configuration*, *User Interface* and *Data Model*, we formulated questions that represent typical adaptation and extension use cases as required by the customer. The questions are answered by five generic metrics that are condensed into the two main indices *power* and *effort*. This model was then applied to a concrete comparison between three select business solutions. The case study showed that the model, despite some limitations, is a valid common template for an extensibility analysis. It can be applied by enterprise software vendors to delimit their products from competitors as well as by customers to help in doing the right purchase decision.

In our analysis, we included five categorical metrics. These metrics only permit simple relative comparisons and not complex aggregated analyses as enabled by cardinal metrics. If the latter are used, more sophisticated metrics like LOC can be designed that imply numerical measurements in the system. Furthermore, our examination concentrated on three select extension categories and did not span the wide area of process flexibility in particular. All these issues could be addressed in future studies.

References

- [BCR94] Victor Basili, Gianluigi Caldiera, and H.Dieter Rombach. *The Goal Question Metric Approach*. In: Marciniak, J.J. (ed.) *Encyclopedia of Software Engineering*, pp. 528–532, John Wiley & Sons, New York, 1994.
- [Dom04] Axel Domschke. *Anpassungsmöglichkeiten von Informationssystemen am Beispiel von ERP-Systemen*. FHWT Vechta/Diepholz, 2004.
- [Hut03] Andreas Huthmann. *ERP-Systeme, Vergleich - Sage KHK, Navision, Bäurer*. University of Marburg, 2003.
- [Ora] Oracle Fusion. <http://www.oracle.com/fusion>.
- [Par79] David Parnas. *Designing Software for Ease of Extension and Contraction*. In: *IEEE Transactions on Software Engineering*, vol.SE-5, pp.128-138, 1997.
- [Sal] Salesforce CRM. <http://www.salesforce.com>.
- [Sap] SAP Business ByDesign. <http://www.sap.com/businessbydesign>.
- [Uns04] Martin Unsöld. *Markt der Standardanwendungssoftware für ERP mit einem Vergleich der konzeptionellen Struktur der Angebote*. University of Würzburg, 2004.