

## Structuring Highly Iterative Product Development Projects by Using Agile-Indicators

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**Abstract :** Nowadays, manufacturing companies are faced with the challenge of meeting heterogeneous customer requirements in short product life cycles with a variety of product functions. So far, some of the functional requirements remain unknown until late stages of the product development. A way to handle these uncertainties is the highly iterative product development (HIP) approach. By structuring the development project as a highly iterative process, this method provides customer oriented and marketable products. There are first approaches for combined, hybrid models comprising deterministic-normative methods like the Stage-Gate process and empirical-adaptive development methods like SCRUM on a project management level. However, almost unconsidered is the question, which development scopes can preferably be realized with either empirical-adaptive or deterministic-normative approaches. In this context, a development scope constitutes a self-contained section of the overall development objective. Therefore, this paper focuses on a methodology that deals with the uncertainty of requirements within the early development stages and the corresponding selection of the most appropriate development approach. For this purpose, internal influencing factors like a company's technology ability, the prototype manufacturability and the potential solution space as well as external factors like the market accuracy, relevance and volatility will be analyzed and combined into an Agile-Indicator. The Agile-Indicator is derived in three steps. First of all, it is necessary to rate each internal and external factor in terms of the importance for the overall development task. Secondly, each requirement has to be evaluated for every single internal and external factor appropriate to their suitability for empirical-adaptive development. Finally, the total sums of internal and external side are composed in the Agile-Indicator. Thus, the Agile-Indicator constitutes a company-specific and application-related criterion, on which the allocation of empirical-adaptive and deterministic-normative development scopes can be made. In a last step, this indicator will be used for a specific clustering of development scopes by application of the fuzzy c-means (FCM) clustering algorithm. The FCM-method determines sub-clusters within functional clusters based on the empirical-adaptive environmental impact of the Agile-Indicator. By means of the methodology presented in this paper, it is possible to classify requirements, which are uncertainly carried out by the market, into empirical-adaptive or deterministic-normative development scopes.

**Keywords :** agile, highly iterative development, agile-indicator, product development

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