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FRAUNHOFER INSTITUTE FOR EXPERIMENTAL SOFTWARE ENGINEERING IESE

CoBRA® – ACCURATE AND TRANSPARENT COST ESTIMATION

Fraunhofer Institute for Experimental Software Engineering IESE

Fraunhofer IESE is one of the worldwide leading research institutes in the area of software and systems development. A major portion of the products offered by our collaboration partners is defined by software. These products range from automotive and transportation systems via automation and plant engineering, information systems, health care and medical systems to software systems for the public sector. Our solutions allow flexible scaling. This makes us a competent technology partner for organizations of any size – from small companies to major corporations.

Under the leadership of Prof. Dieter Rombach and Prof. Peter Liggesmeyer, the past decade has seen us making major contributions to strengthening the emerging IT location Kaiserslautern. In the Fraunhofer Information and Communication Technology Group, we are cooperating with other Fraunhofer institutes on developing trend-setting key technologies for the future.

Fraunhofer IESE is one of 59 institutes of the Fraunhofer-Gesellschaft. Together we have a major impact on shaping applied research in Europe and contribute to Germany's competitiveness in international markets.

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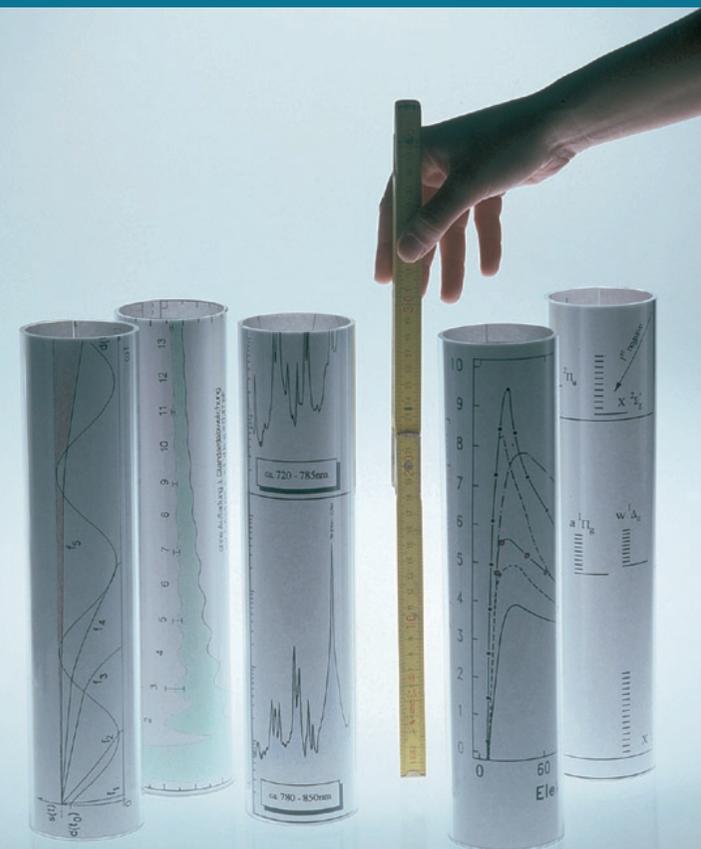## Fraunhofer Institute for Experimental Software Engineering IESE
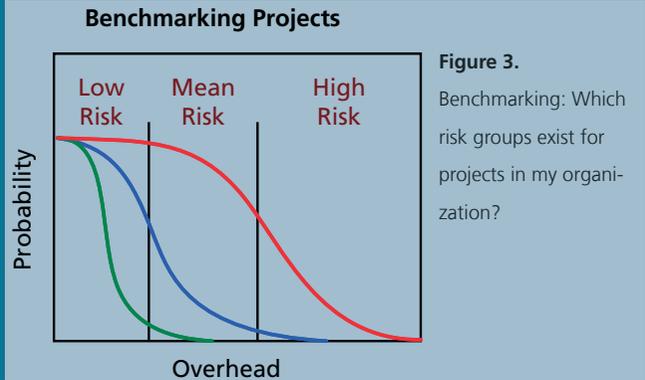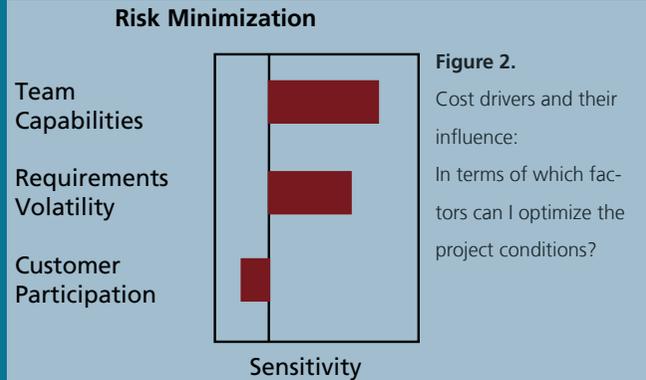
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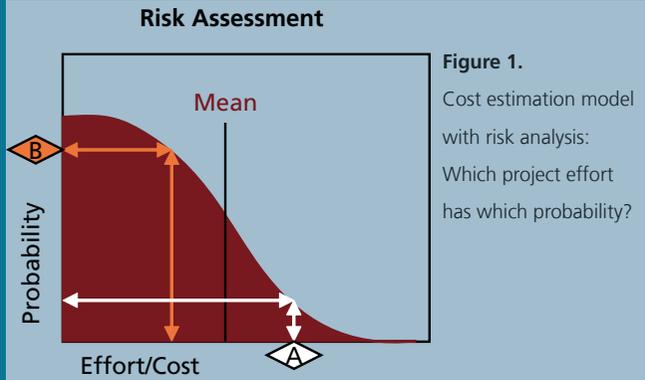67663 Kaiserslautern
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CoBRA® is a registered trademark of the Fraunhofer-Gesell-schaft and stands for Cost Estimation, Benchmarking and Risk Assessment.

Risk Assessment

Figure 1.
Cost estimation model with risk analysis: Which project effort has which probability?

Risk Minimization

Figure 2.
Cost drivers and their influence: In terms of which factors can I optimize the project conditions?

Benchmarking Projects

Figure 3.
Benchmarking: Which risk groups exist for projects in my organization?

THE PROBLEM

Every software business has to be able to budget and plan its software development projects realistically. This is the prerequisite for professional project management, for competitive offers, and for a more objective assessment of the offers made by potential contractors. In order to achieve these objectives, a software business must be capable of producing accurate cost estimates.

Since software projects are usually fraught with uncertainty, they inherently involve planning risks right from the start. Consequently, it is important to manage cost-related risks in order to monitor them and implement adequate continengency plans when a crisis occurs. It is also important for a company to compare, respectively benchmark, its projects in order to improve its understanding of productivity and enable comparison with the market in the respective industry. Since not all projects are equal, it is important to identify the specific factors (cost drivers) that have a positive or negative influence on productivity. Thus, the use of appropriate cost estimation approaches does not only contribute to accurate project planning and successful risk management, but also to improved software processes and overall organization maturity.

THE COBRA® APPROACH

At Fraunhofer IESE, we are developing innovative technologies to assist companies in dealing with cost estimation, benchmarking, and risk management problems. The CoBRA® method is based on both the knowledge of experienced project managers and already existing project data. Due to the systematic use of expert knowledge, COBRA® (with its corresponding tool support CoBRIX) can even be used in situations where only very little data is available about past projects within an organization.

CoBRA® makes subjective cost estimation objective and combines it with simulation techniques to enable cost estimations, quantification of risks, benchmarking of projects against baselines, and sensitivity analyses of cost drivers. The core of the CoBRA® method is the development of a causal model that captures the most important cost drivers and their relationships within a company and quantifies them with the help of experts. The use of simulation techniques makes it possible for CoBRA® to model the uncertainties of an estimation and thus to systematically assess the risks of exceeding the budget.

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APPLICATION EXAMPLES

One of our customers was experiencing increasing pressure to improve cost estimation skills and systematically control cost drivers (e.g., in order to be able to better assess risks in fixed-price contracts). The organization did have a number of experienced experts, but no comprehensive database of previous projects existed. With the help of CoBRA®, we developed a prediction model (Fig. 1) that captured and quantified the experiences of the organization's best project managers. The resulting model was characterized by a very high level of estimation accuracy (9% - 14% estimation errors).

The CoBRA® model did not only help our customer to assess the risk (probability) a given project has of exceeding the planned budget (Fig. 1, scenario A), but also to plan a realistic budget with the lowest possible risk of exceeding costs (Fig. 1, scenario B). In addition, the model helped our customer to compare new projects to already completed projects with respect to cost-related risks (Fig. 2). The results of a sensitivity analysis (Fig. 3) allowed identifying factors that are likely to have the biggest impact on costs and to plan appropriate risk mitigation actions.