Models in Engineering
Project Sample Essay

WEEK 3: JOINING SEVERAL MODELS TOGETHER

Assignment

Pick an analysis for which your company uses or would like to use modeling from several domains. Then, write a short description of each of the following:

A. Describe whether, all else being equal, you believe a combined model or separate models makes sense. Even if your company currently has an approach (for example, for weight analysis you use the combined model approach), describe what you believe would make the most sense. (150 words)

B. What are some of the challenges in implementing your chosen approach? (100 words)

C. What do you believe are the advantages of your chosen approach and what are their impact on the organization? (50 words)

D. What are the downsides of your chosen approach and the impact on the organization? (50 words)

E. How well do you believe your approach satisfies the qualities of great models that we have built so far? (Refer to Week 3 Takeaways for the 14 Qualities of Great Models; there are four additional ones added this week). Rate the model(s) on high, medium, low achievement of each. (150 words)

Sample Essay

Describe whether, all else being equal, you believe a combined model or separate models makes sense. Even if your company currently has an approach (for example, for weight analysis you use the combined model approach), describe what you believe would make the most sense. (150 words)

In software development, where I work, we rarely get to use models, but one area where we do use them is in software project management. It is always crucial to find out how much the organization would spend working to develop software features in the given year before the actual development has taken place. To facilitate this, our organization uses a basic model that predicts the money spent based on the estimates from development teams and past historic trends. It would be great to connect this model to the code complexity model that was provided in the sample example for Week 1. The code complexity example, if connected with this financial prediction model, will help financially analyze the impact of the code complexity on the future of the project. This combination of the code coverage model and the financial estimations model would help make runtime corrections to our estimates using key indications (code quality) early in the development cycle.

What are some of the challenges in implementing your chosen approach?

The biggest challenge is to connect the models together meaningfully. The outputs of the code coverage models predict the likeness of bug in the code; however, the financial model takes development efforts as an input along with other parameters to calculate cost. Therefore, to connect the two, we would have to figure out a good estimate for the severity of the bug which, when combined with its likeness, could help us arrive at development cost -- which is an input to the financial model. However, coming up with an accurate severity would be a tough task and might need another model altogether.

What do you believe the advantages are of your chosen approach and what are their impact on the organization? (50 words)

In the end, the organization tracks financial metrics especially at the executive level. Right now, the individual product teams have other metrics that they might track during the execution of the project. However, having this model would help translate the status of the project into a language which everyone speaks (financial impact), facilitating better communication and better decision making.

What are the downsides of your chosen approach and the impact on the organization? (50 words)

Both of the individual models are empirical and have decent accuracy on their own. However, if you just connect the models as they are, resultant fidelity would be less than their individual fidelity since we would have to make additional assumptions to connect them together. This reduced fidelity might either deter people from trusting the model and using it to make decisions, or use it to make incorrect decisions, both of which are not optimal.

How well do you believe your approach satisfies the qualities of great models that we have built so far? (Refer to Week 3 Takeaways for the 14 Qualities of Great Models; there are four additional ones added this week). Rate the model(s) on high, medium, low achievement of each. (150 words)

1. **Model Fidelity:** Medium. I believe the fidelity of of the combined model would be lower than that of the individual models today.

2. **Model Credibility:** Medium. I believe the credibility of the combined model would be lower than our current state, because the team does not have as much experience with it.

3. **Linked to Decision Support:** High. The combined model would potentially help align stakeholders within the organization on a single metric.

4. **Understandable and Well–Organized.** Low. Although it would be very desirable, I believe this effort will take a fair bit of documentation and user interface design to couple these models.

5. **Well Formed for Optimization:** Medium. In our case, everything would be related to cost optimization, I expect. We have not explicitly set up these models for optimization.

6. **Complete Relative to Scope and Intended Purpose:** Medium. The model suggested above is not a complete model right now; it does not take into consideration factors other than short-term development efforts. For example, there might be cases where a project with higher development cost might add additional benefits (not considered by the model) in the long run.

7. **Clear Scope:** High. I think the scope bounds are clear for this model.

8. **Internally Consistent:** High. The model would be internally consistent. No contractions were created within the model when we joined the smaller model together, because they don't share many variables.

9. **Elegant:** Medium. Although combining these two models may not have the highest economy of description, I think they would cover a wide range of conditions.

10. **Analyzable and Traceable:** Medium. The model would be traceable. It would not only generate expected output, but also explain how the input parameters contributed to it. However, the traceability would be limited by the correlation observed in real life between the various parameters. This should be sufficient for people to make informed decisions off of it.

11. **Avoid Optimizing on a Black Box:** High. Both of the models used to build the single model are mathematical models based on observed data. We know the equations of the model, and based on historic usage, we also know their limitations. Therefore, we should not have any optimization problem for the single combined model.

12. **Validity of Data Extrapolation:** Medium. Although we specify accuracy of the model for certain ranges of data based on data collected, we cannot predict for all of the possible data ranges, so I would choose to constrain the inputs to the model

13. **Availability of Interfaces:** Low. The single model will be an Excel-based model; therefore, it will output data in the Excel format. This is not the most desirable interface, but is adequate enough for most purposes where it might be used.

14. **Reusable:** Medium. The model is relatively modular, which I hope will help with reusability.