Model-Based Systems Engineering: Documentation and Analysis
Sample Project Critique

WEEK 3: CRITIQUING AN MBSE APPROACH

1. Remark on whether the model is meeting the intended scope and purpose. [Limit 350 characters]

   The MBSE approach applied to the ATM software project has a defined scope and purpose at a high level. From a critique perspective, the MBSE model provides a first time user with enough information to understand but leaves unanswered gaps. Without further information, it is not possible to fully assess the use of this MBSE model for the sister project.

   The MBSE model is to be used for the software development of an ATM system. This involves the User Interface (UI) and the back end operations. The main purpose of this MBSE approach is to validate user requirements, maintain a single source of truth and facilitate information across all teams. Additionally, the requirement diagram is well structured and allows for any user to understand the stakeholder needs at a functional, security and performance level. The use case diagram clearly depicts the operator, customer and bank employee and their interactions with the system. Finally, the queries are clear and align with the purpose of the MBSE approach for this project.

   While the previous information is clear, and it provides an abstract understanding of the model. I believe the MBSE model would benefit from the following.

   (1) It is unclear under what conditions the model will be functional.
   (2) The tolerance for errors is depicted in the purpose as “pretty low”. Given the importance of this requirement, I think this should be specified and not generalized. Moreover, this requirement is not clear in requirement diagram.
   (3) It is unclear if this MBSE model will be applied to a specific banking system of a financial institution or if it’s attempting to encompass a general approach. I would expect the scope of this approach to be a single institution.
2. List the model’s strengths and weaknesses. Your findings should relate back to specific instances of the model with screenshots or callbacks. [Limit 350 characters]

**Strengths**
- The MBSE approach was implemented in order to address several challenges listed in step 1 of week 1. If correctly developed, the model would be able to address them and greatly help the developing team.
- Applying MBSE to a highly regulated environment with strict requirements greatly increases its impact.
- Implementing web services, restful APIs and webhooks will allow the different teams to use design patterns and facilitate communication flow.
- The structure of the model diagram is well organized and can be easily understood by any user.
- Use cases include maintenance, operation and customer.
- Queries provided relate to stakeholder requirements and will allow the team to access valuable information.

**Weaknesses**
- The model library relies on translating MBSE information to the various software tools used by the different teams. Specifically, the translating requires a set of translation rules which would need to be updated manually. This seems to put the MBSE approach and the project at risk.
- Failure modes are not depicted. For instance, in case there is an issue with the MBSE model could we run a query? This relates back to under what conditions is the model functional.
- The validation example in step 2 of week 1 mentions, “check if all the components of the system are performing at least one task after the change is made”. This could result in a livelock error where all components are in constant change in regards to one another while not making any progress in the task.

3. Evaluate the model against three qualities of great models, as well as supplementary behaviors or qualities you believe are relevant to MBSE. You may mark as N/A those qualities which you cannot reasonably judge from the Week 1 and 2 output alone. [Limit 350 characters]

- **Availability of interface.** By implementing software industry standard communication protocols such as restful APIs, the team is ensuring loosely coupling, simplicity and reliability of the interfaces. If the model is implemented as depicted, the quality will be present in the MBSE approach.
- **Internally consistent.** While the structure diagram, purpose and scope provide an internally consistent design for all team members and stakeholders. The MBSE model seems to rely on a set of translation rules for the different software teams. Without further information on how these rules will be maintained and developed, it is unclear if this quality will remain true throughout the life of the model.
- **Verification and Validation with Models.** N/A more information is required to reasonably judge this quality. I agree that this is an important quality that should be present in this MBSE approach, especially given the nature of the industry. However, not enough information is provided to assess the quality in this MBSE approach.

4. Offer your conclusions and recommendations, given the specific rationale for your critique. [Limit 350 characters]
The MBSE approach for the ATM project has a large upfront cost given the approach. It requires investment to develop and configure communication across different software used by different teams. However, the benefits are clear and will greatly help the project achieve the stakeholder needs and user requirements.

For the sister project, this MBSE approach can be useful, especially if the upfront costs of rules and integration has been developed. I recommend that the MBSE team provides further information in the management plan given the lack of information. If the team is able to overcome the weaknesses in Step 2 above, I would be able to provide further assess the adoption of the current MBSE efforts.