Smart Checklists:
Process-Based Monitoring, Analysis, and Guidance to Improve the Quality of Healthcare

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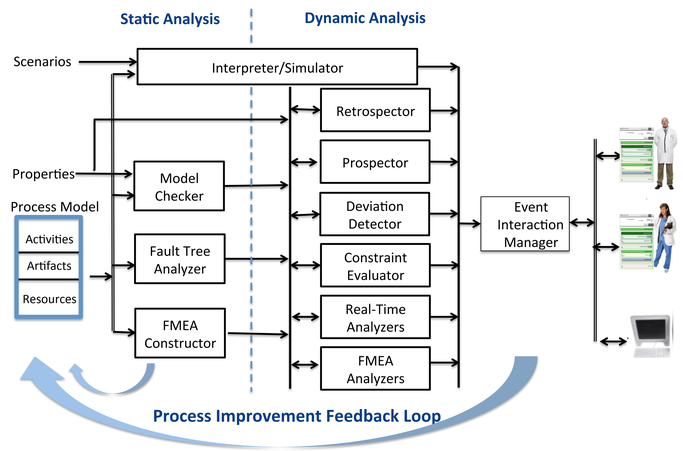
Project Goals

- Develop semantically-rich, validated process models and evaluate their use to guide process monitoring and guidance
  - Provide **retrospective, current, and prospective views** of the process state
  - **Detect deviations** and provide **explanations of likely errors**
  - Develop a framework for accumulating operational data, applying probabilistic analysis, and proposing **evidence-based process improvements**
- Builds on our previous work on process modeling and analysis

Framework Architecture

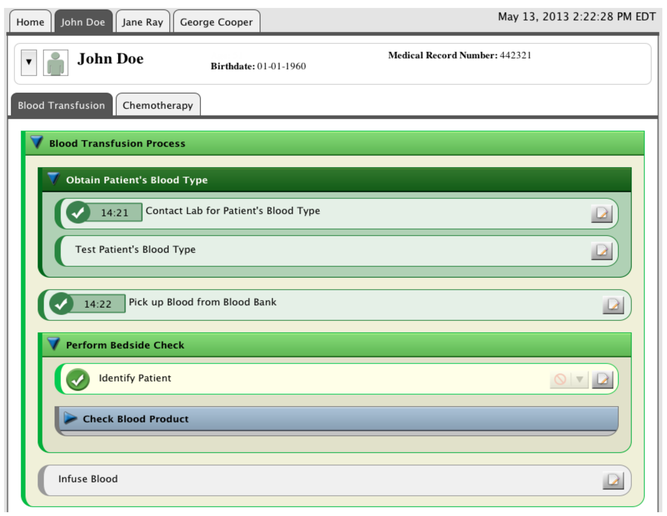


Capture and Represent Process State

- **Retrospection**, **Prospection, and Current Context** based on accurate monitoring of process steps
- **Concisely** and **Accurately** represent the context
  - Optimized representation that will exploit process model information, such as iteration
- Alternative views that highlight what is important to an agent
- Support queries about the past
- Predict future alternatives

Static Analysis Results: 70% reduction of chemotherapy errors reaching patients
[Mertens 2012, Joint Comm Journal on Quality & Patient Safety]

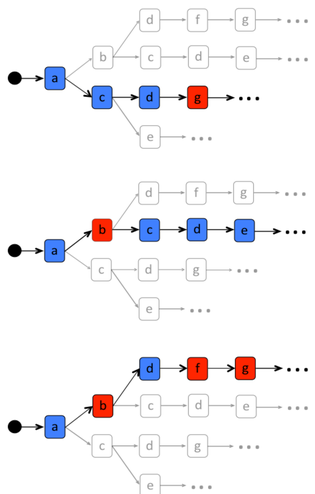
Smart Checklist Mockup



Detecting Process Deviations and Identifying Likely Errors

- Need to consider multiple traces through the process
- But, impractical to consider all traces:
  - Use edit distance and sequence comparison techniques to select most likely intended traces
- Errors could occur before a deviation is even detected
- For each deviation, there could be multiple potential errors
  - Appropriate recovery depends on the error
  - Identify most likely and/or most harmful errors

Example event sequence:
acde



Evaluation Questions

Functionality:

- How well can the framework monitor process progress?
- How well can the framework detect and explain process deviations?
- How well can the framework represent current and past state and accumulated historical data?

Impact:

- How does process monitoring and guidance impact the performance of performers?
- Are error rates and near misses reduced? Are tasks performed more efficiently? Are exceptional situations reduced or handled more effectively?
- How do process performers rate the system's intrusiveness and helpfulness?
- What aspects of the system were most bothersome? What aspects were most helpful? Was the Smart Checklist metaphor useful?

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