Early Phases of SDLC and Quality Metrics

his systematic literature review (SLR) focuses on the early phases of the Software Development Life Cycle (SDLC) and the role of quality metrics in software development. The study emphasizes the importance of early defect detection, which reduces costs and improves efficiency. It classifies early SDLC phases, evaluates software quality metrics, and outlines methodologies for quality assessment.

**Classification of SDLC Phases**  
The early SDLC phases identified include:

* **Requirements Management**: Activities involve requirements elicitation, analysis, validation, and documentation.
* **Design**: This phase establishes the system architecture and involves design specification, verification, and documentation.  
  Other phases like coding and testing are sometimes integrated but less emphasized during early phases.

**Quality Assessment Models**  
Several models and tools were highlighted for assessing software quality in early phases, including:

* **CAME Tools**: Evaluate software components using statistical and graphical techniques.
* **ESQUT Tool**: Measures design and code quality through tree-structured charts.
* **SORTT Tool**: Automates requirements traceability for improved efficiency.
* **Clustering Techniques**: Fuzzy c-means and k-means are employed for quality prediction.

**Activities in Early Phases**  
Early SDLC phases involve activities like feasibility studies, functional requirements analysis, and design architecture selection. These phases aim to identify potential defects early, define metrics, and document software components effectively.

**Metrics for Early Phases**  
Key metrics identified for requirements and design phases include:

1. **Requirements Metrics**:
   * Requirement Defect Density
   * Requirement Change Request Rate
   * Requirements Traceability
   * Requirements Stability
2. **Design Metrics**:
   * Cyclomatic Complexity
   * Design Review Effectiveness
   * Maintenance Severity
   * Coupling and Cohesion Measures

**Findings and Insights**

1. **Importance of Early Phases**: Early defect detection significantly reduces rework and associated costs.
2. **Metrics-Based Prediction**: Metrics like cyclomatic complexity and defect density predict software quality and guide improvements.
3. **Methodology Flexibility**: The choice of methodology and metrics depends on the project’s goals and organizational preferences.

**Conclusion**  
The study underscores the need to focus on early SDLC phases for effective quality management. By tracking relevant metrics and using robust tools, organizations can enhance software reliability, maintainability, and overall quality. Future work should explore uncertainty in metric assessment and develop comprehensive frameworks for software quality evaluation.