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Feature Usage Diagram for Feature Reduction

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Outline

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- Related Work
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- Case Study Design
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- Future Work



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Research Problem

Feature creep [1] is adding features that have **no**, or **marginal value**.



Most of the software products contain **30 % - 50 %** unnecessary features [2].

- It makes a computer application slower
- Requires higher hardware capacities
- Increases the costs of maintenance



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Current Approaches

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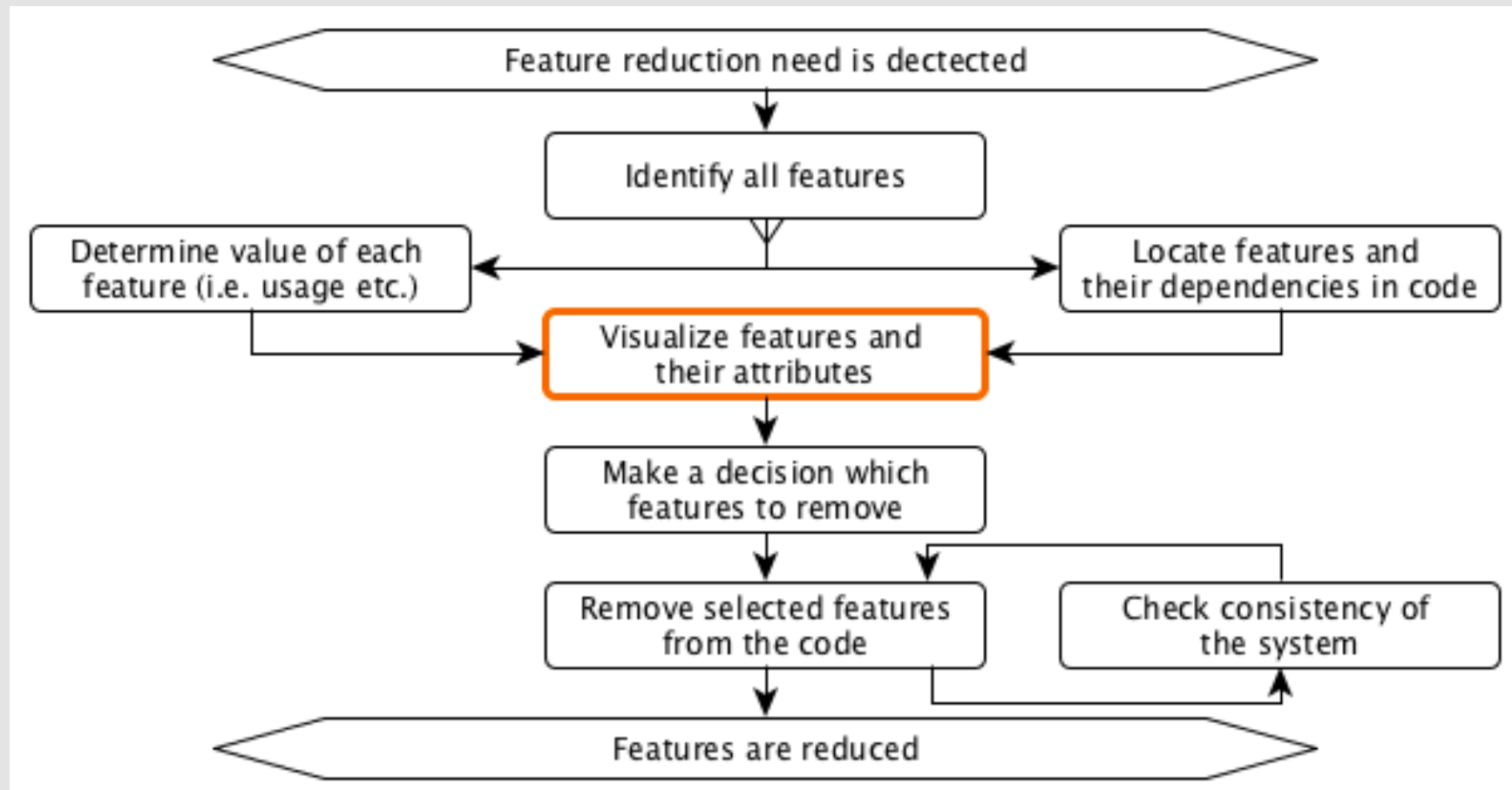
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Lean start-up [3] software development methodology tackles the feature creep problem by finding a minimum viable product.

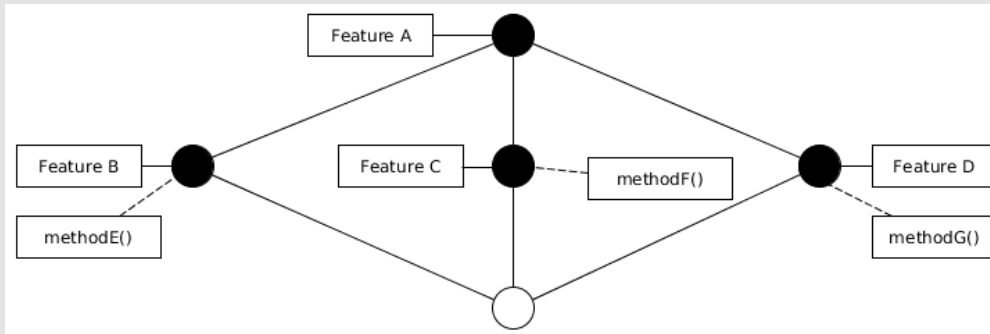
Agile [4] software development practices focus on implementing valuable features by constantly considering changes in requirements.

However, **it is difficult to determine the value** of a feature and find a minimal viable product. In addition, **some features loose their value over time** and might remain in a system unnoticed.

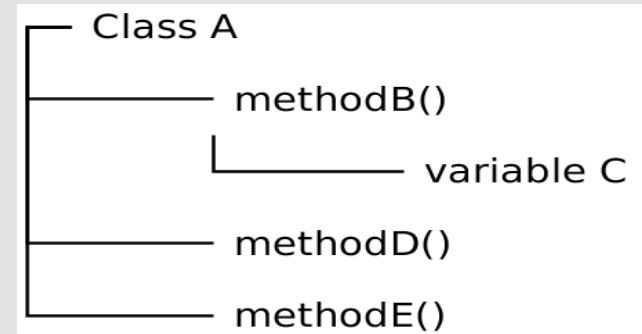




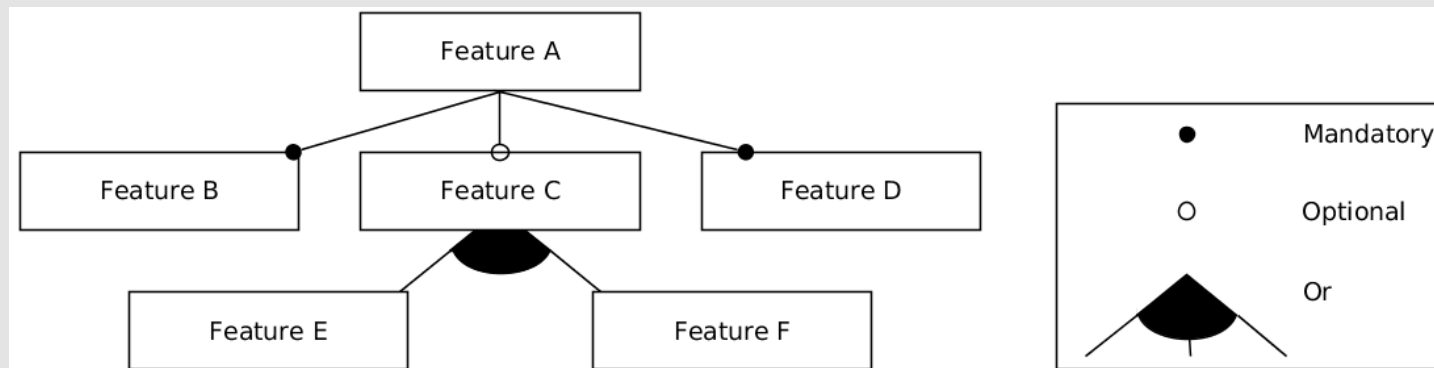
Concept lattice [5]



Concern Graph [6]



Feature diagram [7]





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Related Work

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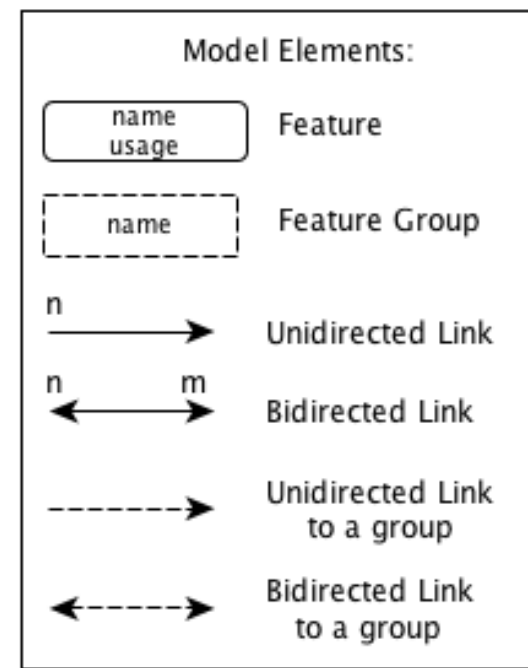
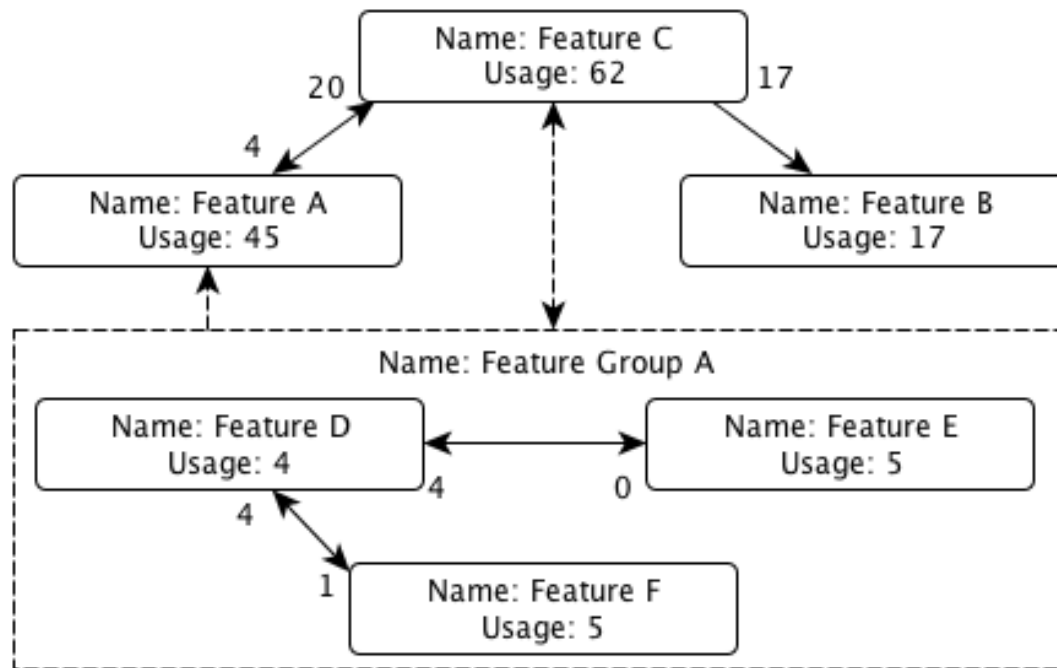
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State of the art methods do not capture value attributes related to features, nor they were created for this purpose.

To address this problem we designed a **Feature Usage Diagram** and Evaluated in the case study.



Feature Usage Diagram





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Feature

A **feature** is an observable unit of behaviour of a system triggered by the user [8]. Where user can be person, or other system.

Attributes:

- **Feature name** - represents a name of a feature.
- **Feature usage** - shows how many times a feature was used.



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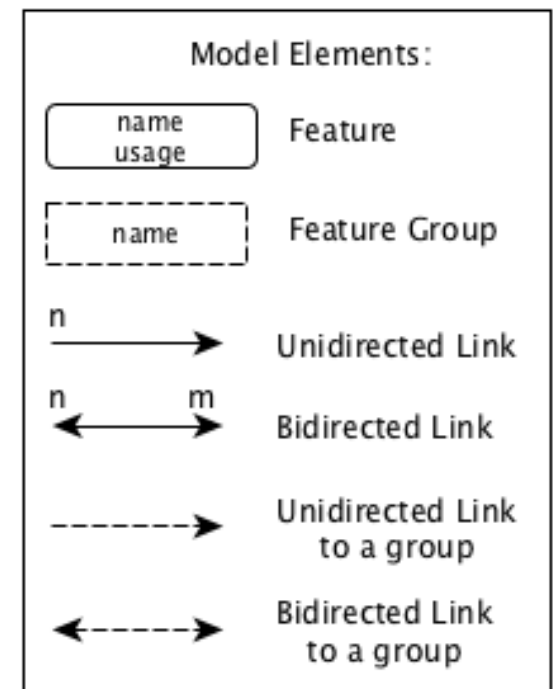
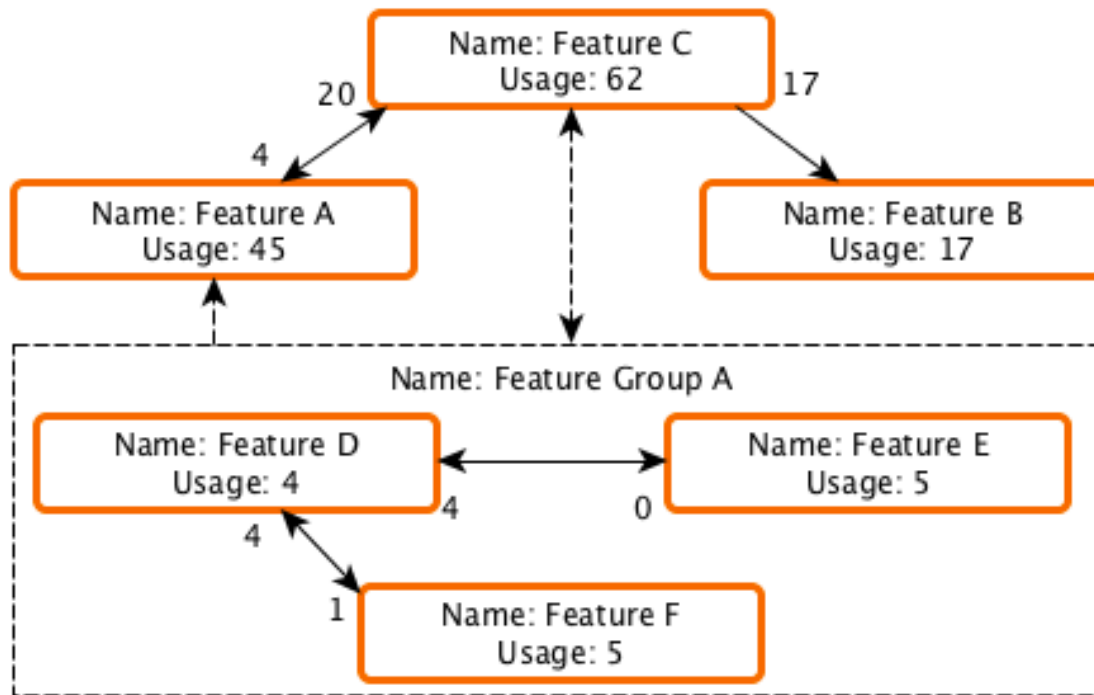
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Feature

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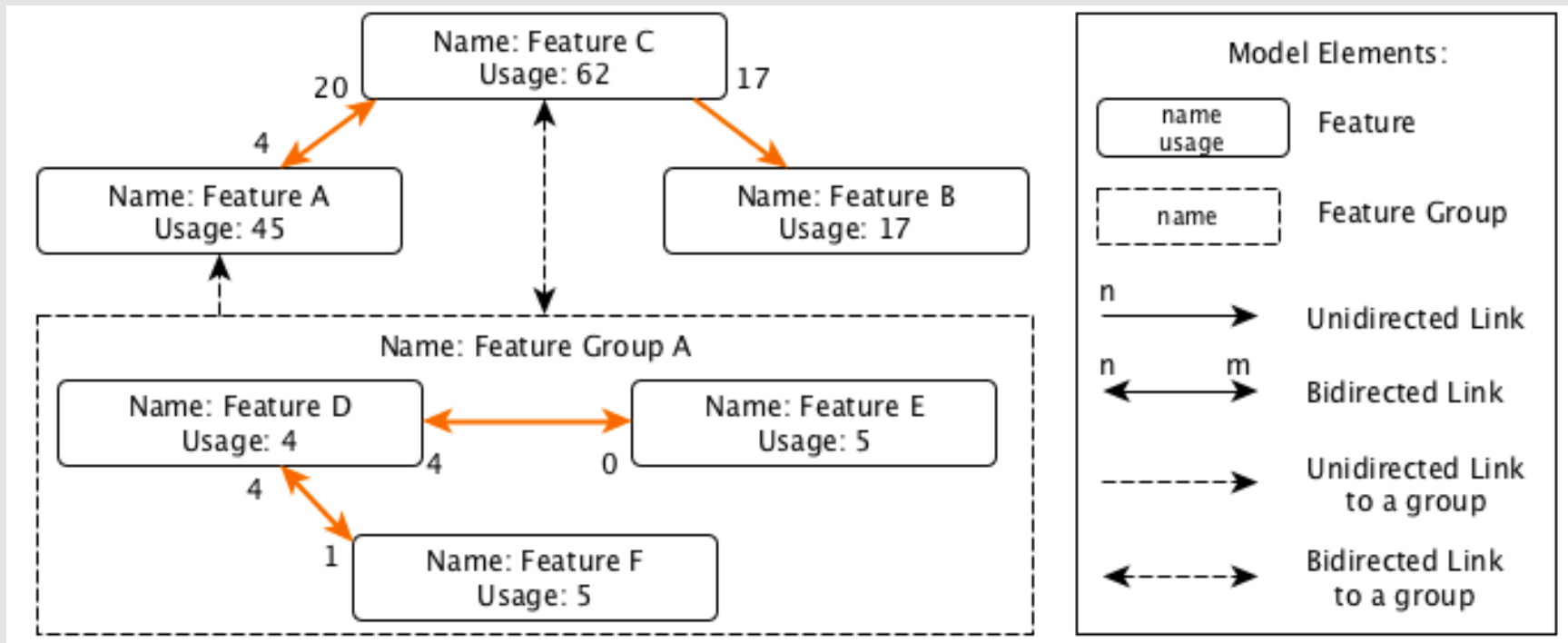
Directed Link Between Features represents an access path between two Features.

Attributes:

Link Cardinality - shows how many times a feature, which the link is pointing to, was accessed from a connected feature.



Directed Link Between Features





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Feature Group

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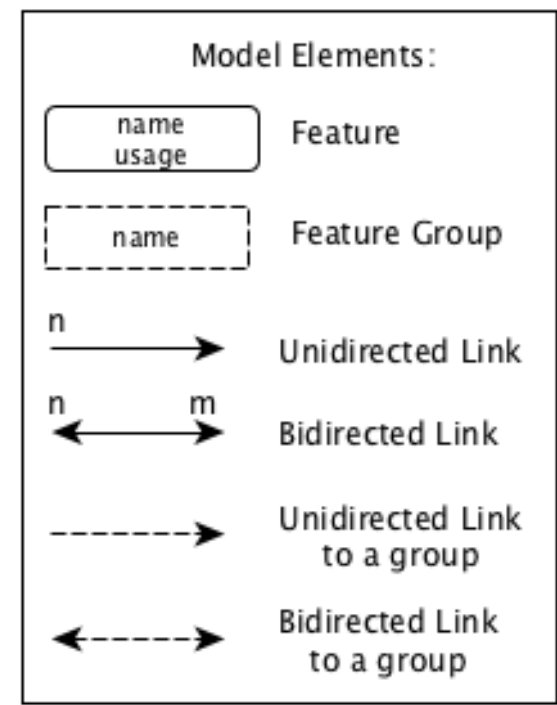
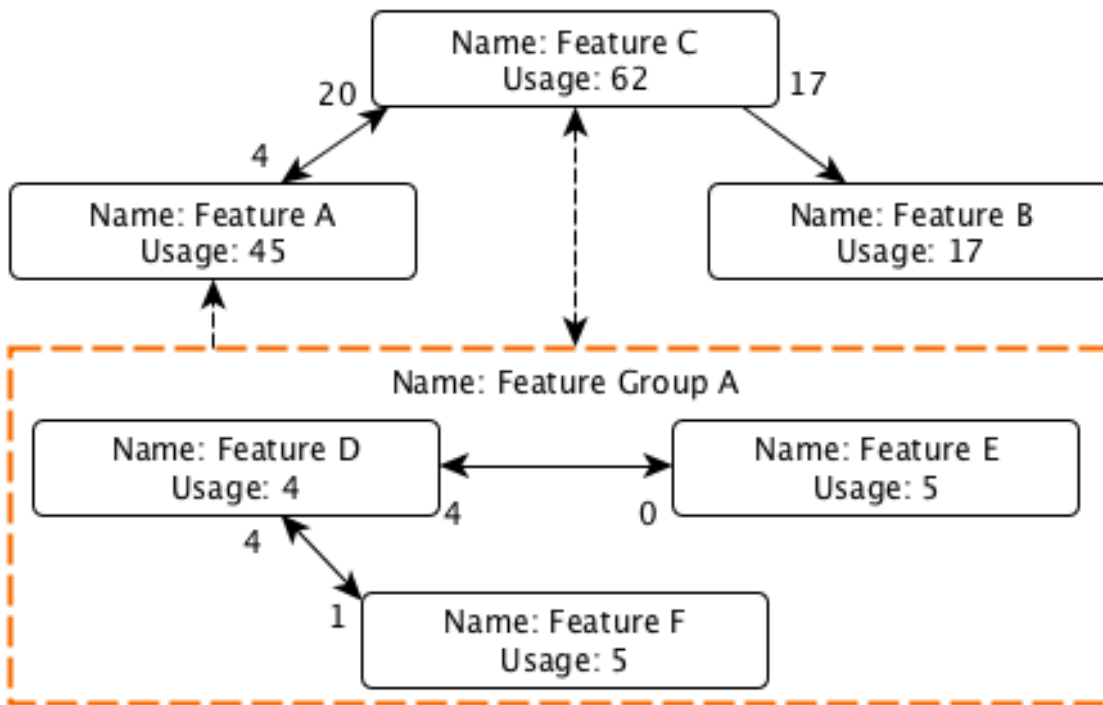
Feature Group element can be used to group Features that have the same links between the Features that are outside the group.

Attributes:

- **Group name** - represents a name of a feature group.



Feature Group





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Directed Link to Feature Group

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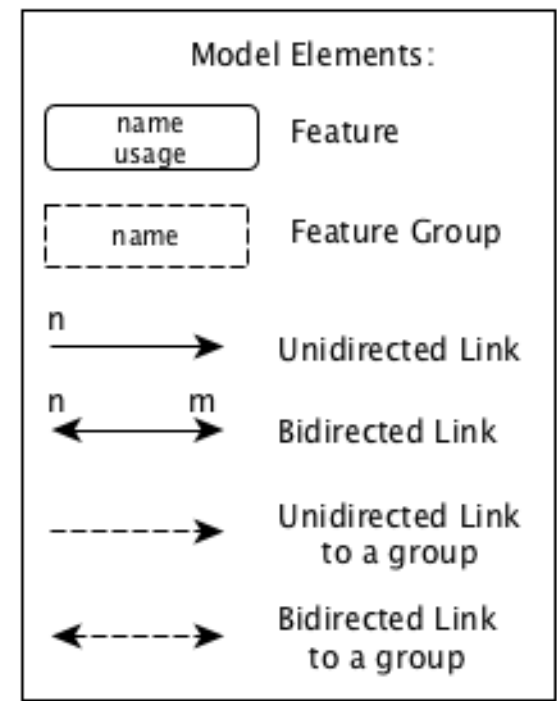
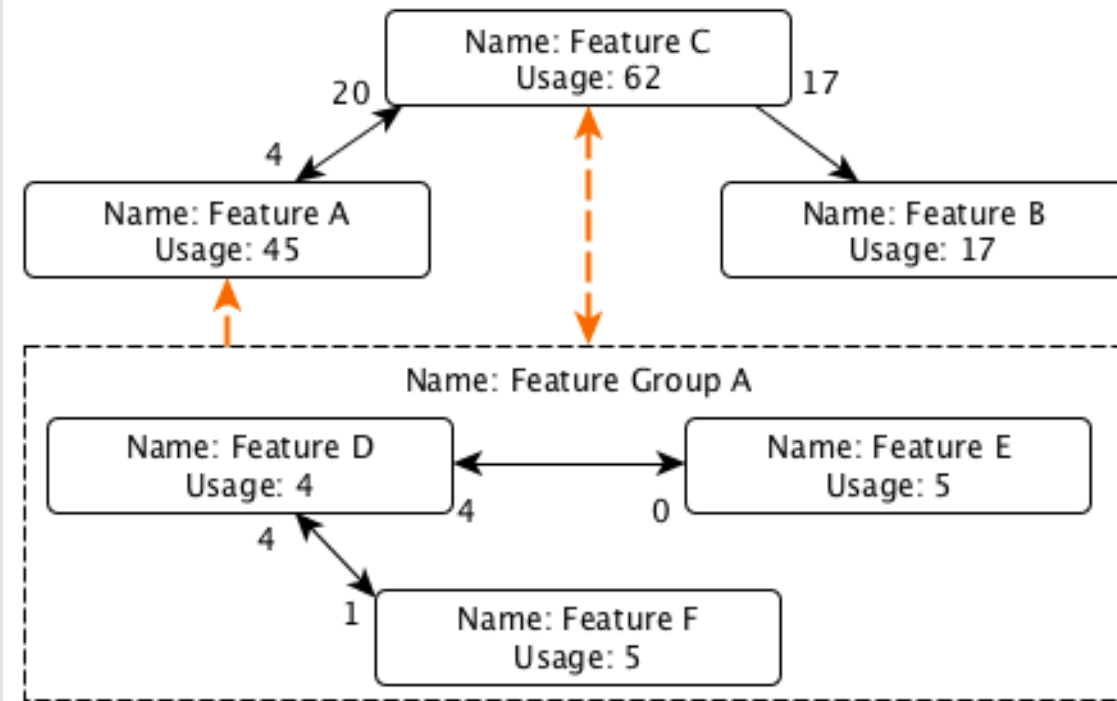
Directed Link to Feature Group shows how a feature group is connected to other feature groups, or features.

Attributes:

None.



Directed Link to Feature Group





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Case Study Design

Case application: nextrailer.net web based movie recommender system. It had 30 Features and 200 Directed Links between them.

Research Questions:

- **RQ1:** Is the Feature Usage Diagram easy to learn and understandable to use?
- **RQ2:** Is the Feature Usage Diagram notation complete to represent features and their dependencies (nothing is redundant or missing)?
- **RQ3:** Is the visualised information on the Feature Usage Diagram useful for decision making in feature reduction?

Participants: 12 Computer Science students (MSc and PhD students) having programming and modeling experiences.



Case Study Conduct (Phase 1)

- Participants were introduced to Feature Usage Diagram.
- The participants modeled the case application using Google Drawing graphical editor.
- To understand if it is easy to learn the notation (**RQ1**) we compared the time spent on the task by each participant to the time spend by the first author of this paper.
- To investigate if notation is understandable (**RQ1**) we compared the results of the participants to a complete and correct version of the diagram provided by the developers of the system.
- We made an unstructured interview with each participant to understand if the notation is complete to represent features and their dependencies (**RQ2**).



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Case Study Conduct (Phase 2)

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- We collected feature usage data on nextrailer.net website for 30 days.
- Then, we inserted this information to the correct version of Feature Usage Diagram.
- Finally, we interviewed the developers to understand if the visualised information on the Feature Usage Diagram is useful for decision making in feature reduction (**RQ3**).

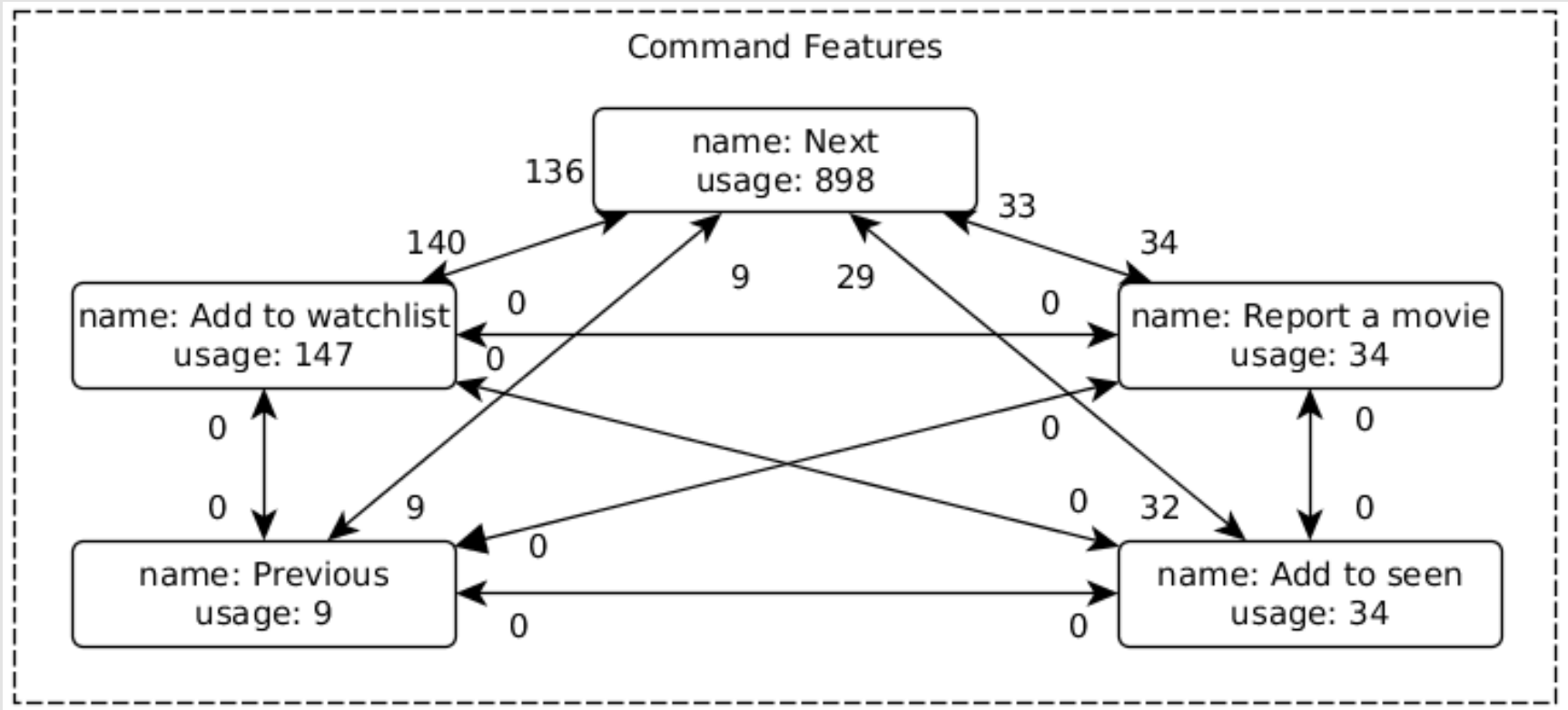


Results (Phase 1)

- Feature Usage Diagram notation was easy to learn (**RQ1**), as the times to draw it were similar among participants and the first author of the paper.
- Feature Usage Diagram notation is understandable to use (**RQ1**), as most of the participant could identify feature and feature groups correctly.
- Interviews with the participant revealed that Cyclic Bi-directed Link on a Feature Group, would be useful extension for this notation (**RQ2**).
- However, participants noted that tool support for the notation would be useful.



Results (Phase 2)





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Results (Phase 2)

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- During the interviews, all developers pointed out that the Feature Usage Diagram would be very useful for decision making in feature reduction (**RQ3**).
- Moreover, usage information could be useful for value maximisation purposes in order to make decisions for how to modify a system, which generates more value.
- However, other aspects of value should be taken into account as well.



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Conclusions

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- We introduced a new diagram to visualise the features, their relationships, and their usage information.
- The Feature Usage Diagram elements and notation is easy to learn and understand by novice users.
- Feature Usage Diagram has a potential to aid developers in decision making for feature reduction purposes.



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Future Work

- We plan to investigate other aspects of feature value and extend the Feature Usage Diagram to incorporate these aspects as well.
- We will explore how value can be maximized by relocating features in different places of a system.
- We will analyse the challenges faced to apply feature Usage Diagram to big systems with a high number of features.
- We aim to develop a tool to support for drawing Feature Usage Diagram.
- We will explore the ways how to automatically generate a the diagram.



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Questions

Thank you for your attention!



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