

Table I  
CODE SMELLS DETECTED TO ANSWER RQ1

| Name                         | Description  |
|------------------------------|--|
| Class data should be private | A class exposing its fields, violating the principle of data hiding.   |
| Complex class                | A class having at least one method having a high cyclomatic complexity.  |
| Data class                   | Classes that have only fields as well as getting and setting methods, and nothing else.  |
| Data clumps                  | Clumps of data items that are always found together weather within classes or between classes.                                     |
| Duplicated code              | Same or similar code structure repeated within a class or between classes.   |
| Feature envy                 | A method is more interested in a class other than the one it actually is in.   |
| God class                    | A class having huge dimension and implementing different responsibilities.   |
| Lazy class                   | A class having very small dimension, few methods and with low complexity.  |
| Long method                  | A method that is unduly long in terms of lines of code.  |
| Long parameter List          | A method having a long list of parameters, some of which avoidable.  |
| Message chain                | A long chain of method invocations is performed to implement a class functionality.  |
| Refused bequest              | A class redefining most of the inherited methods, thus signaling a wrong hierarchy   |
| Spaghetti code               | A class implementing at least two long methods (see previous rule) interacting between them through method calls or shared fields. |
| Speculative generality       | A class declared as abstract having less than three children classes using its methods.  |
| Shotgun Surgery              | A change in a class results in the need to make a lot of little changes in several classes.  |