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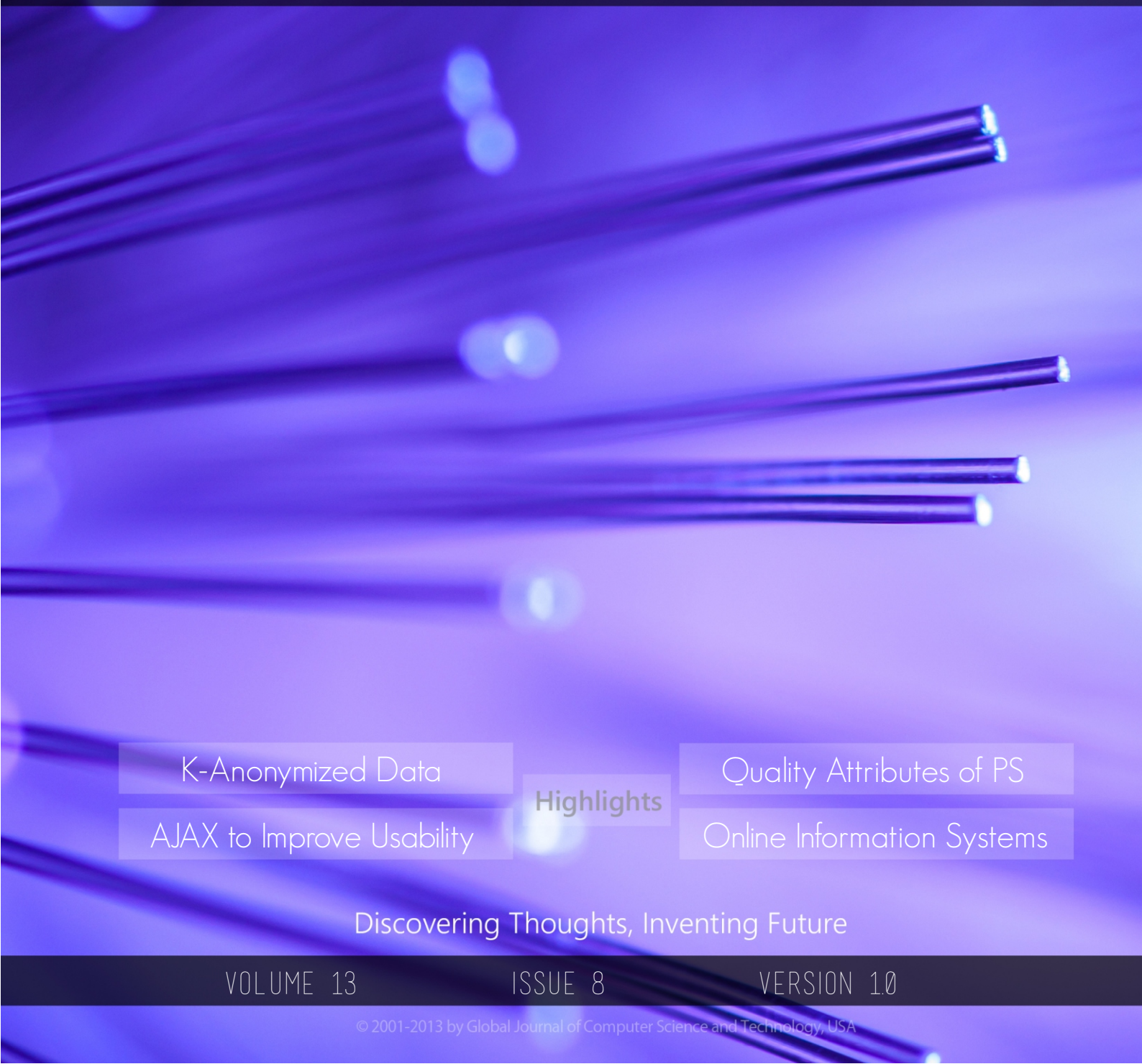

Highlights

K-Anonymized Data

AJAX to Improve Usability

Quality Attributes of PS

Online Information Systems

Discovering Thoughts, Inventing Future

VOLUME 13 ISSUE 8 VERSION 1.0

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Software Cost Estimation using Function Point with Non Algorithmic Approach

By Dr. N. Balaji, N. Shivakumar & V. Vignaraj Ananth
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Abstract - Cost estimation is one of the most challenging tasks in project management. It is to accurately estimate needed resources and required schedules for software development projects. The software estimation process includes estimating the size of the software product to be produced, estimating the effort required, developing preliminary project schedules, and finally, estimating overall cost of the project. Nearly one-third projects over run their budget and late delivered and two-thirds of all major projects substantially over run their original estimates. Effort is a function of size. For estimating effort first we face sizing problem. In direct approach size is measured in lines of code (LOC). In indirect approach, size is represented as Function Points (FP). In this paper we use both approach with different technique.

Keywords : *estimation; budget; effort; LOC; FP.*

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Software Cost Estimation using Function Point with Non Algorithmic Approach

Dr. N. Balaji [α], N. Shivakumar [σ] & V. Vignaraj Ananth [ρ]

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Keywords : estimation; budget; effort; LOC; FP.

I. Introduction

Out of the three principal components of cost i.e., hardware costs, travel and training costs, and effort costs, the effort cost is dominant. Software cost estimation starts at the proposal state and continues throughout the life time of a project.

There are several techniques of software cost estimation:

- Algorithm Cost Model
- Expert Judgments
- Estimation by Analogy
- Top-down Estimation
- Bottom-up Estimation

a) Expert Judgment Method

Expert judgment techniques involve consulting with software cost estimation expert or a group of the experts to use their experience and understanding of the proposed project to arrive at an estimate of its cost.

b) Estimating by Analogy

Estimating by analogy means comparing the proposed project to previously completed similar project where the project development information id known. Actual data from the completed projects are extrapolated to estimate the proposed project. This method can be used either at system-level or at the component-level.

c) Top Down Estimating Method

Top-down estimating method is also called Macro Model. Using top-down estimating method, an overall cost estimation for the project is derived from the global properties of the software project, and then the project is partitioned into various low-level components.

d) Bottom Up Estimating Method

Using bottom-up estimating method, the cost of each software components is estimated and then combine the results to arrive at an estimated cost of overall project. It aims at constructing the estimate of a system from the knowledge accumulated about the small software components and their interactions.

e) Algorithmic Method

The algorithmic method is designed to provide some mathematical equations to perform software estimation. These mathematical equations are based on research and historical data and use inputs such as Source Lines of Code (SLOC), number of functions to perform, and other cost drivers.

II. Direct Approach

Source lines of code (SLOC) is a software metric used to measure the size of a software program by counting the number of lines in the text of the program's source code. SLOC is typically used to predict the amount of effort that will be required to develop a program, as well as to estimate programming productivity or maintainability once the software is produced. There are two major types of SLOC measures: physical SLOC (LOC) and logical SLOC (LLOC). Specific definitions of these two measures vary, but the most common definition of physical SLOC is a count of lines in the text of the program's source code including comment lines. Blank lines are also included unless the lines of code in a section consists of more than 25% blank lines. Logical SLOC attempts to measure the number of executable "statements", but their specific definitions are tied to specific computer languages.

The COCOMO cost estimation model is used by thousands of software project managers, and is based on a study of hundreds of software projects. Unlike other cost estimation models, COCOMO is an

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open model. COCOMO estimates are more objective and repeatable than estimates made by methods relying on proprietary models. The most fundamental calculation in the COCOMO model is the use of the Effort Equation to estimate the number of Person-Months required to develop a project. COCOMO has cost drivers that assess the project, development environment and team to set each cost driver. The cost drivers are multiplicative factors that determine the effort required to complete your software project. number of executable "statements", but their specific definitions are tied to specific computer languages.

Effort is calculated by

$$\text{Effort} = a^* (Size)^b$$

Where 'a' and 'b' are empirically determined constants. Size is length of the code in KLOC.

Type of project	A	B
Organic	3.2	1.05
Semi detached	3.0	1.12
Embedded	2.8	1.20

The Effort Adjustment Factor in the effort equation is simply the product of the effort multipliers corresponding to each of the cost drivers.

For example, if your project is rated Very High for Complexity (effort multiplier of 1.34), and Low for Language & Tools Experience (effort multiplier of 1.09), and all of the other cost drivers are rated to be Nominal (effort multiplier of 1.00), the EAF is the product of 1.34 and 1.09.

The COCOMO schedule equation predicts the number of months required to complete your software project. The duration of a project is based on the effort predicted by the effort equation:

$$\text{Duration} = 3.67*(\text{Effort})^{SE}$$

Where

Effort is the effort from the COCOMO effort equation. SE is the schedule equation exponent derived from the cost Drivers.

The Man per month is calculated by

Average staffing = (Person-Months) / (Duration)

III. Indirect Approach

a) Function Point Analysis (FPA)

It begins with the decomposition of a project or application into its data and transactional functions. The data functions represent the functionality provided to the user by attending to their internal and external requirements in relation to the data, whereas the transactional functions describe the functionality provided to the user in relation to the processing this data by the application.

Each function is classified according to its relative functional complexity as low, average or high. The data functions relative functional complexity is based on the number of data element types (DETs) and the number of record element types (RETs). The transactional functions are classified according to the number of file types referenced (FTRs) and the number of DETs. The number of FTRs is the sum of the number of ILFs and the number of EIFs updated or queried during an elementary process.

The data functions are:

1. Internal Logical File (ILF)
2. External Interface File (EIF)

The transactional functions are:

1. External Input (EI)
2. External Output (EO)
3. External Inquiry (EI)

The actual calculation process consists of three steps:

1. Determination of unadjusted function points (UFP).
2. Calculation of value of adjustment factor (VAF).
3. Calculation of final adjusted functional points.

b) Evaluation of Unadjusted FP

The unadjusted Functional points are evaluated in the following manner.

UFP= $\Sigma \Sigma$Fij*Zij, for j= 1 to 3 and i = 1 to 5, where Zij denotes count for component i at level (low, average or high) j, and Fij is corresponding Function Points.

c) Evaluation of Value Adjusted FP

Value Adjustment Factor (VAF) is derived from the sum of the degree of influence (DI) of the 14 general system characteristics (GSCc). General System characteristics are:

1. Data communications
2. Distributed data processing
3. Performance
4. Heavily utilised configuration
5. Transaction rate
6. On-line data entry
7. End-user efficiency
8. On-line update
9. Complex processing
10. Reusability
11. Installations ease
12. Operational ease
13. Multiple sites/organisations
14. Facilitate change

Function points can be converted to Effort in Person Hours. Numbers of studies have attempted to relate LOC and FP metrics. The average number of source code statements per function point has been derived from historical data for numerous programming languages. Languages have been classified into different levels according to the relationship between

LOC and FP. Programming language levels and average numbers of source code statements per function point.

d) Fuzzy Logic

Fuzzy logic is used to find fuzzy functional points and then the result is defuzzified to get the functional points and hence the size estimation in person hours. Triangular fuzzy numbers are used to represent the linguistic terms in Function Point Analysis (FPA) complexity matrixes. A fuzzy set is characterized by a membership function, which associates with each point in the fuzzy set a real number in the interval [0,1], called degree or grade of membership. The membership function may be triangular, trapezoidal, parabolic etc. Fuzzy numbers are special convex and normal fuzzy sets, usually with single modal value, representing uncertain quantitative information. A triangular fuzzy number (TFN) is described by a triplet (α , m, β), where m is the modal value, α and β are the right and left boundary respectively.

We take each linguistic variables as a triangular Fuzzy numbers, TFN (α , m, β), $\alpha \leq$ m, $\beta \geq$ m. The membership function (μ (x)) for which is defined as:

$$\mu(x)=\begin{cases} 0 & , \ x \leq \alpha \\ x-\alpha / m-\alpha & , \ \alpha \leq x \leq m \\ \beta - x / \beta - m & , \ m \leq x \leq \beta \\ 0 & , \ x \geq \beta \end{cases}$$

The five major components mentioned above, they have to be rated as either Low, Average, or High. Ranking is commonly based on File Types Referenced, Data Element Types and Record Element Types. File Types Referenced (FTRs) represents the total number of internal logical files (ILFs) maintained, read, or referenced and the external interface files read or referenced by the EI/EO transaction. Data Element Type (DET) can be defined as unique user recognizable non-recursive fields including foreign key attributes that are maintained on ILF/EIF. Record element type (RET) is a subgroup of data elements within an ILF/EIF. For each of the components belonging to Transactional functions, the ranking is based on the number of files updated or referenced (FTRs) and number of data element types (DETs). For the data components viz., Internal Logical Files (ILF) and External Interface Files (EIF), ranking is based on the number of Data Element Types (DETs) and number of Record Element Types (RETs). Based on the ratings the domain character values are fuzzified using the Triangular membership function. The value thus obtained is called membership function output, whose domain is specified, usually the set of real numbers and whose range is the span of positive numbers in the closed interval [0, 1]. Each numerical value of the domain is assigned a specific value and 0 represents the smallest possible value of the membership function, while the largest possible value is 1.

e) Defuzzification

Defuzzification means the fuzzy to crisp conversions. The fuzzy results generated cannot be used as such to the hence it is necessary to convert the fuzzy quantities into crisp quantities for further processing. This can be achieved by using defuzzification process. The defuzzification has the capability to reduce a fuzzy to a crisp single-valued quantity or as a set, or converting to the form in which fuzzy quantity is present. Defuzzification can also be called as "rounding off" method. Defuzzification reduces the collection of membership function values in to a single sealer quantity.

Defuzzification is the process of producing a quantifiable result in fuzzy logic, given fuzzy sets and corresponding membership degrees. It will have a number of rules that transform a number of variables into a fuzzy result, that is, the result is described in terms of membership in fuzzy sets. The defuzzification is applied to the value that had been obtained from the fuzzification process. The fuzzified output has to be defuzzified into the real number so that it will give the effort that has been needed for the cost estimation.

$$D(y)=\begin{cases} \mu(x)*w1 & 0<c(x)\leq 1 \leq 2 \\ \mu(x)*w2+(1-\mu(x))*w1 & 2<c(x)\leq 3.5 \\ \mu(x)*w2+(1-\mu(x))*w3 & 3.5<c(x)\leq 5 \\ \mu(x)*w3+(1-\mu(x))*w2 & 5<c(x)\leq 6.5 \leq 8 \end{cases}$$

IV. Various Criterions for Assessment of Software Cost Estimation Models

There are 4 important criterions for assessment of software cost estimation models:

1. VAF (Variance Accounted For) (%):

$$\text{VAF (\%)} = \left(1 - \frac{var(E-E)}{var\ E} \right) *$$

2. Mean absolute Relative Error (%):

$$\text{Mean absolute error (\%)} = \frac{\Sigma f}{\Sigma} * 100$$

3. Variance Absolute Relative Error (%):

$$\text{VAR (\%)} = \frac{\Sigma f\ (R_E - Means\ )}{\Sigma f} * 100$$

4. Pred (n): Prediction at level n((Pred (n)):

$$\text{Var x} = \frac{\Sigma f(x)}{\Sigma f}$$

V. Experimental Results

Performance of the effort can be predicted based on the MARE and Prediction n method. The estimated effort of LOC is compared with the actual effort of LOC in the first graph. The estimated effort of FP is compared with the actual effort of FP in the second graph. The MARE of LOC and FP is compared in the third graph. It has been clearly identified that Function point based estimation is better than the LOC estimation.

The Table 1 indicates the lines of code with the actual effort and the estimated effort using the cocomo model. Both MARE analysis and Prediction n method has been applied to the direct approach and the indirect approach. The actual effort is the original effort and the estimated effort is the one which has been done in the estimation process using the cocomo method.

LOC	Actual effort	Estimated effort
48	1107.3	1465.83
50	84	145
39	72	112
164	246	510
200	130	625
40.5	82.5	160.7

The next table shows the function point with actual effort and the estimate effort.

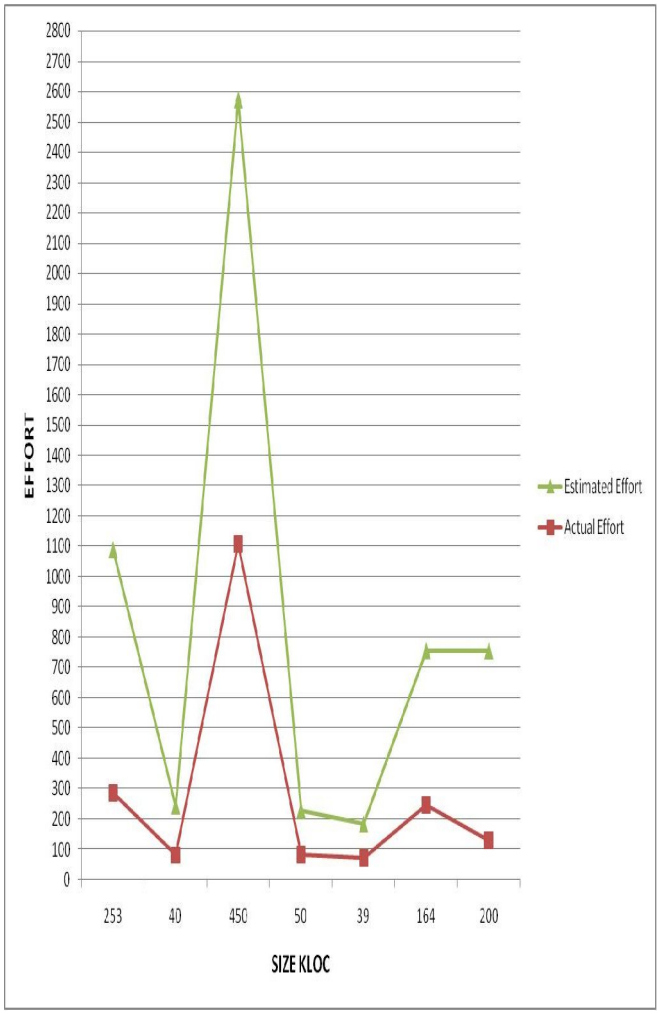
LOC in FP	Actual effort	Estimated effort
15.23	40	52
10.1	12	36
17	50	67
20	60	83
18	52	73
22	90	105

VI. Conclusion and Future Work

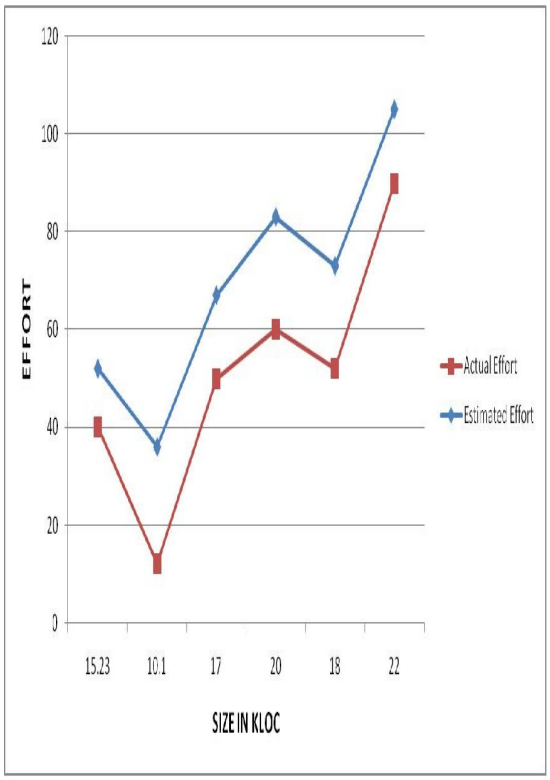
This project proposes an efficient way of estimating the effort. The results of the estimation based on the Direct method shows that the deviation between the actual and the estimated effort is more. The result of Indirect method using the algorithmic technique cocomo model based estimation reduces the relative error and the mean absolute relative error. So the analysis of the effort from Direct method and Indirect method gives that Function point based estimation is the efficient method for the estimation process.

Though Cocomo model which is algorithmic method is an open model. It has some limitations also. In the FP based estimation also exists the deviation between actual and estimated effort. So the same effort can be implemented by using the Non algorithmic Method. Fuzzy logic is one type of Non algorithmic method. This fuzzy based estimation using the Triangular Membership Function has been proposed in this paper. In future this non algorithmic based estimation can be done to achieve the better performance.

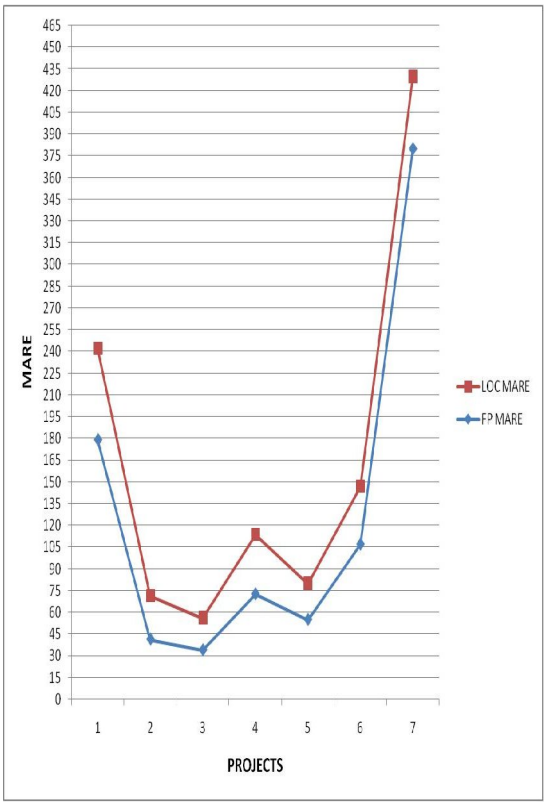
The graph shows the variation between the actual and estimated effort using LOC.



The following graph shows the variation between the actual and estimated effort using LOC in FP.



The MARE analysis is given as follows



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Performance Evaluation of K-Anonymized Data

By J. Paranthaman & Dr. T. Aruldoss Albert Victoire
University College of Engineering, India

Abstract - Data mining provides tools to convert a large amount of knowledge data which is user relevant. But this process could return individual's sensitive information compromising their privacy rights. So, based on different approaches, many privacy protection mechanism incorporated data mining techniques were developed. A widely used micro data protection concept is k-anonymity, proposed to capture the protection of a micro data table regarding re-identification of respondents which the data refers to. In this paper, the effect of the anonymization due to k-anonymity on the data mining classifiers is investigated. Naïve Bayes classifier is used for evaluating the anonymized and non-anonymized data.

Keywords : *data mining, privacy-preserving data mining, k-anonymity, naïve bayes.*

GJCST-C Classification : *D.2.m*

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Keywords : data mining, privacy-preserving data mining, k-anonymity, naïve bayes.

I. Introduction

Data mining technology provides tools to transform large amount of data into knowledge useful to the user [1]. Knowledge extracted from data mining is expressed as association rules, decision trees or clusters, permitting one to locate interesting patterns/regularities in data which facilitates decision making [2]. Such knowledge discovery can inadvertently return individual sensitive information compromising their privacy. They could also reveal business information, compromising free competition. So confidential personal information disclosure and that of sensitive information should be prevented [3].

Great effort was recently devoted to overcoming privacy preserving problems in data mining leading to many data mining techniques with privacy protection mechanisms. Sanitization techniques were proposed to hide sensitive items/patterns based on removing reserved information or by noise insertion into data. Privacy preserving classification procedures thwart data miners from using classifier to predict sensitive data. Additionally, privacy preserving clustering techniques which distort sensitive numerical attributes were also suggested while retaining general features/clustering analysis [4].

Privacy issue also includes commercial concerns. Organizations collect individuals' information for particular needs, but different departments might need to share such information. Then, each organization/unit must ensure that individual privacy is not violated, nor sensitive business information revealed [5]. Confidentiality is a major issue in mass data collection. Privacy needs could be due to law or due to motivated business interests. But some data sharing situations could lead to mutual gain. Research – scientific, economic or market oriented – is a key database utility. The medical field gains by data pooling for research and even for competing businesses with mutual interests. Increasing confidentiality issues ensure it is impossible to attain any potential gain.

Privacy-preserving data mining use algorithms on confidential data that are to be unknown even to the algorithm operator. PPDM has twofold considerations. First, names and addresses which are sensitive raw data identifiers should be modified/trimmed from the original database, to ensure that data recipient does not compromise another's privacy. Second, sensitive knowledge from a database mined with data mining algorithms should be kept out as such knowledge can also compromise data privacy [6]. Users' personal information and information concerning their collective activity are two major privacy preservation dimensions. The former is called individual privacy preservation and the latter collective privacy preservation.

Privacy-preserving data mining is split into 2 parts: data hiding and rule hiding. Data hiding converts data or designs new computation protocols to ensure that private data is private during/after data mining ensuring recovery of data patterns/models while the capable of discovery. Additive perturbation, multiplicative perturbation, and secure multi-party computation techniques come into this category. Rule hiding, in contrast transforms the database to ensure masking of sensitive rules while underlying patterns can be discovered [7].

Privacy preservation protects individual identifications and sensitive relationships [8]. An emerging micro data protection is the *k-anonymity concept*, recently proposed as a property to capture micro data table protection regarding respondent's re-identification which data referred to [9]. *k*-anonymity demands that micro data table tuple be released and be related to a specific number of *k* respondents. An interesting *k*-anonymity aspect is its connection to protection techniques preserving data bonafides. K-anonymity concept captures on the private table PT yearning for release, a main requirement followed by statistical community and by data releasing agencies, that released data be related to a specific number of respondents. The private table attribute set is available externally and hence capable of linking is called *quasi-identifier*. The stated requirement is translated in the *k*-anonymity requirement below, stating that all released

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tuples should be related to a certain number of *k* respondents.

In this paper, the effect of the anonymization due to k-anonymity on the data mining classifiers is investigated. The data is anonymized for different granularity. Naïve Bayes classifier is used for evaluating the anonymized and non-anonymized data. The following sections deal with related works, methods, experimental results and discussion.

II. Related Works

K-anonymity of Classification Trees Using Suppression (kACTUS), a new method to achieve k-anonymity was proposed by Kisilevich et al [10]. kACTUS performs efficient multi-dimensional suppression where values are suppressed by certain records based on other attribute values, without manually-produced domain hierarchy trees. kACTUS identifies attributes with reduced influence on data records classification suppressing them to comply with k-anonymity. kACTUS was evaluated for accuracy on ten separate datasets compared to other k-anonymity generalization and suppression methods. Results proved that kACTUS' predictive performance is better than current k-anonymity algorithms. TDS, TDR and kADET accuracies on average are lower than kACTUS in 3.5%, 3.3% and 1.9% respectively inspite of manually defined domain tree usage. Accuracy goes up to 5.3%, 4.3% and 3.1% respectively when domain trees are left unused.

A new data record anonymizing method was proposed by Aggarawal et al [11], where data records quasi-identifiers are first clustered with cluster centers then being published. To ensure data records privacy, a constraint that clusters contain a pre-specified number of data records was imposed. This technique has a bigger choice for cluster centers than k-Anonymity. In most cases, it releases more information without privacy compromises. Clustering is through a constant-factor approximation algorithm. This algorithm set is for anonymization problem where performance does not depend on anonymity parameter k. Extended algorithms ensure that a fraction of points remain unclustered through deletion from anonymized publication. Release of a fraction of database records ensures that data published for analysis is useful as it has less distortion.

A new globally optimal de-identification algorithm satisfying k-anonymity criterion suiting health datasets was developed and evaluated by El Emam et al [12]. It was empirically compared to OLA (Optimal Lattice Anonymization) and to Datafly, Samarati, and Incognito, three existing k-anonymity algorithms, on six public, hospital, and registry datasets for different values of k and suppression limits. Precision, discernability metric, and non-uniform entropy, three information loss metrics were compared, and each algorithm's performance speed was evaluated. The Datafly and Samarati algorithms ensured higher information loss than OLA and Incognito; OLA was quicker regularly than Incognito in locating a globally optimal de-identification solution.

An (α, k)-anonymity model to protect data's identification and relationship to sensitive information was proposed by Wong et al [13]. The properties of (α, k)-anonymity model were discussed. That the optimal (α, k)-anonymity problem is NP-hard is proved. The (α, k)-anonymity problem had an optimal global recoding method being presented. A more scalable and less data distortion local-recoding algorithm was proposed next, and its effectiveness/efficiency was proved by experiments.

III. Materials and Methods

A total of 22 attributes with 8124 tuples is in the mushroom data set with each tuple recording physical characteristics of a single mushroom. A poisonous or edible classification label is provided to each tuple. The numbers of edible and poisonous mushrooms in the dataset include 4208 and 3916, respectively.

a) K-Anonymity

Data refers to person-specific information conceptually organized as rows (or records) and columns (or fields) with each row being termed a tuple having a relationship among values set linked to a person. Tuples in a table is not necessarily unique. An attribute is a column denoting a field/semantic category of information which could be a set of possible values; hence, an attribute is also a domain. Attributes are unique within a table. In a table, each row is an ordered n-tuple of values <d1, d2, …,dn> so that each value dj is in the domain of the j-th column, for j=1, 2, …, n where n is the column number, A relation corresponds with this tabular presentation in mathematical set theory, the difference being the absence of column names [9].

Let B(A1,…,An) be a table with finite tuples. The finite attributes set of B are {A1,…,An}. All attributes are to be identified by the data holder in private information that can link external information. Such attributes not only include name, address, and phone number as explicit identifiers, but also include attributes that when combined can uniquely identify individuals through birth date and gender. Such attributes set is called a quasi-identifier. In anonymity, linking should be prevented on publicly available data so that private and public data and are candidates for linking; hence, such attributes include a quasi-identifier where attributed disclosure should be controlled. Data holders can easily identify such attributes.

To find out how many individuals a released tuple matches, needs a combination of released data and available data externally, along with analysis of other possible attacks. Such a direct determination is

tough for data holders who release information. That data holders know which data in PT appear externally is assumed and also what constitutes a quasi-identifier but external data specific values cannot be assumed. Thus, if RT(A1,...,An) be a table and QIRT be associated quasi-identifier, RT can satisfy k-anonymity only if values of each sequence in RT[QIRT] appear with k occurrences in RT[QIRT] [9].

K anonymity guarantee is that an attacker will be unable to link private information with groups of less than k individuals, ensured by making sure that every public attribute values combination in the release is in at least k rows. The k-anonymity privacy model was studied intensively in a public data releases context where database owner want to ensure that nobody will be able to link database information to individuals from whom it was collected. This method could also provide anonymity in other contexts like anonymous message transmission and location privacy.

b) Naive Bayes Classifier

Classifiers predict class membership probabilities like probability of a given term to belong to a particular class. Common classification algorithm of Bayesian is the Naïve Bayesian classifier with accuracy and speed when applicable to huge dataset. A brief summation of the classifier is given below as Naïve Bayesian classifiers are extensively used.

Let *D* be a training documents set and associated class labels. Each document is represented by an n-dimensional attribute vector, $V = (v_1, ..., v_n)$. $C_1, ..., C_m$ represents *m* classes. The classifier predicts by matching test document to class with the highest posterior probability. Naïve Bayesian classifier predicts that document V belongs to the class C_i if $P(C_i|V) > P(C_j|V)$ for $1 \leq j \leq m, j \neq I$ Maximizing $P(C_i|V)$, the class C_i for which $P(C_i|V)$ is maximized is called maximum posteriori hypothesis. By Bayes theorem,

$$P(C_i|V) = \frac{P(V|C_i)P(C_i)}{P(V)}$$

As P(X) is constant for all classes, only $P(V|C_i)P(C_i)$ needs maximization. If class prior probabilities are unknown, then it is thought that classes are equally likely, and then only $P(V|C_i)P(C_i)$ is maximized.

But it is computationally expensive to compute $P(V|C_i)$. Naïve assumption of class conditional independence is made to reduce computation.

$$P(V|C_i) = \prod_{k=1}^{n} P(x_k|C_i)$$

To predict V class label, $P(V|C_i)P(C_i)$ is evaluated for each class $C_{i,\text{ with the}}$ classifier predicting that class label of V document is class C_i if $P(V|C_i)P(C_i) > P(V|C_j)P(C_j)$ for $1 \leq j \leq m, j \neq i$. The predicted class label is class C_i for which $P(V|C_i)P(C_i)$ is maximum. This classifier's empirical study compared to a decision tree revealed that it is comparable in some domains. Bayesian classifiers has minimum error rate of all classifiers.

IV. Results and Discussion

Experiments are conducted for different levels of k-anonymity (5, 10,…, 45, 50). The anonymized data is classified using Naïve Bayes classifier. The following Figures and Tables give results for classification, precision and recall.

Table 1 : Classification Accuracy for different levels of K-anonymity

K-Anonymity Level	Classification Accuracy
No anonymization	0.958272
K=5	0.954333
K=10	0.94707
K=20	0.9371
K=25	0.934515
k=30	0.923929
k=35	0.917528
k=40	0.914082
k=45	0.908419
k=50	0.907189

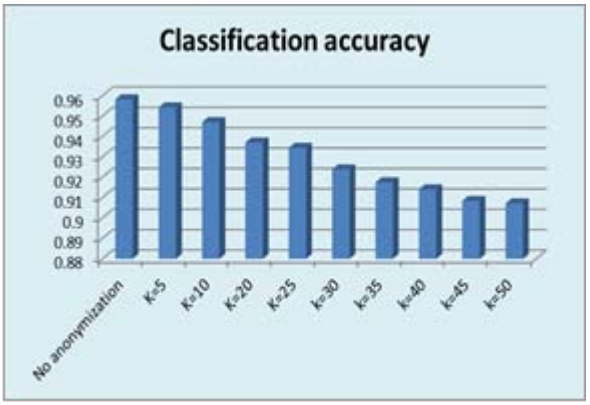

Figure 1 : Classification Accuracy for Different Levels of K-anonymity

Figure 1 reveals that classification accuracy decreases when k-anonymity level increases. Table 2 and Figure 2 show precision and recall for different levels of k-anonymity.

Table 2 : Precision and Recall

K-Anonymity Level	Precision	Recall
No Anonymization	0.961	0.957
K=5	0.957	0.953
K=10	0.950	0.946
K=20	0.940	0.936
K=25	0.937	0.933
K=30	0.925	0.923
K=35	0.919	0.917
K=40	0.915	0.913
K=45	0.909	0.908
K=50	0.908	0.906

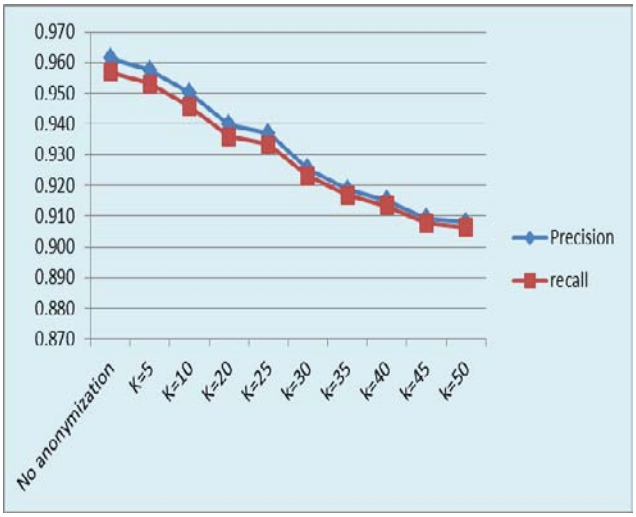

Figure 2 : Precision and Recall for Different Levels of K-anonymity

It is observed from the experimental results that with the increase in the anonymity the performance of the classifiers degrades proportionately. Further work is required to define privacy preserving methods which reduce the negative performance of the classifiers.

V. Conclusion

Privacy-preserving data mining's basic idea was extending data mining techniques to work with sensitive information masked modified data. What was at issue here was how to modify data and how to recover data mining result from it. Solutions were linked to data mining algorithms under study. This paper investigated anonymization effect due to k-anonymity on the data mining classifiers. Data is anonymized for different granularity. Naïve Bayes classifier evaluated anonymized and non-anonymized data with results showing that anonymity increase lead to proportional degradation of classifier performance.

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Use of AJAX to Improve Usability of Online Information Systems

By Ravi Kumar Sachdeva & Dr. Sawtantar Singh
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Abstract - The AJAX has changed the traditional paradigm of Web development by giving partial page update facility. The facility to update the Web pages partially can be very advantageous to improve usability of online information systems. The research paper discusses some instances when usability of online information systems can be improved using AJAX.

Keywords : *information system, usability, AJAX, learnability, memorability, subjective satisfaction.*

GJCST-C Classification : *H.3.5*

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Use of AJAX to Improve Usability of Online Information Systems

Ravi Kumar Sachdeva [α] & Dr. Sawtantar Singh [σ]

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Keywords : information system, usability, AJAX, learnability, memorability, subjective satisfaction.

I. Introduction

An information system allows the use of information technology to support various business operations like decision making etc [12]. Usability of an information system enables the users to perform a task accurately and completely without any frustration and improves the productivity of the information systems and may affect the success or failure of the system [6]. Usability reduces training time, data input errors, staffing requirements and staff turnover. Usability helps to improve user productivity and satisfaction [8]. Thus it becomes very important to consider usability while developing an information system.

II. Usability

According to Jakob Nielsen [10], usability is defined by 5 quality components:

a) Learnability

The users of the information system should be able to accomplish the basic tasks easily within stipulated time period interval at their first use of the information system [10]. The system should be easily understandable and it's functioning should be obvious. Some professionals may save themselves by giving alternatives like users will be trained for the use of information systems or help/documentation will be provided for use of the system but every user is not expected to go through training or help/documentation to perform the basic tasks. Moreover learnability is concerned about performing the basic tasks easily. Studying help/documentation should not be necessity for use of the system but should be considered as a helping tool to perform the tasks.

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b) Efficiency

The expert users should be able to perform defined typical tasks rapidly. Shortcut keys can be provided for most frequently used functionalities to improve the efficiency of the system.

c) Memorability

Memorability refers to ability of a casual user to remember the use of information system when he is away from the system for a time interval [10]. System feedback and visual cues are two methods to improve memorability. Icons, symbols and images should be used to provide visual cues to the users about the system functionality. Understandable text instructions specified in simple and short sentences can help to improve memorability.

d) Errors

The average rate with which errors appear in the system and how rapidly the users are able to recover from the errors. Proper validations should be provided to avoid errors as prevention is better than cure. On screen instructions like expected format of data etc. can also help to avoid errors. On occurrence of any error, instead of describing technical jargon help should be provided in a language understandable by the user e.g. in case of primary key violation error, the user should be explained that a particular value for the data already exists and some other value should be provided for the same data, instead of describing the technical specification of primary key violation error.

e) Subjective Satisfaction

Subjective satisfaction refers to overall satisfaction of the user in using the system. Feedback is one of the methods to determine the subjective satisfaction of the system.

III. AJAX

AJAX allows partial page update without the need of refreshing the full page [7]. Google Maps, Youtube, Gmail are certain examples of use of AJAX.

IV. Use of AJAX to Improve Usability

AJAX can help to improve usability in many situations while implementing an online information system. Some have been discussed below by the author:

1. AJAX allows the partial page updates which improves the efficiency of the information system [7]. Consider a case study of implementing a search employee functionality based upon different search criteria. Out of various possible search criteria let us consider country location criteria. The country names have been displayed using check boxes. On select/deselect of a particular country check box, the displayed search results can get updated automatically using AJAX without need of refreshing the full page or waiting for the user to press the submit button. The partial page update will reduce the time taken to complete the task and thus improve efficiency of online information system. The recently updated results could have been highlighted also to let the user know the changes that have taken place.
2. While filling a form with AJAX support in an online information system, the users will get to know the validation errors in the form before actually submitting the form. Although certain validations like mandatory field validation, range validation etc. could have been implemented with only Javascript but there may be cases where data is required to be posted to server to validate the data like ensuring availability/non-availability of UserID while filling a registration form. In such cases AJAX may help to post the data to server to ensure availability of UserID and coming up with possible suggestions in case of non availability of filled UserID. Use of AJAX to perform validation at an earlier stage will help to improve efficiency and satisfaction level of users. In the above discussed example, without AJAX support, to ensure availability/non-availability of UserID, user may get frustrated if the filled UserID, tried differently multiple times, is unavailable. Moreover whenever there is a round trip from client to server and server to client, data filled in certain fields like password may get empty and user will have to fill the data every time.
3. AJAX can be used during CAPTCHA verification to allow partial page update instead of refreshing full page when the filled image characters are sent to server for verification.
4. Various AJAX Controls are available in different front ends to provide different functionalities like providing watermark on textboxes, determining password strength etc. These AJAX controls help to build a more usable and intuitive interface.

V. Problems with AJAX

To work with AJAX, Javascript must be enabled. So if the users of the information system, to work on, may have old browsers which do not support Javascript or browsers with disabled Javascript, AJAX features may not work properly. For such users, alternative pages without AJAX features should be provided for better accessibility, satisfaction and thus usability.

VI. Conclusion

The paper has highlighted some of the real time instances where AJAX can help in improving usability of online information systems. The paper has also highlighted major problem in use of AJAX. Despite of limitations in use of AJAX, AJAX has introduced a new and successful paradigm for Web development.

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Performance Evaluation of Non Functional Requirements

By K. Mahalakshmi & Dr. R. Prabhakar
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Abstract - Requirement engineering (RE) concerns goal identification by a system, operationalization of such goals into services and constraints, and assigning responsibilities, needs to agents including humans, devices/software. RE processes include negotiation, documentation, domain analysis, specification, elicitation, assessment, and evolution. It is difficult and critical to get high quality requirements. The paper gives a synopsis of the field of requirements engineering. RE is defined, and a brief history of main concepts and techniques is presented. The result got by using the method is very promising. It was evaluated extensively on Non Functional Requirements (NFR) dataset obtained from PROMISE repository, which is publicly accessible.

Keywords : requirement engineering, functional require-ments, non function requirements, performance.

GJCST-C Classification : H.3.4

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Performance Evaluation of Non Functional Requirements

K. Mahalakshmi [α] & Dr. R. Prabhakar [σ]

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I. Introduction

Requirements engineering (RE) [1] is activities set concerning identifying/communicating a software-intensive system's purpose and contexts of use. So, RE spans users real-world needs, customers, and other constituencies affected by software systems and capabilities/opportunities provided by software-intensive technology. An abstract description of how a specific organization conducts activities, resource usage focused and dependencies between activities is a process model. Methods and process models difference is that while methods focus on technical activities (activities content), process models focus on activities management (how activities can be measured/improved).

A software system's success measure [2] is the degree to which it meets its intended purpose. Generally, software systems requirements engineering discovers that purpose through identification of stakeholders, their needs and documenting them in a process amenable to analysis, communication, and implementation. There are many difficulties in this. Stakeholders (paying customers, users and developers) could be numerous and distributed. "Requirements engineering is that branch of software engineering dealing with real-world goals for, functions of, and constraints on software systems. It concerns these factors, relationship to precise software behavior and to its evolution with time across software families."

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A requirement is a condition/capability to be met/fulfilled by a system satisfying a contract, specification, standard, or formally imposed documents. Requirements for a system should be verifiable, consistent, correct, and traceable. RE specifies, understands, elicits, and validates customers/users requirements. It identifies technological restrictions through which an application should be built/run. An iterative/co-operative process, it aims to analyze a problem, document results in various formats, evaluating results precision.

RE iterative process includes 3 activities [3]:

- Requirements elicitation
- Requirements specification
- Requirements validation

The process starts with requirements elicitation. A developers' set collect users and customers information. Information is got from documents, legacy applications, interviews used in preparation of requirements catalogue. Finally, requirements validation finds out if there are inconsistencies/mistakes/undefined requirements. Specification-validation is iterative being executed many times in complex projects.

Activities which are basic to all RE processes [4]:

- *Elicitation :* Identify information sources about system and discover requirements from them.
- *Analysis :* Understand requirements, their overlaps, and conflicts.
- *Validation :* Reverting to system stake holders to see if requirements are what they need.
- *Negotiation :* Inevitably stakeholders' views will differ from proposed requirements creating conflicts. Try to reconcile such views generating consistent requirements set.
- *Documentation :* Write requirements in a way that stakeholders/software developers understand.
- *Management :* Control requirements changes that will arise.

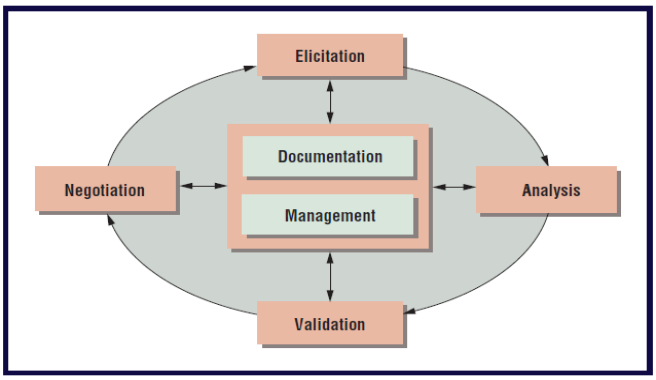

Figure 1 : The requirements engineering activity cycle

Requirements are software system's foundation. Functional requirements indicate what a system can do, data requirements indicate what it can store while quality requirements indicate how quickly /easily it performs.

a) Functional Requirements

Functional requirements [5] capture a system's intended behavior which could be expressed as services, tasks or functions the system has to perform. It is useful to distinguish between baseline functionality required for a system to compete in that product domain, in product development. F*eatures* differentiate a system from competitors' products, and from the company's own product line/family variants. Features may be added functionalities, or differ from basic functionality along some quality attribute (performance or memory utilization). Functional requirements of early (nearly concurrent) releases need to be considered. Later releases can be accommodated through architectural qualities like extensibility and flexibility.

b) Non Functional Requirements

A semantic definition would be "*any requirement that is not functional*" [6]. Non-functional requirements are those which cannot be categorized in Functional, Data or Process requirements. Generally,

- They are requirements
- They are not functional, data or process requirements

Non-functional requirements define overall qualities/attributes of the system that results. Non-functional requirements restrict product under development, development process, specifying external constraints to be met by that product.

Some of the non-functional requirements are,

⇒ Availability Requirements
⇒ Capacity Requirements
⇒ Performance Requirements
⇒ Reliability Requirements
⇒ Security Requirements

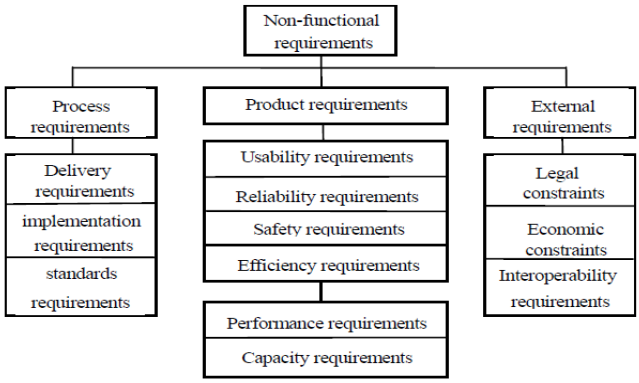

Figure 2 : Classification of Non-functional requirements

To measure ad hoc information retrieval effectiveness requires a test collection of three things:

1. A document collection.
2. Information needs test suite, expressible as queries.
3. A relevance judgments set, usually a binary assessment of either *relevant* or *non-relevant* for a query-document pair.

Usual approaches to information retrieval system evaluation include *relevant* and *non-relevant* documents notion. Regarding user information need, a test collection document is provided a binary classification either as relevant/non relevant. This decision is called the *gold standard* or *ground truth relevance* judgment.

NFR Locator extracts NFR sentences in unconstrained natural language documentation. The process takes project related natural language document as input. The former parses natural language into an internal representation based upon relevant features, to classify sentences into particular NFR categories or returns "not applicable" when it does not specify a NFR [7].

Step 1 : Parse Natural Language

The process enters text into a system, parsing it and converting parsed representation into NFR Locator's sentence representation (SR). SR represents every sentence as directed graph where vertices are words and edges the relationships between them.

Step 2 : Classify Sentences

Once parsing and initial sentence analysis is finished, a k-NN classification algorithm classifies every sentence into one/more NFR categories. Sentences classified other than "not applicable" appear on generated reports for use outside the system. A k-NN classifier predicts classification by taking a majority vote of existing k nearest neighbors' classification to the item under test.

II. Related Works

Non-functional requirements identification is important for development/deployment of software

products. Customers software product acceptance depends on non-functional requirements incorporated in the software. It should identify all non-functional requirements of stakeholders. Many approaches are unavailable for this. Rao and Gopich and [8] suggested a 4 layered analysis approach to identify non-functional requirements. The approach has advantages over non-layered approach. Rules were proposed for use in each layer as part of the approach which was successfully applied on 2 case studies. The identified non-functional requirements were validated through the use of a check list. Also, a metric ensured computation of completeness of the identified non-requirements.

Functionality and non-functional characteristics determine a software system's utility. Also usability, flexibility, performance, interoperability and security add to the score. There is currently a lop-sided emphasis on software functionality, though it was not useful or usable without non-functional characteristics. Chung and do Prado Leite [9] reviewed state of the art on treating non-functional requirements (NFRs), when providing prospects for future directions.

Liu et al [10] proved that continuous randomization spectrum existed where most existing tree randomizations operated around the spectrum's two ends leaving a major portion of the spectrum unexplored. The authors proposed A base learner VR-Tree generating trees with variable-randomness. VR-Trees spanned from conventional deterministic trees to complete-random trees by using a probabilistic parameter. Using VR-Trees as base models, the spectrum of randomized ensembles was explored along with Bagging and Random Subspace. It discovered that spectrum's two halves have distinct characteristics; understanding which led to the proposal of a new approach to build better decision tree ensembles. It was named Coalescence, as it coalesces many points in spectrum's random-half. Coalescence behaves like an experts committee to cater to unforeseeable conditions in training data. Coalescence performed better than the spectrum's any single operating point, without needing to tune in to a specific randomness level. The proposed empirical study ranks Coalescence top among benchmarking ensemble methods including Random Forests, Random Subspace and C5 Boosting. Coalescence was significantly better than Bagging and Max-Diverse Ensemble when compared with other methods. Though Coalescence was not greater than Random Forests, it identified conditions under which one can perform better than the other.

Pavlovski and Zou [11] proposed application of 2 new artifacts to model linked with a business process. This was operating condition denoting a business process constraint. Control case defined controlling criteria to mitigate the risk associated with an operational condition. Modeling constraints thus was an opportunity to capture such business process characteristics early in a systems development cycle. This contributes to a model providing a more through overall business process representation. The methods assist in risk mitigation and facilitate non-functional requirements early recovery during systems development.

Though all systems have non-functional requirements (NFRs), they are not clearly stated in formal specification requirements. Further, NFRs may be externally imposed through government regulations/industry standards. Slankas and Williams [12] examined document types (data use agreements, installation manuals, regulations, proposals requests, requirements specifications, and user manuals) containing NFRs categorized in 14 NFR categories (capacity, reliability, and security) measuring how to effectively identify/classify NFR statements in those documents. In documents evaluated, NFRs were present. Using a NFR word vector representation, a support vector machine algorithm performed twice as effectively compared to the same input on a multinomial Naïve Bayes classifier. The k nearest neighbor classifier with a unique distance metric had an F1 measure of 0.54, outperforming in experiments, optimal Naïve Bayes classifier which had a F1 measure of 0.32. It was also found that stop word lists beyond common determiners lacked minimal performance effect.

Asghar and Umar [13] discussed/critically evaluated RE challenges highlighted by researchers and provided a model encapsulating 7 major challenges recurring in a RE phase. The challenges were further categorized as problems. Further, the model was linked to earlier research elaborating challenges not specified earlier. Anticipating RE challenges could help RE engineers prevent software tower from destruction.

RE is an effective phase in software development aiming to collect good requirements from stakeholders correctly. It is important for an organization to develop quality software products satisfying user needs. RE for software development is a complex exercise taking into account product demands from many viewpoints, roles, responsibilities, and objectives. Hence, it is necessary to apply RE practices in all software development phases. Pandey et al [14] proposed an effective RE process model to produce quality software development requirements. Requirement management/planning were executed independently for effective requirements management. It was iterative for better RE and maintenance later. Successful implementation of the proposed RE process has good impact on quality software production.

III. Methodology

For classifier validation, NFR dataset available in the promise data repository [15] was used. It consists of 15 requirement specifications of MS student projects with a total of 326 NFRs and 358 FRs. NFR categories

included availability, scalability, usability and security. Features extraction was from each requirement document using word occurrence criteria. Extracted data was used to investigate bagging and boosting methods.

a) Boosting

Boosting [16] is a method to improve learning algorithms accuracy. Given a training set of labeled examples, {(*x*1*; y* 1)*;*(*x*2*; y*2),…,(*xm; ym*)}, where each *xi* is drawn from an underlying distribution *D* on a universe *X*, and *yi* ∈ {+1,-1}, a learning algorithm produces a hypothesis *h* : *X* → {+1,-1}. Ideally, *h* "describes" not just given samples, but also underlying distribution. Boosting converts a weak learner, producing a hypothesis that is slightly better than random guessing, into a strong/accurate learner. Many boosting algorithms share a basic structure. First, the sample set is given an initial (typically uniform) probability distribution. Computation proceeds in rounds. In each round *t:* (1) base learner is run on current distribution *Dt*, producing a classification hypothesis *ht;* and (2) the hypotheses *h*1,…, *ht* reweight samples, defining *Dt*+1. The process halts after predetermined rounds or when combining of hypotheses is accurate. Main design decisions on how to modify probability distribution from one round to next, and how to combine hypotheses $\{ht\}_{t=1,\ldots,T}$ to form a final output hypothesis.

Bagging [17] is based on bootstrapping and aggregating. Bootstrapping is based on random sampling with replacement. Hence, taking a bootstrap replicate $S^i = (X_1^i, X_2^i, \ldots, X_n^i)$ of the training set $S = (X_1, X_2, \ldots, X_n)$, sometimes has less misleading training instances in bootstrap training set. Thus, a classifier constructed on such training sets provides better performance. Aggregating means combining classifiers, Bagging provides good results when unstable learning algorithms (decision trees) are used as base-level classifiers, with small changes in training sets resulting in different classifiers.

b) The bagging algorithm

Input : Training examples *S*, Bag size *B*
Output : Ensemble *E*
E ← 0
for *i* = 1 to *B* do
S^i ← *BootstrapSample* (*S*)
C^i ← *ConstructClassifier* (S^i)
E ← *E* ∪ {C^i}
end for
return *E*

c) Random Forest

Random forests [18] are a recursive partitioning method suiting small *n* large *p* problems. They involve a classification ensemble (aka: set) or regression trees calculated on random data subsets, using a randomly restricted and selected predictor's subset for splits in each classification tree.

The posterior probability that a random tree predicts class *j* at *X*, given the training data (*xi, yi*), *i* = 1,…, *n*, is

$$Q_j(X) = P_\theta\left(h(X,\theta) = j\right)$$

Note that *h* depends on training data. In practice, *Qj is estimated* using

$$\hat{Q}_j(X) = \frac{1}{N}\sum_{k=1}^{N} I\left(h(X,\theta_k) = j\right)$$

where *I* denotes indicator function. The ensemble predicts class at *X* by

$$\hat{h}(X) = \arg\max_j \hat{Q}_j(X)$$

d) REP TREE

Reptree uses regression tree logic to create multiple trees in varied iterations. It then selects the best from generated trees which is then considered as representative. In tree pruning the measure used is mean square error on the tree's predictions.

IV. Experimental Results

The classification accuracy and the Root Mean Squared Error (RMSE) are shown in Table 1.

Table 1 : Classification and RMSE of the technique under consideration

Classifiers	Classification accuracy %	Root mean squared error
Bagging with Reptree	59.29	0.23
Bagging with Random Forest	62.82	0.2174
Bagging with Reptree and resampling	70.83	0.197
Bagging with Random Forest and resampling	82.37	0.1562
Logitboost with Reptree	59.94	0.228
Logitboost with decision stump	60.42	0.2232
Logitboost with Reptree and resampling	71.47	0.1972
Logitboost with decision stump and resampling	78.37	0.1739

In table 1, the performance variations of classifiers have been shown. The Classification Accuracy and RMSE results of the classifiers are shown in Figure 3 & 4.

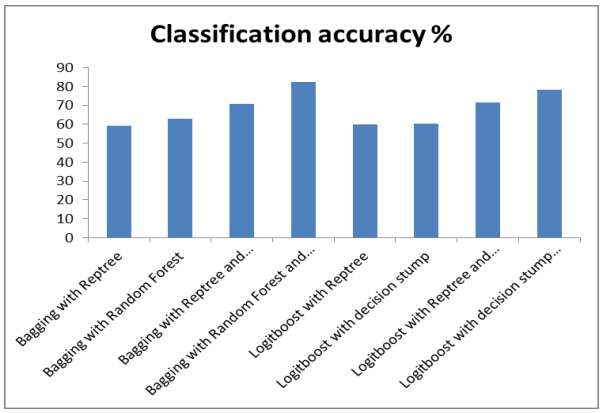

Figure 3 : Classification Accuracy

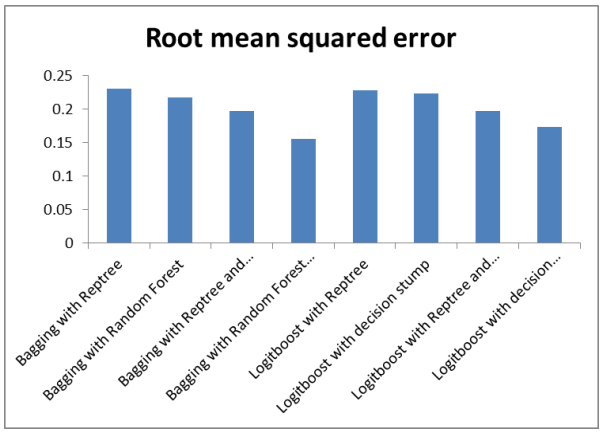

Figure 4 : Route Mean Squared Error

V. Experimental Results

RE activities occur across multiple phases. Of the 7 suggested activities, only elicitation is performed clearly in all projects. Interpreting & Structuring, and Negotiation were also performed in the projects, but they varied between implicit and explicit performance. When RE was considered as a continual task through the project, RE process model was iterative. RE activities occurred across multiple phases, making process models appear iterative. Boosting and Bagging classifiers were used in experiments with Reptree, Random forest and resampling. The results showed the performance variation between classifiers. Bagging with Random Forest and resampling achieves the best performance accuracy of 82.37%.

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Improving Software Quality Attributes of PS using Stylecop

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Abstract - Software product quality improvement is a desired attribute and a strenuous effort is required to achieve that. Static Code Analysis (SCA) is used to find coding bugs. Stylecop is an SCA tool from Microsoft. In this paper SCA and stylecop usages are discussed. Also a comparison of Software Testing, software Metrics & Source Code Analysis (SCA) is done. Product PS designed by author1 and author2 is introduced. PS application is analyzed using static SCA tool Stylecop. After analysis recommendations were applied to PS. The results showed improved software quality attributes.

Keywords : *SCA, PS, stylecop, software quality.*

GJCST-C Classification : *K.6.4*

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Improving Software Quality Attributes of PS using Stylecop

Rajesh Kulkarni [α], P. Padmanabham [σ] & M. S. Namose [ρ]

Abstract - Software product quality improvement is a desired attribute and a strenuous effort is required to achieve that. Static Code Analysis (SCA) is used to find coding bugs. Stylecop is an SCA tool from Microsoft. In this paper SCA and stylecop usages are discussed. Also a comparison of Software Testing, software Metrics & Source Code Analysis (SCA) is done. Product PS designed by author1 and author2 is introduced. PS application is analyzed using static SCA tool Stylecop. After analysis recommendations were applied to PS. The results showed improved software quality attributes.

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I. Introduction

Software quality improvement is of foremost importance for product success. Techniques such as software testing, Usability testing and source code analysis are prevalent. Also secure programming to tackle code-based vulnerabilities is in vogue nowadays [2]. Our work focuses on evaluation of PS product designed by author[1] and author[2] using static source code Analysis (SCA) tool Stylecop. In this paper overview of SCA, comparison of SCA with software testing and software metrics [1] is done. Also introduction to PS product [8], [9] and Stylecop [1], [5], [6], [7] is given. The organization of the paper is as followed: section I which is the current section introduces SCA, section II distinguishes SCA with testing and metrics along with that evaluation criteria of SCA tool selection is also done, section III gives the introduction to PS, section IV details stylecop tool, section V discusses evaluation of PS product using stylecop and section VI lists results of analysis of PS using stylecop. The static analysis approach is meant to review the source code, checking the compliance of specific rules, usage of arguments and so forth. Static code analysis is the analysis of computer software which is performed without the actual execution of the programs built from that software, as opposite of dynamic analysis (testing software by executing programs) [6]. The output of static analysis tools still requires human evaluation [6].

The BCS SIGIST defines static analysis of source code as the "analysis of a program carried out without executing the program" [2]. This definition emphasizes the contrast to dynamic analysis, where the behavior of program is observed while it is executed. Static analysis can be used for varied purposes such as software quality improvement, code optimizations and identifying vulnerabilities [2]. Manual reviewing of code is a form of static code analysis, it is a time consuming process and it should be done at the very early stage of design [6]. Manual review kind of static code analysis can be either a self-review or a third party review [6].

II. SCA vs Testing and Metric

Software Testing is the process of executing a program or system with the intent of finding errors [10]. Software testing tools are programs that are trying to find errors, defects, bugs, failures, etc in the software [1]. Test cases are generated and results are compared with expected results. Nonconformance leads to debugging the program. Correctness is the minimum requirement of software, the essential purpose of testing. Correctness testing will need some type of oracle, to tell the right behavior from the wrong one [10]. While according to [11] software metrics is defined as the continuous application of measurement-based techniques to the software development process and its products to supply meaningful and timely management information, together with the use of those techniques to improve that process and its products. **Software metrics** are programs or tools that collect information about the software regarding its characteristics for example metrics such as Lines Of Code (LOC), size, complexity, Number of functions per class, etc [1]. While the high level goal of software metrics is similar to software testing in improving the overall quality of the software, there are several differences between software testing and metric tools [1]. Software metrics are usually collected after testing and after making sure that program is free from errors (at least syntactic errors)[1].

III. PS Product

The PS (personal Secretary) web application is targeted for online users who has many email ids, other site ids, does online banking and online transactions. Presently he stores his email ids and passwords, ATM pins as emails or in written form on a paper which he keeps in his wallet. His constant fear is if he loses his wallet there may be misuse of his ids and pins. He also faces the problem of recollecting the ids, passwords and ATM pin numbers.PS is intended to provide

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complete solutions for the above vulnerabilities through a single get way using the internet as the sole medium. It will enable the online user to retrieve ids, passwords and ATM pin numbers at will 24/7. The administration module will enable a user to allow addition, deletion and updating of ids, passwords and documents.

The target user also requires documents frequently such as Copies of mark memos, certificates and updated resume for applying for jobs. Copies of documents such as form 16s, salary slips, ids for loan application. Insurance policy numbers

PS was designed using TEIM(The Evolved Integration Model) of software engineering and human computer Engineering proposed by us [8].This paper is a continuation of efforts for validating the utility of TEIM and acceptance from peers [9].

Email Details: On successful login, user can see email details by default.

Figure 1 : PS Product Screen

IV. Stylecop

StyleCop is an open source SCA tool from Microsoft that checks. NET code for conformance of several design guidelines defined based on Microsoft's .NET Framework [1][7]. StyleCop evaluates the style of C# source code in order to enforce both a set of style and consistency rules. Style guidelines are rules that specify how source code should be formatted and dictate whether spaces or tabs should be used for indentation and the format of for loops, if statements and other constructs [5]. The goal is to define guidelines to enforce consistent style and formatting and help developers avoid common pitfalls and mistakes. StyleCop contributes to this maintainability by encouraging consistency of style, which in turn makes it easier for developers to pick up existing code and work with it productively, and by encouraging plenty of documentation for future developers to read thereby improving the long term maintainability of the source.[6] Historically, different development groups have used drastically different coding styles. Many teams have used inconsistent coding styles within a single product or even a single source file. StyleCop was originally written to provide a simple and efficient way to enforce a common coding style for C# code throughout Microsoft. Over time, StyleCop evolved to include new rules that go beyond style checks.[6]

V. Evaluation of PS using Stylecop

PS application was developed using .NET. Stylecop was configured with .NET during installation. Each of the file of PS was evaluated using Stylecop. Stylecop issued warnings and errors in the following categories: Naming, maintainability, documentation, ordering, readability, spacing, and layout [1] [7]. Except maintainability all the categories belong to refactoring. Refactoring indicates cosmetic improvement in software without changing its functionalities [1].Priority numbers assigned are based on the importance and impact of its program [1].Some sample warnings are shown in TABLE I. PS Screenshots showing Evaluation by Stylecop are shown in in Figure 2 and Figure 3. After evaluating PS with stylecop manual corrections were made in the code of PS. These corrections led to improvement in software quality attributes of PS as shown in TABLE II.

For evaluation manual review technique was used. A group of students undergoing ME Computer program were given a walkthrough of the code and then static code analysis was done. We maintained a log of bugs found for each screen of PS.

Table 1 : Sample Warnings for Ps

Warnings	Category	Priority	File name	Line	Col
The field must have an access modifier	**Maintainability**	1	DAL.cs	16	1
names must start with a lower-case letter	**Naming**	2	DAL.cs	16	1
The call to Initialize Component must begin with the 'this.' prefix to indicate that the item is a member of the class.	**Readability**	3	Login.cs	19	1
The file has no header, the header Xml is invalid, or the header is not located at the top of the file.	**Spacing**	4	Login.cs	1	1
The field must have a documentation header.	**Ordering**	5	Login.designer.cs	37	1
The body of the if statement must be wrapped in opening and closing curly brackets.	**Layout**	6	DAL.cs	32	1
The class must have a documentation header.	**Documentation**	7	DAL.cs	13	1

Table 2 : Improved Ps Quality Attributes After Applying Stylecop

Tool	Increase complexity	Increase usability	Increase Maintainability	Increase Documentation
Style Cop	√	√	√	√

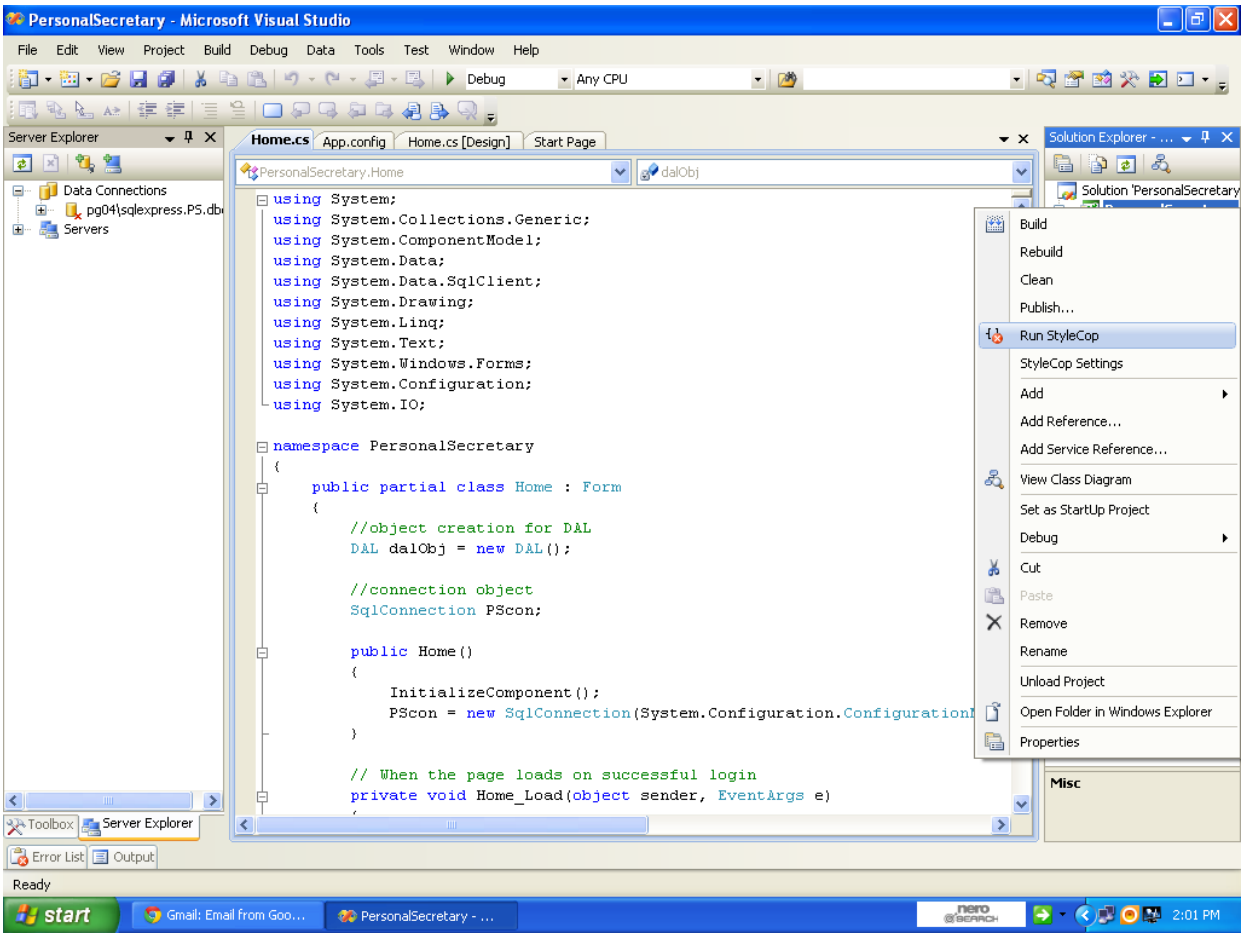

Figure 2 : PS Screenshot showing Evaluation by Stylecop

VI. Conclusion

In this paper we analyzed product PS designed by author1 and author2 using stylecop- a static source code analysis (SCA) tool. Manual corrections in code of PS as per recommendations of stylecop were done. The results showed

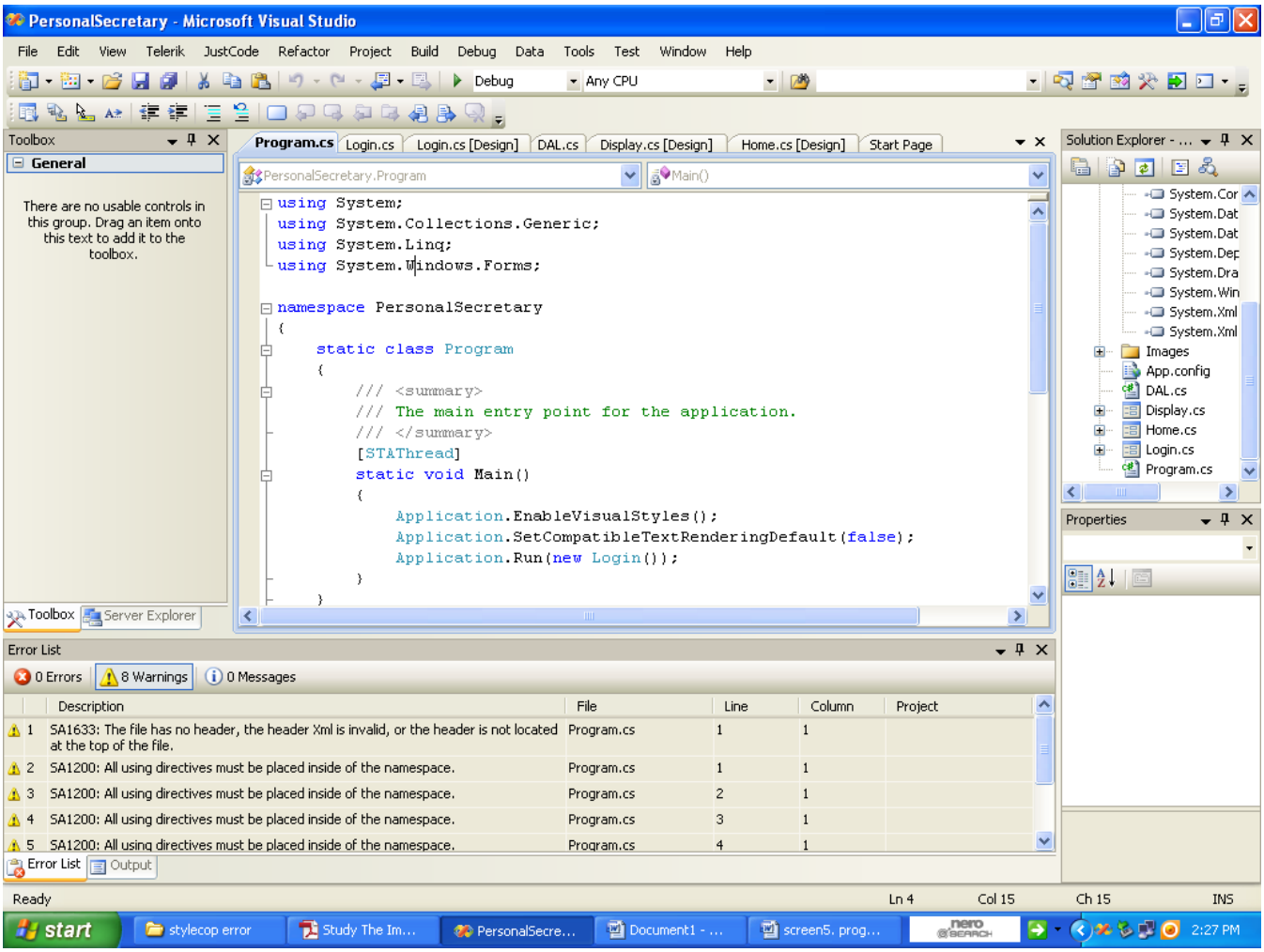

Figure 3 : PS Screenshot showing Evaluation by Stylecop

improved software quality attributes in PS. The focus in this paper was explored the working of stylecop SCA tool and improving software quality of PS using stylecop. It also helped in improving the style guidelines. Manual review was found to be a tedious process in terms of time and planning. As our product is being targeted as a client-server program security was not an issue and so our focus was less on security and more on styling and usability.

VII. Acknowledgements

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You can use your own standard format also.
Author Guidelines:

1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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