ISBSG Analysis Report

Improving the management of IT resources by both business and government

SOFTWARE APPLICATIONS MAINTENANCE AND SUPPORT DATA ANALYSIS

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Purpose of this Report

This report provides an analysis of the ISBSG Maintenance and Support data with the aim of making the industry aware of this repository and encouraging further contributions of M&S applications' data.

The Need for M&S Data

Managers responsible for software maintenance & support activities need answers to the following questions:

- How do we compare to other organisations in the same industry?
- What productivity rates are being achieved?
- What proportion of time is spent on maintenance and what on support?
- What percentage of time is being spent on the different categories of Maintenance and Support?
- What defect densities are being experienced?

The ISBSG in now in a position to research answers to these and other questions.

Maintenance & Support – What are good metrics?

With the cooperation of its international members the ISBSG has proposed the metrics that it expects will be most useful in the management of software maintenance and support activities. This has resulted in an initial set of derived metrics from the data that the ISBSG collects through its maintenance & support data collection questionnaires. These derived metrics have supplied guidance for the analysis of the data and for the principal set of M&S metrics used in this report. The ISBSG uses the term "Application" to describe a program or group of programs designed to deliver a set of functionality to end users. These suggested principal M&S metrics, for the application are:

i. Application productivity

ii. Application maintenance and support proportion

iii. Application defect density

iv. Effort per defect

Analysis of M&S Data

Introduction

The ISBSG has a growing Repository of Software Maintenance and Support (M&S) application data. This document provides an analysis of the applications that have been submitted to the M&S Repository.

At this early stage of the Repository's growth some caution should be exercised in using the results of this analysis.

What data is available?

Sample sizes

The M&S Repository presently contains 1007 applications. The applications were submitted in 37 blocks.

8 blocks of 1 application,

4 blocks of 2 applications,

2 blocks of 3 applications,

1 block of 5 applications,

2 blocks of 6 applications,

2 blocks of 7 applications,

2 blocks of 9 applications,

1 block of 10 applications,

1 block of 13 applications,

1 block of 14 applications,

2 blocks of 17 applications,

2 blocks of 20 applications,

1 block of 21 applications,

1 block of 23 applications,

1 block of 24 applications,

1 block of 28 applications.

1 block of 34 applications,

1 block of 36 applications,

1 block of 40 applications,

1 block of 169 applications,

1 block of 450 applications.

Twenty-five organisations submitted data to the M&S Repository.

Base Measures

Caution: The statistics in this report constitute a best effort to report a genuine picture from the available data in the ISBSG M&S Repository. Do not take what follows as necessarily representing the M&S norm because:

- The samples are sometimes small
- The data reflect the proportions of submissions that happen to come from different organisations

Note that only those applications, from the M&S Repository, with a data quality rating A or B have been included in the statistical calculations in this report. All statistical values have been rounded up.

Definitions of the Statistical Terminology Used in This Report

Mean The sum of the values of items in a sample divided by the number of items in the sample. The mean is also known as the 'average'.

Median When values are arranged in ascending/descending order, the median is the 'middle' value. For statistical analysis, the median is often preferred to the mean. This reason for this is: if the data sample contains outlying values, the sample's mean may be 'skewed' and not truly representative.

Range The smallest to largest value in a sample.

Sample A set of applications chosen because they satisfy a certain criteria.

Sample Size The number of applications in the sample that are included in statistical calculations.

General Application Statistics

The table below provides a general snapshot of the M&S Repository. Application size, team size and M&S Effort statistics are given.

Description	Sample Size	Range	Median	Mean
Application Size (Function Points)	266	2 – 974,358	580	4,892
Application Size (KSLOC)	224	0.023 – 915,000	57	8,489
Application Team Size (persons)	136	1 – 80	3	9
Maintenance & Support Hours over a 12 month period	314	8 – 555,740	829	7,945

Table 1: General Application Statistics

Defects

A defect is defined as a system/software bug or problem. The table below displays defect and average repair time statistics. Most significant are the defect densities (ie. Defects per year per ksloc or Defects per year per 1000 fps). This provides a benchmark against which you can compare your application's defect density.

Description	Sample Size	Range	Median	Mean
Number of defects over 12 mths	246	0 – 5,677	12	155
Defects per year per 1000 FiSMA FPs	91	0 – 193	5	18
Defects per year per 1000 IFPUG/NESMA FPs	120	0 – 2,750	31	196
Defects per year per KSLOC	199	0 – 315	0.1	3
Average days elapsed from defect detection to repair (days)	100	0.2 – 75	2	5

Table 2: Defect and Repair Time Statistics

At ISBSG, defects are classified as: extreme defects, major defects or minor defects.

Extreme Defect Renders the system inoperable so that manual procedures may be required.

Major Defect Seriously degrades but does not totally disable the system. The system is still able to function.

Minor Defect Low-key system disruption that may cause a failure but doesn't stop the system in any significant manner.

94 applications in the M&S Repository have a breakdown of defect type as follows:

Average of 18% of defects are extreme

Average of 32% of defects are major

Average of 49% of defects are minor

Maintenance

Maintenance consists of the activities and tasks required to keep a system operational after it has been implemented into Production.

Maintenance tasks are classified as follows:

Adaptive Changes required to keep the system operational when environmental changes occur (eg. Operating system upgrades).

Corrective Modifications required to fix defects in the system.

Perfective Work required to improve the system's performance or maintainability. This includes user Enhancements.

Preventative Detecting and fixing faults before they become effective.

Management The time spent on tasks such as administration or personnel management.

155 applications, with data quality rating A or B, provide a breakdown of effort by type of maintenance.

The table below shows the percentage of time that is spent on the different types of maintenance activities. The data that the ISBSG has indicates that the majority of support time is being spent on Corrective Maintenance.

Maintenance Type	Range (%)	Median (%)	Mean (%)
Perfective	0 - 100	0	17
Preventative	0 - 100	0	10
Corrective	0 - 100	62	56
Adaptive	0 - 100	0	15
Management	0 - 82	0	2

Table 3: Maintenance Breakdown Statistics

Support

Support consists of the activities undertaken to address users' problems/queries after a system has been implemented into Production.

Support activities are classified as follows:

Problem Investigation Determines whether reported incident is a user error, user documentation/training error or, in fact, a defect.

Queries & Quick Service One-off user requests.

User Help & Advice General support not related to an incident or a one-off request.

Management Time spent on tasks such as administration or personnel management.

86 applications, with data quality rating A or B, provide a breakdown of effort by type of support. The table below shows the percentage of time that is spent on different support activities. The data that the ISBSG has indicates that the majority of support time is being spent on Problem Investigation.

Support Type	Range (%)	Median (%)	Mean (%)
Problem investigation	0 – 100	50	55
Queries and quick service	0 - 100	26	29
User help and advice	0 - 87	0	15
Management	0 - 27	0	1

Table 4: Support Breakdown Statistics

Appendix 1 - The International Software Benchmarking Standards Group

The International Software Benchmarking Standards Group, (ISBSG), is a not-for-profit organisation that was established in 1997. Its formation was built upon several years of cooperation by a group of national software metrics associations that were trying to develop and promote the use of measurement to improve software processes and products for the benefit of both business and government.

The mission of the ISBSG is:

To help improve the management of IT resources by both business and government

through

the provision and exploitation of public repositories of software engineering knowledge which is standardised, verified, recent and representative of current technologies.

Body of Knowledge

To meet its mission, the ISBSG has established standards to measure software maintenance & support, (M&S), and software development, enhancement & re-development performance. These standards are designed to provide a "common language" of standard terms that can be understood by all practitioners.

Using these standards the ISBSG has created two data repositories; a repository of M&S applications' data and its software development/enhancement repository.

Development, Enhancement & Re-development

The ISBSG has, over a ten-year period, established and grown a repository of data on software development, enhancement and redevelopment projects. This repository now exceeds 6,000 projects and is used by organisations worldwide for estimating, benchmarking, risk minimisation, research and infrastructure planning.

Maintenance & Support

Using its data collection standard for M&S the ISBSG has established a useful data set that will continue to grow to provide valuable information to the large section of the IT industry that is responsible for M&S.

Appendix 2 - Submitting Your Application Information to ISBSG

Incentives

ISBSG rewards organisations that contribute to the growth of the ISBSG M&S Repository. We are pleased to offer the following:

- Submit 1-4 applications – receive an Application Benchmark Report** for each application.
- Submit 5+ applications - receive an Application Benchmark Report** for each application and an annual Maintenance & Support Web subscription.
- Submit 20+ applications – receive all of the above plus the latest release of the Maintenance & Support Industry data from the ISBSG Repository.

Note: **The Application Benchmark Report compares your application's effort against the M&S Repository. Your submitted application must be rated A or B, by us, to be eligible for this offer.

How to submit your application data

To submit your M&S application data to the repository, visit: http://www.isbsg.org. Download the Maintenance & Support Data Collection Package. Alternatively, you may fill out the online Maintenance & Support questionnaire.

The data collection questionnaire contains questions about: the submitter, the organization, and the software application. Particularly important questions are denoted with asterisks (**) and are described as 'mandatory'. Please note: if you have data in an electronic form, (eg: Excel spreadsheet) the ISBSG will accept data in that form and will map it to the ISBSG format.

When you submit your applications' data to the ISBSG the administrator will remove your organisation identification and issue unique identification numbers so that your anonymity is protected but you can identify your applications in the repository.