




What you can find in the ISBSG Development & Enhancement Repository – R1 (March 2016)

This document provides details of the various project data types that are included in the ISBSG D&E repository, March 2016. You will note that the project totals shown at the bottom of the tables rarely equal the 7,518 projects in the Repository. This is because submitters do not necessarily provide project data for all the data fields that ISBSG offers. The “ISBSG Field Descriptions March 2016” document explains the contents of the various data fields that the Repository caters for.

By studying the demographics that follow, you will be able to establish the areas that are of specific interest to you. The data in the Repository projects have come from over thirty countries, with 48% of the projects being completed in the last decade. This is what makes the ISBSG Repository unique. A broad range of project types from many industries and many business areas are available for you to use for estimating, awareness of trends, comparison of platforms and languages or benchmarking.

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Major differences to be found in Release 2016 R1

A large number of the new projects added to the database since Release 13 come from Spain and the Netherlands. This is reflected in the Country Tables. The Communications and Insurance sectors also are better represented. Over 85% of the new projects are Enhancement projects, increasing the dominance of Enhancement projects in the Repository. Multi-platform projects are the most common development platform in the Repository.

Demographic Summary

The projects in the Repository cover a broad cross-section of the software industry. In general, they have a business focus.

Project origin:

- The projects have been submitted from 26 different countries. Major contributors are the United States (29% of all projects), Australia (11%), Japan (11%), Spain (11%), Finland (8%), France (8%), the Netherlands (6%), India (4%), and Canada (4%).
- The projects were performed in 32 different countries. Major contributors are United States (16% of all projects where the country of effort is known), the Netherlands (15%), Spain (12%), Finland (12%), France (9%), Australia (8%), India (7%), Japan (5%), Canada (4%), Denmark (3%), Brazil (3%), United Kingdom (2%) and China (1%).

Project context:

- Industry sector: major sectors are communications (23% of all projects where the organisation type is known), insurance (18%), manufacturing (13%), government (11%), banking (9%), medical and health care (8%), and financial (6%).
- Business area: major areas are telecommunications (19% of all projects where the business area is known), insurance (9%), banking (9%), transport/logistics (9%), finance (9%), manufacturing (8%), and sales and marketing (5%).

Type of project:

- Development type: 67% are enhancement projects, 31% are new developments, and 1% are re-developments.
- Intended market: 82% of projects are developed for internal use, (i.e. for the organisation that contributed the project to the Repository), and 18% for other users. 36% are developed in-house and 64% are outsourced. In total, 39% are developed in-house for internal use.
- Team size: 30% of projects have up to 4 people in the development team, 30% have 5 to 9 people, 17% have 10 to 19 people, and 23% have 20 or more people.

Type of product:

- Product size: while IFPUG projects dominate the Repository, COSMIC, NESMA and FiSMA are all well represented. Among the IFPUG projects, 42% of projects have fewer than 100 UFPs, 33% have 100–299 UFPs, and 19% have 300–999 UFPs. The median size is 124 UFPs. 100-299 FPs is the most common size range for each of the other main sizing methods as well.
- Application group: 89% are business applications (40% transaction processing, 11% information system), 5% are real-time applications, and 4% are mathematically-intensive applications.
- Architecture: 42% of projects for which this information is available have a client-server architecture, and 28% have a multi-tier architecture (there is

some overlap between these groups of projects). 36% are stand-alone systems.

- Web development: 14% of the projects in the Repository are web developments.

Development environment:

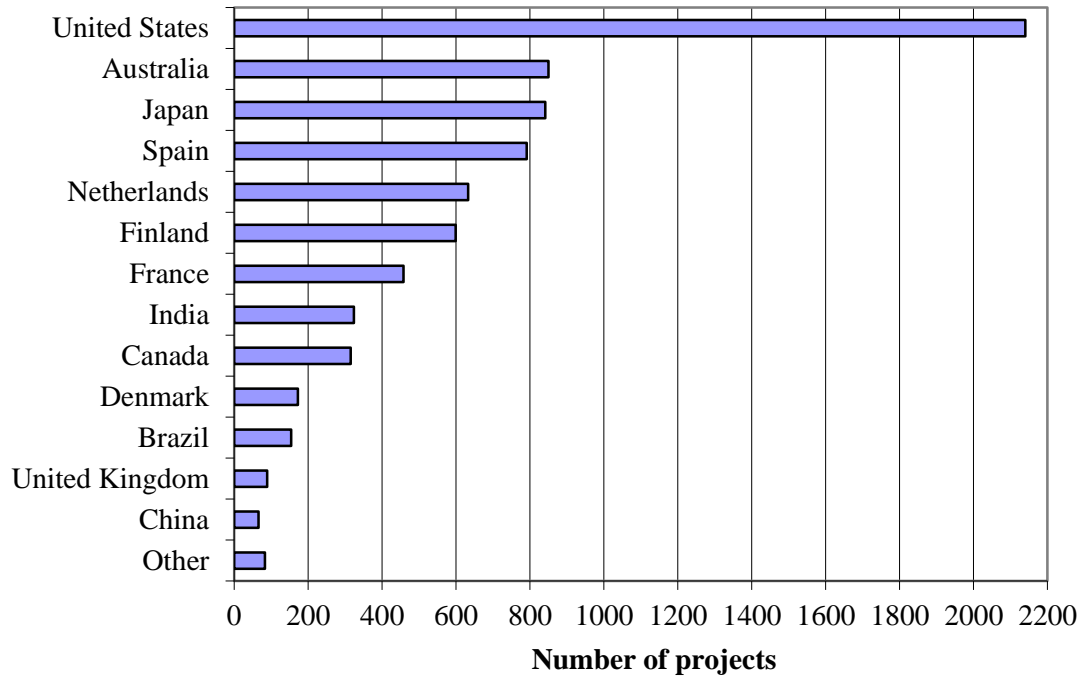
- Platform: 33% are mainframe projects, 11% midrange, and 19% microcomputers. 36% of projects involve multiple platforms.
- Language: over 100 programming languages are represented. 3GLs represent 64% of projects, 4GLs 32%, and application generators 3%. Major languages are COBOL, C/C++/C#, Java/JavaScript, Visual Basic, PL/I, Oracle, .Net, SQL, Natural, and ABAP.

Development methods:

- For ISBSG purposes a methodology applies to the whole project development process. This is distinct from techniques, which apply to individual activities within the development process.
- Methodology: 79% of projects that describe methodologies report using a waterfall model. Other methodologies include Joint Application Development (7%), Rapid Application Development (6%), Multi-functional teams (5%), Agile and/or RUP (4%), and Timeboxing (4%).
- Standards: ISO, CMM, and/or CMMI are used in 18% of projects that provide information about methodologies and techniques, with CMMI the most common.
- Techniques: the most common techniques are data modelling (54% of projects providing data about techniques), process modelling (17%), object oriented techniques (50%), prototyping (43%), and reviews/inspections/walkthroughs (18%).

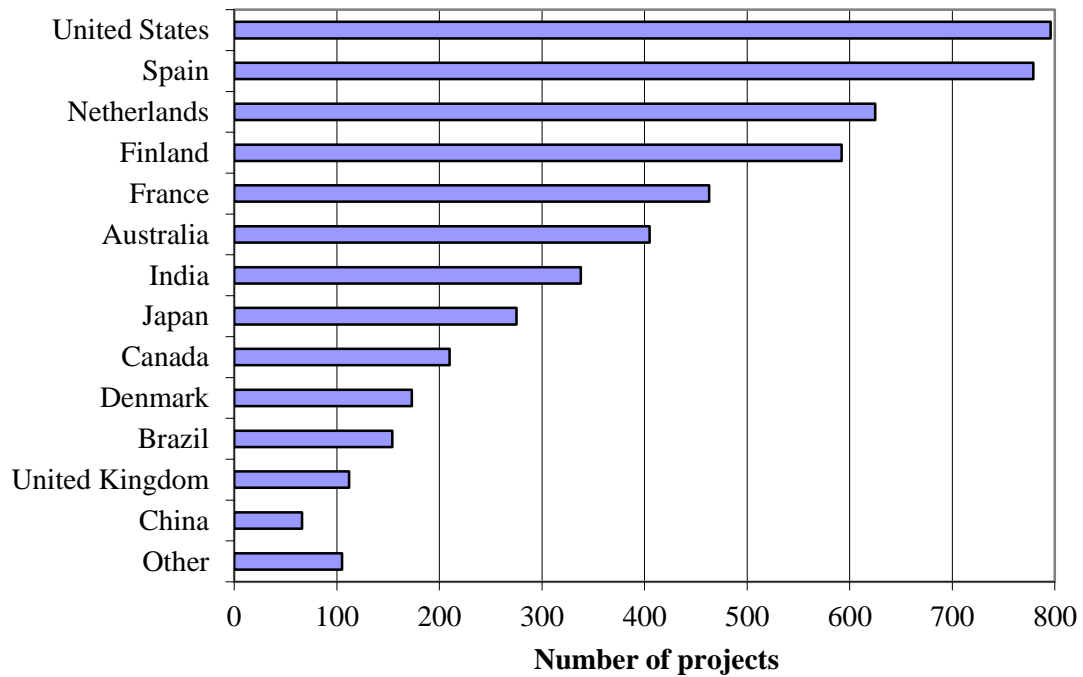
Project Origin

Country of origin



Country	Projects	Percent
United States	2140	28.5 %
Australia	847	11.3 %
Japan	841	11.2 %
Spain	791	10.5 %
Finland	599	8.4 %
France	458	8.0 %
Netherlands	431	6.1 %
India	324	4.3 %
Canada	315	4.2 %
Denmark	172	2.3 %
Brazil	154	2.0 %
United Kingdom	89	1.2 %
China	66	0.9 %
Other	83	1.1 %
Total	7515	

Projects have been contributed from twenty-six different countries.

Country of effort

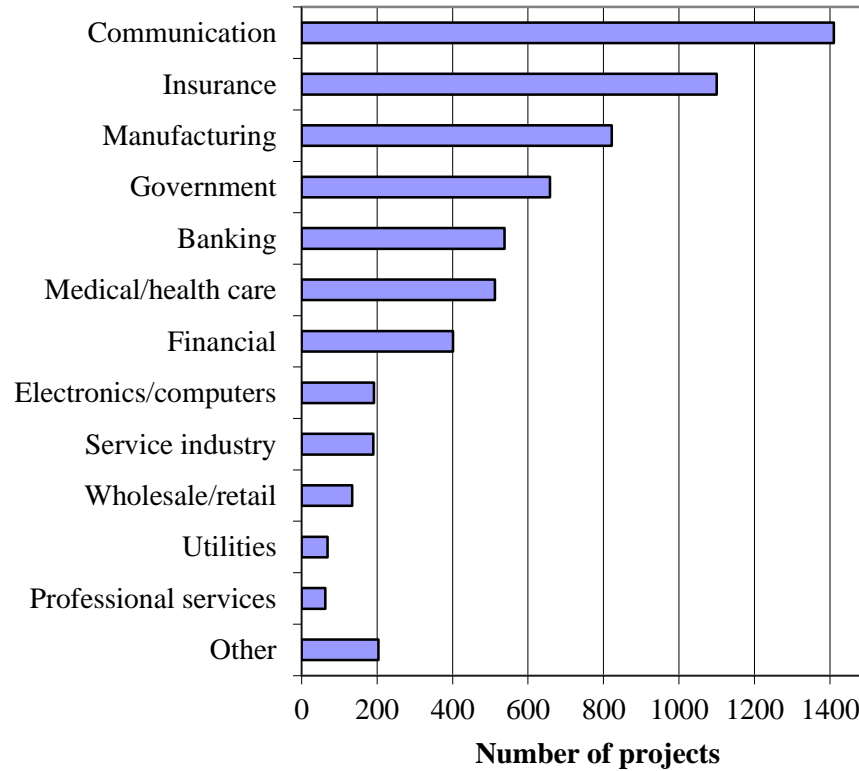
Country	Projects	Percent
United States	796	15.6 %
Spain	779	15.3 %
Netherlands	625	12.3 %
Finland	592	11.6 %
France	463	9.1 %
Australia	405	8.0 %
India	338	6.6 %
Japan	275	5.4 %
Canada	205	4.1 %
Denmark	173	3.4 %
Brazil	154	3.0 %
United Kingdom	112	2.2 %
China	66	1.3 %
Other	105	2.1 %
Total	5093	

Thirty-two countries are represented in the Repository.

Project Context

Industry Sector

The Industry Sector summarises the industry, or type of organisation, for which each project has been developed.

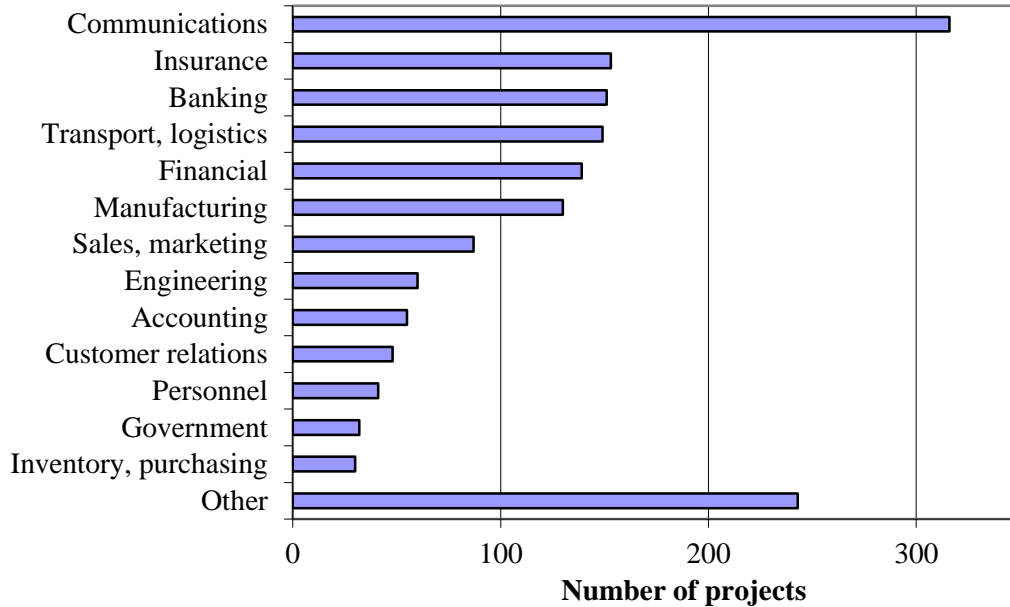


Industry Sector	Projects	Percent
Communication	1410	22.6 %
Insurance	1100	17.7 %
Manufacturing	822	13.2 %
Government	658	10.6 %
Banking	538	8.6 %
Medical & health care	512	8.2 %
Financial	401	6.4 %
Electronics / computers	192	3.1 %
Service industry	190	3.0 %
Wholesale / retail	134	2.2 %
Utilities	69	1.1 %
Professional services	63	1.0 %
Other	204	3.3 %

Total	4719
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Business Area

This is the business area within the organisation/industry that the project/application will be supporting.

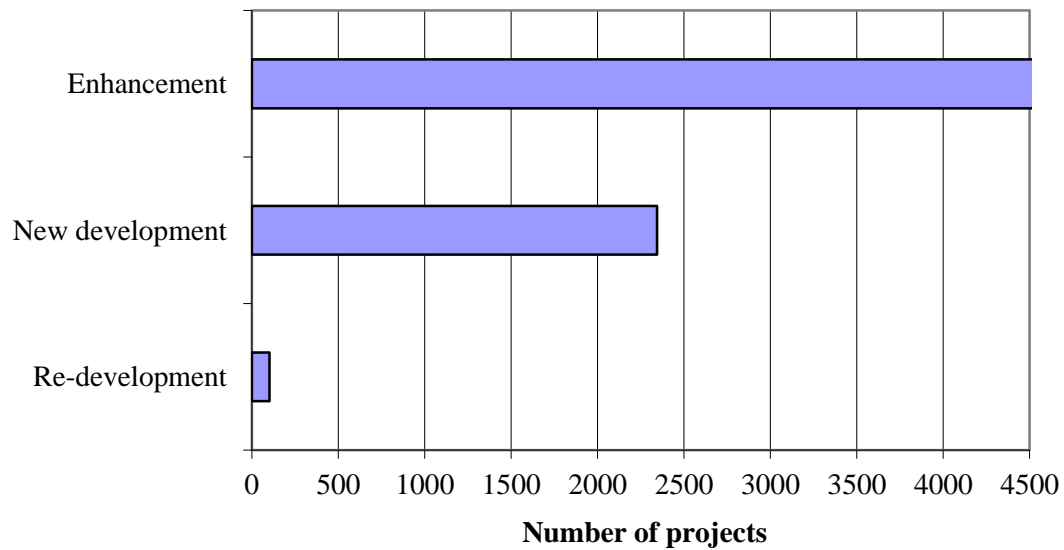


Business area	Projects	Percent
Communications, networks	316	19.2 %
Insurance	155	9.4 %
Banking	155	9.4 %
Transport, logistics	149	9.1 %
Financial	139	8.5 %
Manufacturing	130	7.9 %
Sales, marketing	87	5.3 %
Engineering	60	3.7 %
Accounting	55	3.3 %
Customer relations	48	2.9 %
Personnel	41	2.5 %
Government, public administration	35	2.1 %
Inventory, purchasing	30	1.8 %
Other	243	14.8 %
Total	1643	

Type of Project

Development type

A detailed explanation of the development types is given in Appendices, Glossary of Terms.

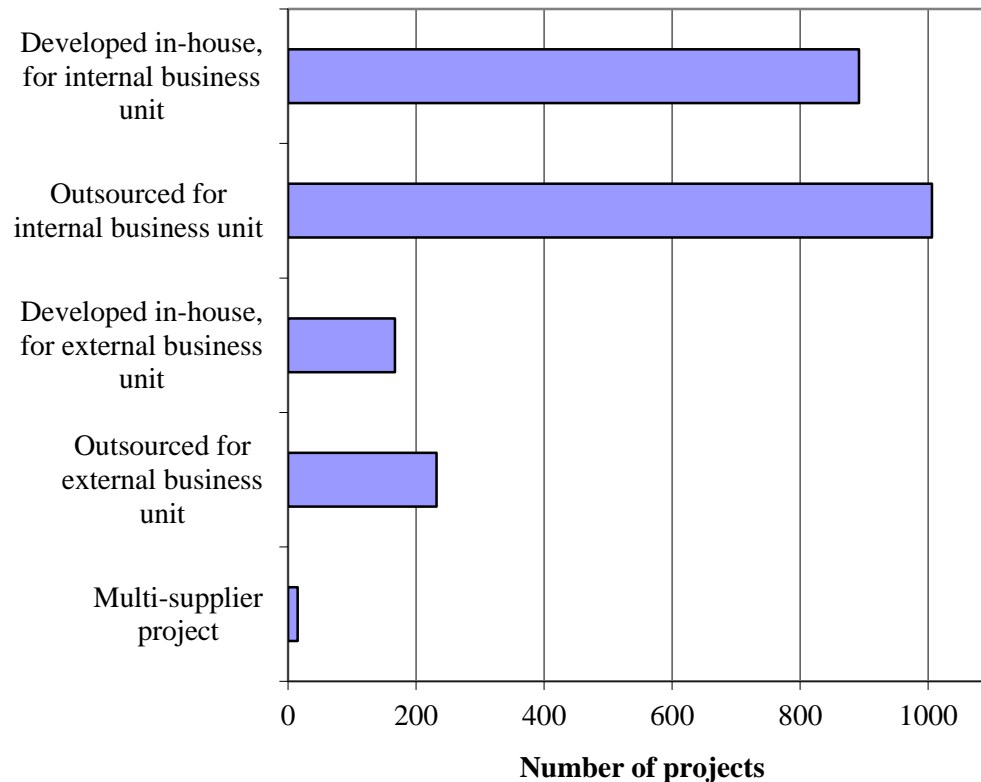


Type of development	Projects	Percent
Enhancement	5051	67.3 %
New development	2344	31.2 %
Re-development	102	1.4 %
Other	6	0.1 %
Total	7503	

Intended market

This defines the relationship between the customer, the project/application developer, and application user. If the customer and the developer are in the same organisation the project is assumed to be an in-house development; if the customer and user are in the same organisation the project is assumed to be developed for internal use. For some projects it is possible to determine whether the development was in-house or outsourced, or whether the users are internal or external, but not both.

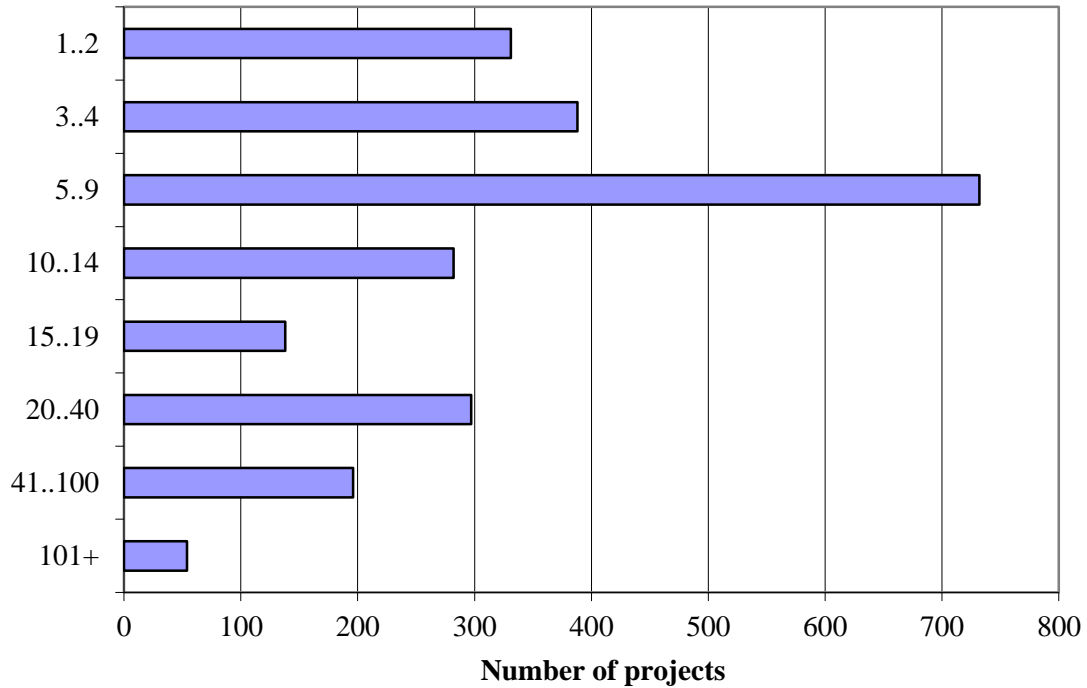
Most (82%) of the projects in the Repository (for which this information is available) have been developed for an internal business unit. Outsourced developments (64%) outnumber in-house developments (36%).



Intended market	Projects	Percent
Developed in-house for internal business unit	892	38.6 %
Outsourced for internal business unit	1006	43.5 %
Developed in-house for external business unit	167	7.2 %
Outsourced for external business unit	232	10.0 %
Multi-supplier project	15	0.7 %
Total	2312	

Team size

This is the maximum number of people in the development team at any given time in the project.



Maximum team size	Projects	Percent
1 or 2	331	13.7 %
3 or 4	388	16.0 %
5 to 9	732	30.3 %
10 to 14	282	11.7 %
15 to 19	138	5.7 %
20 to 40	297	12.3 %
41 to 100	196	8.1 %
101+	54	2.2 %
Total	2418	

Teams of 2 through 5 people are about equally common. 5 is most common (by a small margin).

Type of Product

Product size

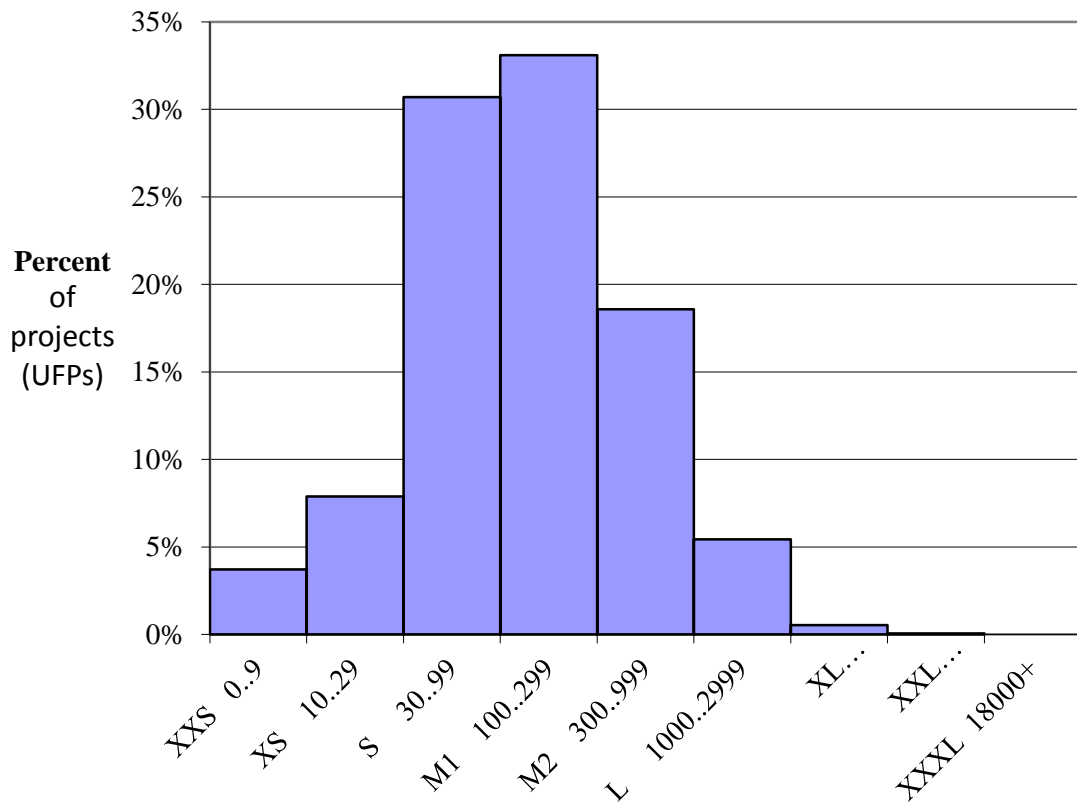
Size is measured in function points. The four main function point counting approaches represented in the Repository are IFPUG CPM 4.0 or later, COSMIC, FiSMA and NESMA. Other approaches represented in the Repository include Mark II, Feature Points, and older versions of IFPUG (IFPUG 2, IFPUG 3) but there are few such projects and very few have been contributed to the Repository for many years now.

IFPUG 4+ projects dominate the Repository. The numbers of COSMIC, FiSMA and NESMA projects are steadily increasing.

The following tables and histograms show the range of project sizes, for each of these four function point counting approaches. (Projects sized with other approaches, or that have low data quality ratings, are not included.)

IFPUG 4+

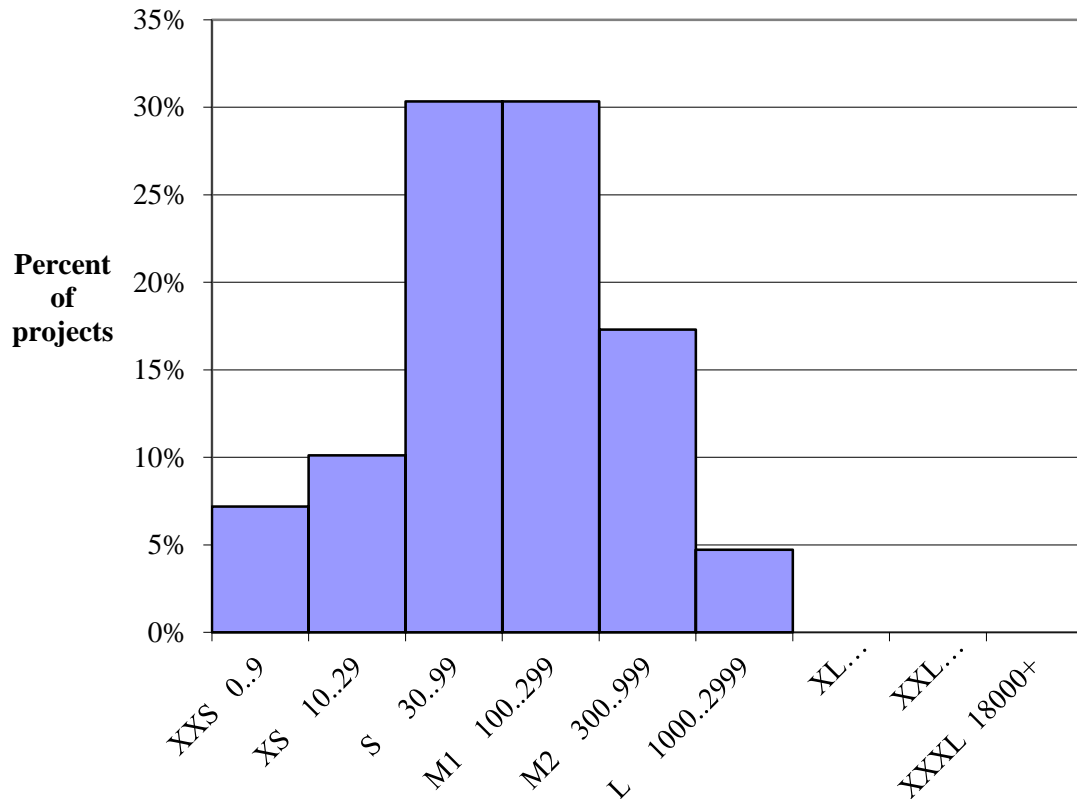
The table shows the sizes (in UFPs) of projects sized with IFPUG function points, that are known or presumed to have been sized using CPM4.0 or later.



Relative Size	Size in IFPUG 4+ function points	Projects (UFPs)	Percent (UFPs)	Projects (AFPs)	Percent (AFPs)
XXS	0 to 9	171	3.7 %	209	3.9 %
XS	10 to 29	363	7.9 %	457	8.6 %
S	30 to 99	1413	30.7 %	1591	29.8 %
M1	100 to 299	1523	33.1 %	1776	33.3 %
M2	300 to 999	855	18.6 %	986	18.5 %
L	1000 to 2999	250	5.4 %	275	5.2 %
XL	3000 to 8999	25	0.5 %	33	0.6 %
XXL	9000 to 17999	3	0.1 %	8	0.1 %
XXXL	18000 or more	0	0.0 %	1	0.0 %
	Total	4603		5336	

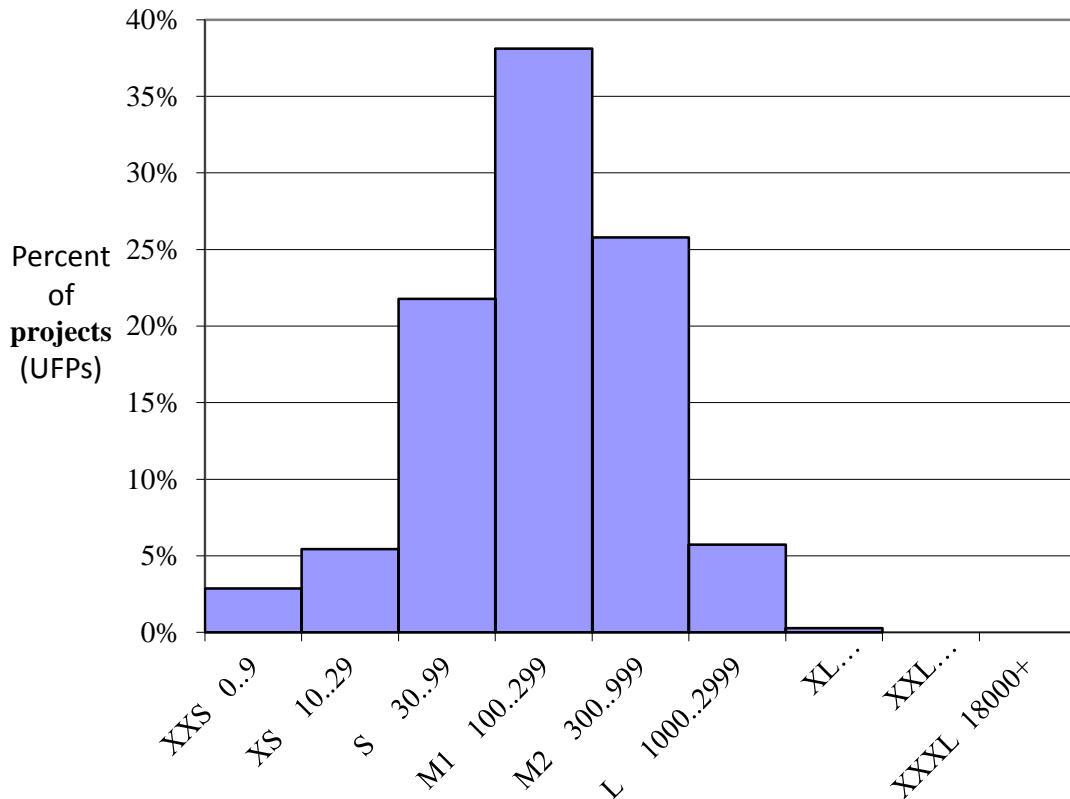
Size ranges from 3 to 16,148 UFPs (3 to 20,000 AFPs). The median size is 124 UFPs (127 AFPs).

For enhancement projects, the range is 3 to 7,134 UFPs with a median of 94 UFPs (3 to 20,000 AFPs with a median of 95 AFPs). For new developments, the range is 6 to 16,148 UFPs with a median of 308 UFPs (6 to 16,148 AFPs with a median of 314 AFPs). For re-developments, the range is 89 to 13,580 UFPs with a median of 410 UFPs (89 to 17,518 AFPs with a median of 408 AFPs).

COSMIC

Relative Size	Size in COSMIC CFP	Projects	Percent
XXS	0 to 9	32	7.2 %
XS	10 to 29	45	10.1 %
S	30 to 99	135	30.3 %
M1	100 to 299	135	30.3 %
M2	300 to 999	77	17.3 %
L	1000 to 2999	21	4.7 %
XL	3000 to 8999	0	0.0 %
XXL	9000 to 17999	0	0.0 %
XXXL	18000 or more	0	0.0 %
	Total	445	

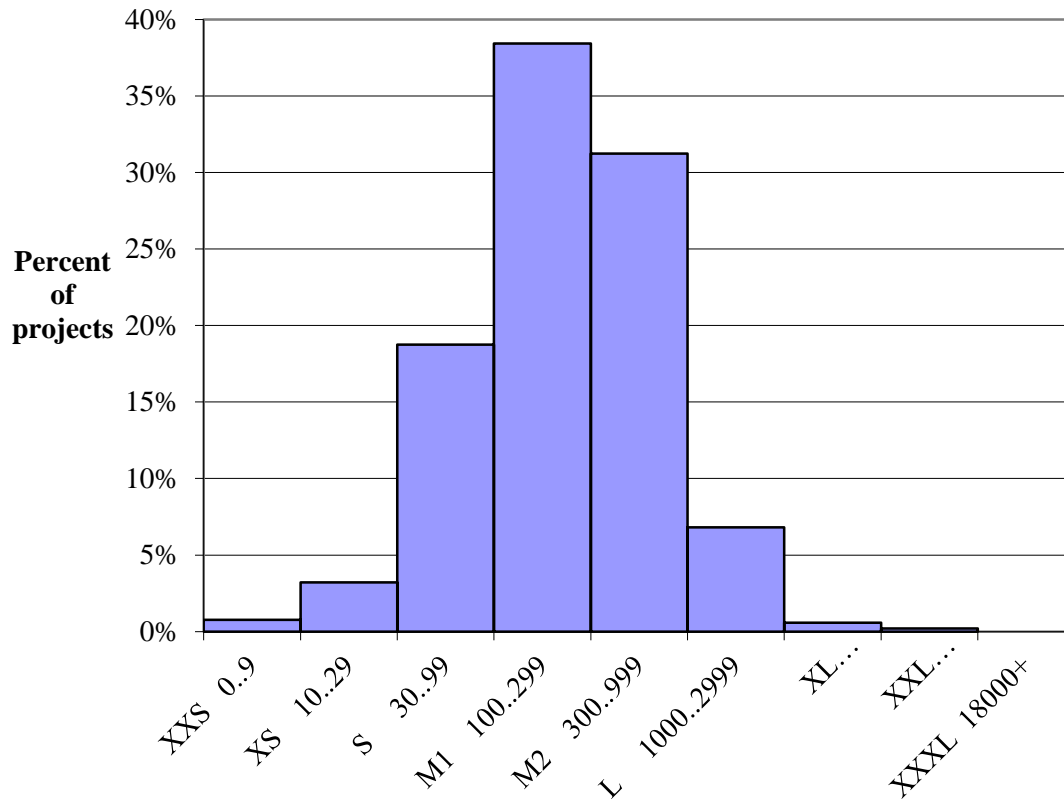
Size ranges from 2 to 2,090 CFP. The median size is 110 CFP. For enhancement projects the range is 2 to 2003 CFP (median 73). For new developments the range is 8 to 1958 CFP (median 156). For re-developments the range is 46 to 2090 CFP (median 402).

NESMA

Relative Size	Size in NESMA function points	Projects	Percent
XXS	0 to 9	10	2.9 %
XS	10 to 29	19	5.4 %
S	30 to 99	76	21.8 %
M1	100 to 299	133	38.1 %
M2	300 to 999	90	25.8 %
L	1000 to 2999	20	5.7 %
XL	3000 to 8999	1	0.3 %
XXL	9000 to 17999	0	0.0 %
XXXL	18000 or more	0	0.0 %
	Total	349	

AFP's and UFP's are identical for most projects. Size ranges from 4 to 5,667 UFPs (same for AFPs).

For enhancement projects, the range is 4 to 2,128 UFPs with a median of 168 UFPs (same for AFPs). For new developments, the range is 14 to 5,667 UFPs with a median of 214 UFPs (same for AFPs). For re-developments, the range is 91 to 327 UFPs with a median of 139 UFPs. For AFPs the range is the same, but the median is 142.

FiSMA

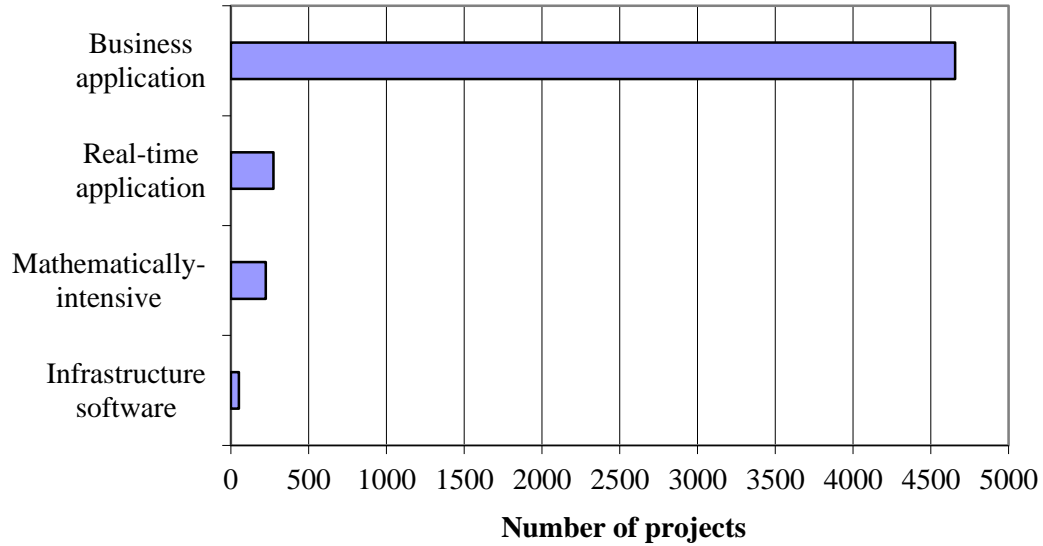
Relative Size	Size in NESMA function points	Projects	Percent
XXS	0 to 9	4	0.8 %
XS	10 to 29	17	3.2 %
S	30 to 99	99	18.8 %
M1	100 to 299	203	38.4 %
M2	300 to 999	165	31.3 %
L	1000 to 2999	36	6.8 %
XL	3000 to 8999	3	0.6 %
XXL	9000 to 17999	1	0.2 %
XXXL	18000 or more	0	0.0 %
	Total	528	

The FiSMA projects all report size in adjusted function points only. Size ranges from 6 to 9,390 AFPs. The median size is 224 AFPs. For enhancement projects, the range is 6 to 1,843 AFPs with a median of 148 AFPs. For new developments, the range is 18 to 9,390 AFPs with a median of 316 AFPs.

Application group

The application type identifies the type of application being addressed by the project (e.g. information system, transaction/production system, process control.)

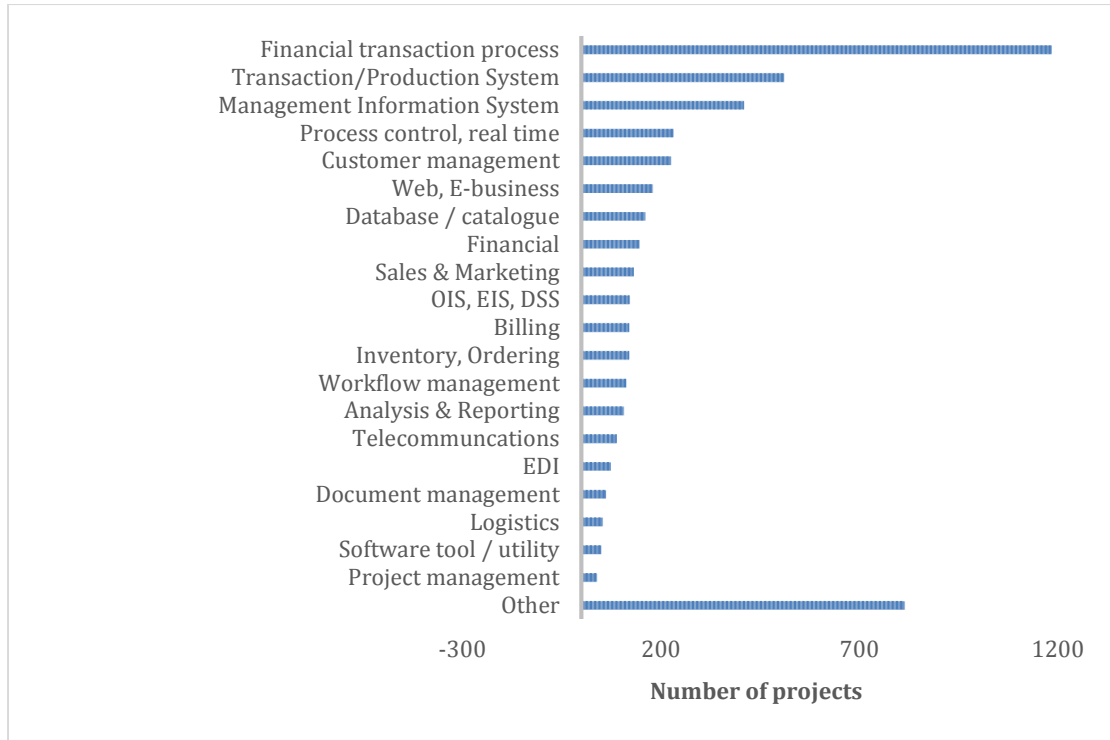
As there are hundreds of different application types recorded, they are grouped here into four groups.



Application group	Projects	Percent
Business application	4657	89.4 %
Real-time application	274	5.3 %
Mathematically-intensive application	225	4.3 %
Infrastructure software	51	1.0 %
Total	5207	

Application type

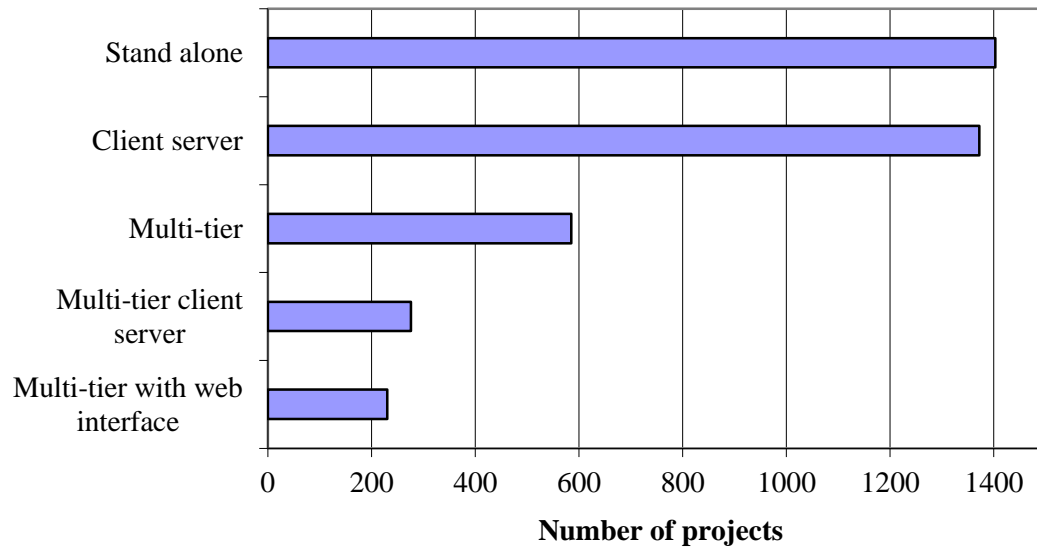
A finer-grained breakdown of application types follows.



Application type	Projects	Percent
Financial Transaction Process/Accounting	1182	23.9 %
Transaction/Production System	510	10.3 %
Management Information System	409	8.3 %
Process control, sensor control, real time	232	4.7 %
Customer management	225	4.6 %
Web, E-Business	179	3.6 %
Database, Catalogue/register of events or things	161	3.3 %
Financial	146	3.0 %
Sales & Marketing	132	2.7 %
Office information system, Executive information system, Decision support system	121	2.5 %
Billing	120	2.4 %
Inventory / Ordering	120	2.4 %
Workflow management	113	2.3 %
Analysis & Reporting	107	2.2 %
Network Management, Communications	89	1.8 %
Electronic Data Interchange	74	1.5 %
Document management	62	1.3 %
Logistics	53	1.1 %
Software tool / Utility	50	1.0 %
Project management	39	0.8 %
Other	813	16.5 %
Total	4937	

Architecture

Two broad types of system architecture are represented in the Repository: client-server (of various flavours), and multi-tier (of various flavours). Stand-alone systems are also recorded as a contrast to client-server systems.

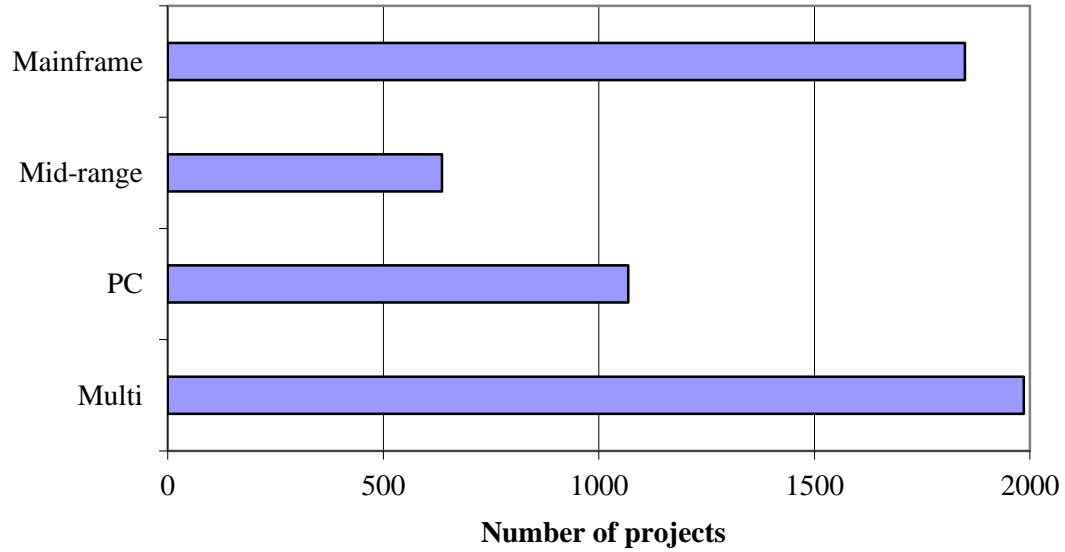


Architecture	Projects	Percent
Stand alone	1403	36.3 %
Client server	1372	35.5 %
Multi-tier	585	15.1 %
Multi-tier client server	276	7.1 %
Multi-tier with web interface	230	5.9 %
Total	3866	

Taken together, 28% of projects in the Repository (for which this information is known) have a multi-tier architecture, and 42% of projects have a client-server architecture.

Development Environment

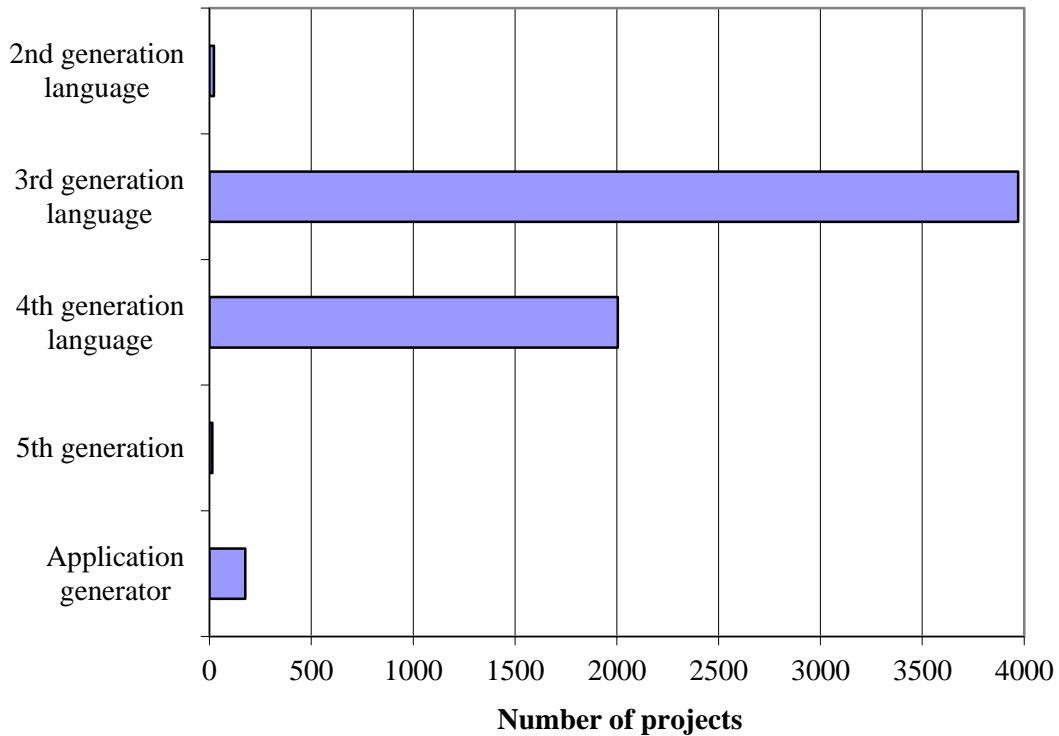
Development platform



Development platform	Projects	Percent
Mainframe	1849	33.4 %
Mid-range	636	11.5 %
Personal computer	1068	19.3 %
Multi	1986	35.9 %
Total	5539	

Type of programming language

There are a large number of languages recorded in the Repository. This can make it difficult to compare some projects. Consequently languages are classified by type as shown below.



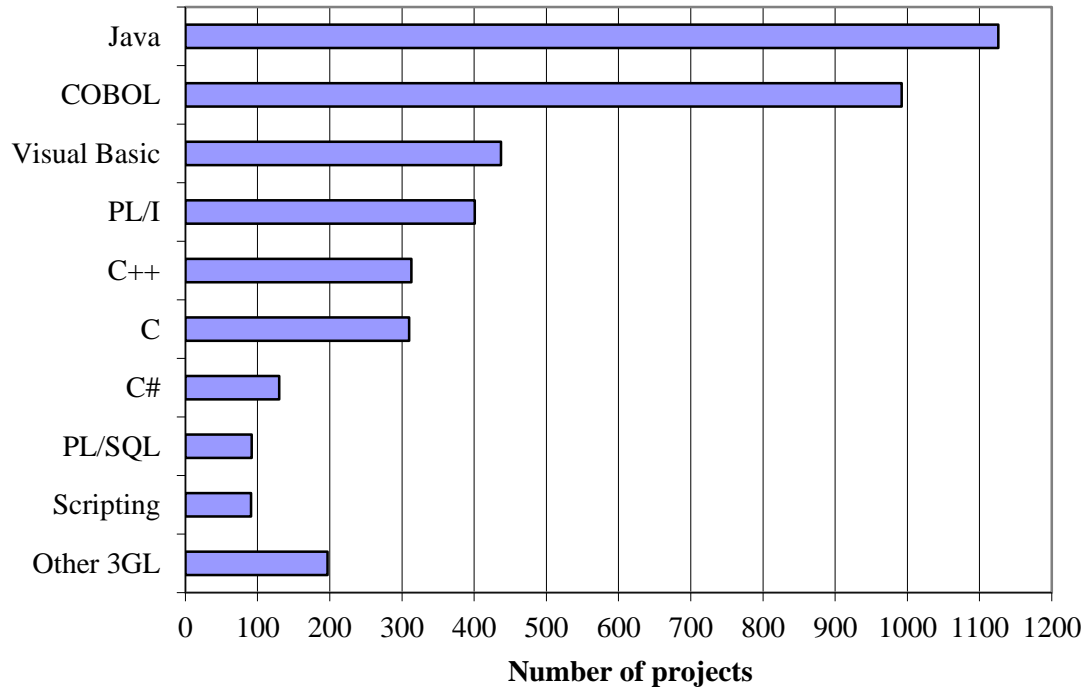
Type of programming language	Projects	Percent
2nd generation language	22	0.4 %
3rd generation language	3971	64.2 %
4th generation language	2005	32.4 %
5th generation language	13	0.2 %
Application generator	176	2.8 %
Total	6187	

Over 120 programming languages are represented in the Repository. 3rd generation languages dominate, but 4th generation languages are also very well represented.

Some languages (e.g. Visual Basic, Visual C++) were nominated sometimes as 3GLs and sometimes as 4GLs. The table above tallies the language types as originally nominated. In the following tables, each language is consolidated under a single type.

Primary programming languages – 3GLs

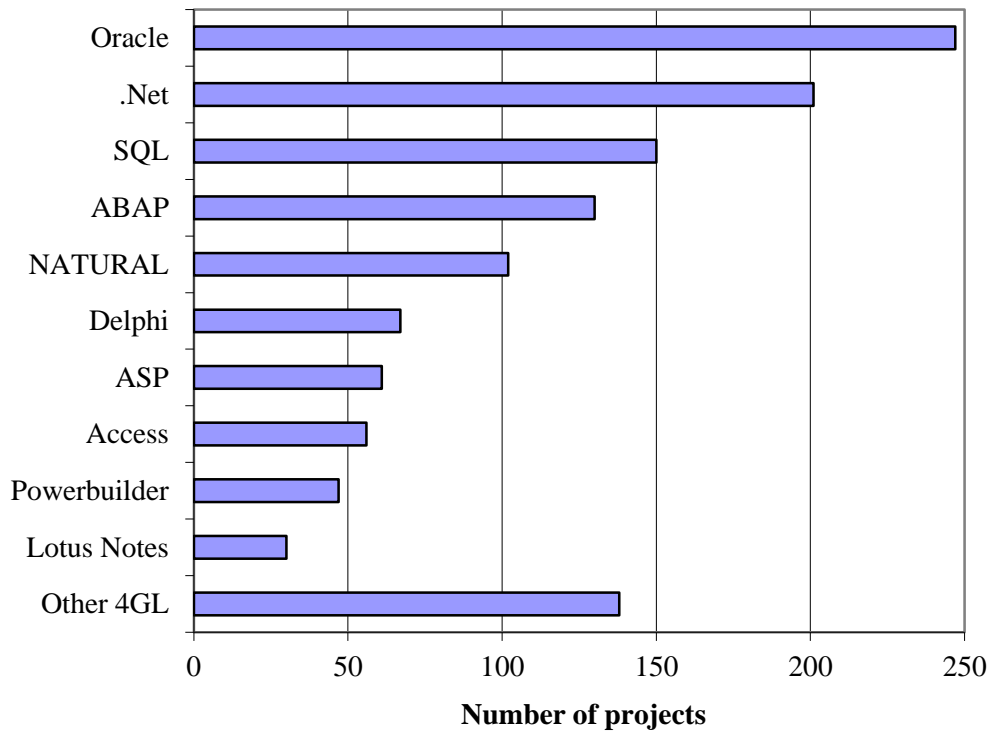
This is the programming language that has been nominated by the project submitter as the primary programming language.



3 rd generation languages	Projects	Percent
Java	1126	27.5 %
COBOL	997	24.4 %
Visual Basic	437	10.7 %
PL/I	401	9.8 %
C++	313	7.6 %
C	310	7.6 %
C#	130	3.2 %
PL/SQL	92	2.2 %
Scripting	91	2.2 %
Other	197	4.8 %

Other 3GLs in the Repository include JavaScript, Smalltalk, HTML, Ada, Pascal, Periphonics, and FORTRAN.

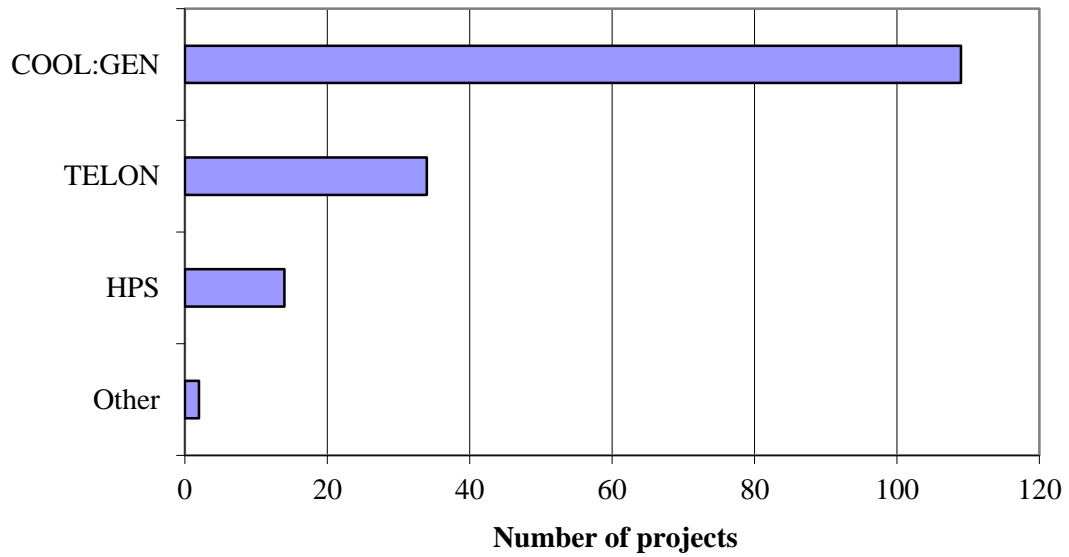
Primary Programming Languages - 4GLs



4 th generation languages	Projects	Percent
ORACLE	247	20.1 %
.Net	201	16.4 %
SQL	150	12.2 %
ABAP	130	10.6 %
NATURAL	102	8.3 %
Delphi	67	5.5 %
ASP	61	5.0 %
Access	56	4.6 %
PowerBuilder	47	3.8 %
Lotus Notes	30	2.4 %
Other 4GL	138	11.2 %

Other 4GLs represented in the Repository include Easytrieve, CLIPPER, ColdFusion, Ingres, FOCUS, IDEAL, and RALLY.

Application generators



Application generators	Projects	Percent
COOL:GEN	109	68.6 %
TELON	34	21.4 %
HPS	14	8.8 %
Other	2	1.3 %

Few projects that used application generators have been contributed to the Repository in recent years. The most recent projects that used application generators were implemented in 2008.

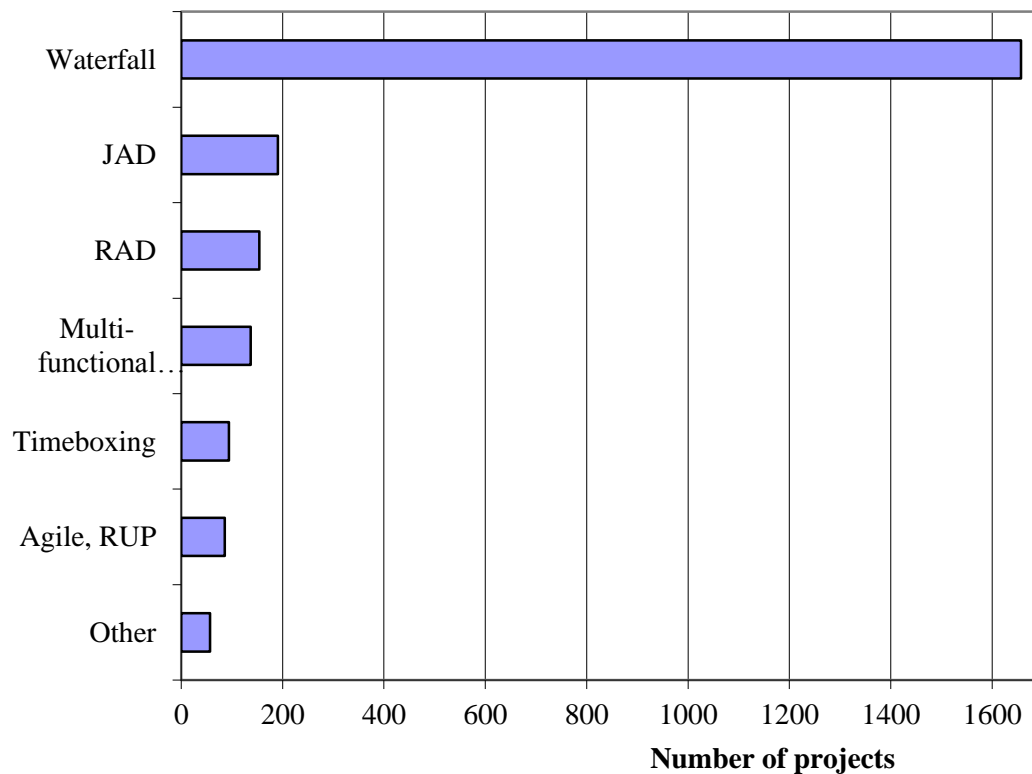
Methodologies and Techniques

These describe the various methodologies and techniques that may have been used during the execution of a project. They have not been related to specific project activities, and therefore may apply to any part of the development lifecycle.

For ISBSG purposes a methodology (Agile, JAD, Waterfall etc.) applies to the whole project development process. This is distinct from techniques (Data Modelling, OO Analysis etc.), which apply to individual activities within the development process.

Some projects mention more than one methodology (e.g. some JAD projects also use RAD and/or timeboxing), and some mention more than one technique.

Methodology

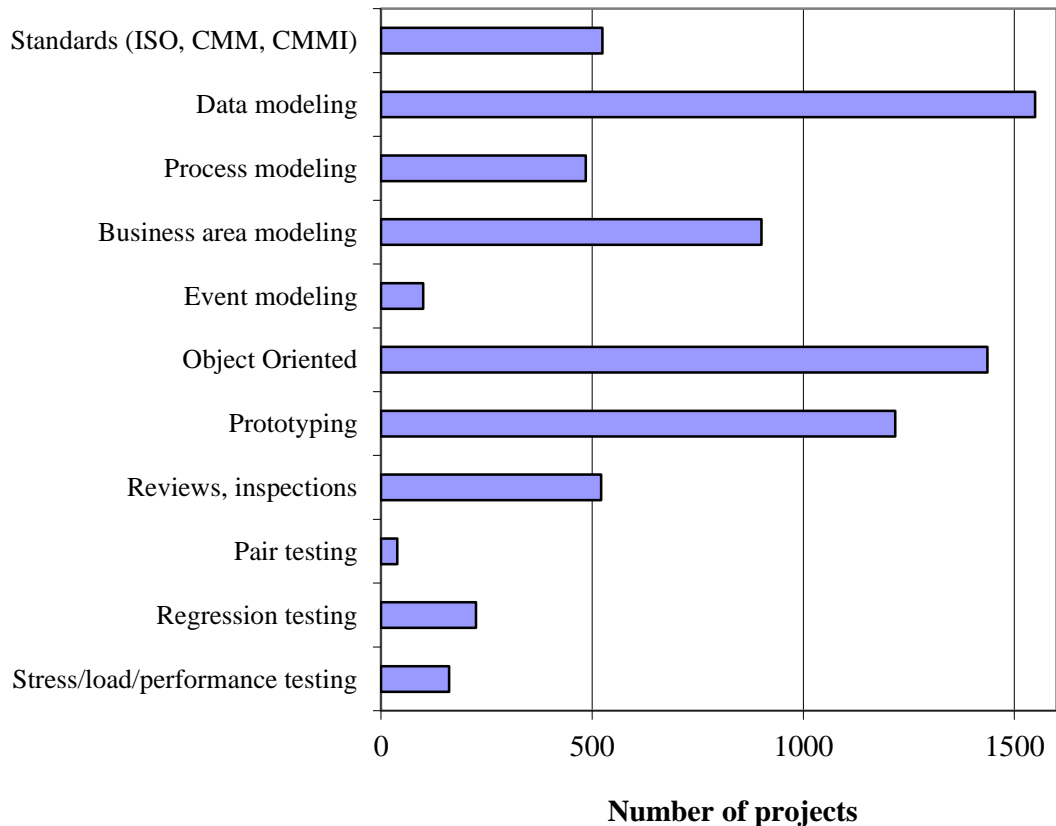


Methodology	Projects	Percent
Waterfall	2206	78.7 %
Joint Application Development (JAD)	191	6.8 %
Rapid Application Development (RAD)	154	5.5 %
Multi-functional teams	138	4.9 %
Agile, RUP	104	3.7 %
Timeboxing	94	3.4 %
Other	57	2.0 %
One or more of the above	2802	

Of the 191 JAD projects, 37 also mention RAD, 45 also mention multi-functional teams, and 13 also mention timeboxing. “Other” methodologies include Spiral and Incremental.

Specification Techniques, Design Techniques, Development techniques

The following graph and table combine information from all three of these fields, as well as considering Specification Documents, and Design Documents.



Development techniques	Projects	Percent
Standards (ISO 9000; CMM, CMMI)	524	18.3 %
Data modeling	1549	54.0 %
Process modeling	485	16.9 %
Business area modeling	901	31.4 %
Event modeling	100	3.5 %
Object Oriented Analysis/Design, UML	1436	50.1 %
Prototyping	1218	42.5 %
Reviews, inspections, walkthroughs	521	18.2 %
Pair testing	38	1.3 %
Regression testing	225	7.8 %
Stress / Load / Performance testing	161	5.6 %
One or more of the above	2869	

Many of the projects that have been contributed recently to the Repository make use of standards (ISO 9000 series, CMM, CMMI). Of the 524 projects in the Repository now that used standards, 336 (65%) used CMMI, 168 (32%) used CMM, and 142 (27%) used ISO 9000 series standards. 113 projects (22%) used ISO 9000 and one or both of CMM/CMMI.