RECENT TRENDS IN THE ADOPTION OF SOFTWARE BEST PRACTICES BY EUROPEAN SOFTWARE DEVELOPERS

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Recent Trends in the Adoption of Software Best Practices by European Software Developers

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Executive Summary

The following report presents an analysis of the responses to the Software Best Practice Questionnaire (SBPQ) which was filled by organizations submitting project proposals to the European Commission during the ESSI calls in 1995, 1996 and 1997. The objective of the report is to identify noticeable trends in the changing adoption levels and the possible causes and explanations for the same.

The aim of the survey is to collect data on the use of software best practices within European organisations. A "best practice" is defined as a management practice that is widely recognised as excellent and is recommended by most practitioners and experts in the field. The SBPQ was designed such that each question addressed a particular best practice. The questionnaire had 42 questions divided into five sections: organisational issues, standards and procedures, metrics, control of the development process and tools and technology. It was clearly stated to the participating companies that the SBPQ responses would be evaluated separately and would not affect the assessment of the project proposals either positively or negatively.

Our analysis reveals that there are very few noticeable trends in the shifting adoption rates over the three years 1995, 1996 and 1997. There are, however, a set of countries and sectors which exhibited the same trends over most of the practices surveyed. The sectors *Machinery, Electrical & Optical Instruments*, *Finance & Insurance* and *Software Consultancy and Supply* registered improvements in adoption levels while *Air & Spacecraft* and *Mechanical Engineering & Technical Consultancy* registered a decline. The countries Belgium, Denmark, France, Greece and Italy improved their overall adoption levels while those for Ireland, the Netherlands and the UK deteriorated. The lack of statistical significance of the results could be attributed to the scarce number of observations in most of the countries/sectors as a majority of datapoints were from one sectors and a few countries.

Introduction

The European Commission, as part of its Information Technologies Program conducts longitudinal surveys to assess and monitor the level of adoption of key software management practices across Europe. In collaboration with the European Software Institute, this survey has been conducted thrice thus far once each in 1995, 1996 and 1997.

A Software Best Practices Questionnaire (SBPQ) was used for the surveys. The aim of the survey was to collect data on widely recognized management practices i.e. software best practices within European organizations. The SBPQ was designed such that each question addressed a particular best practice. The questionnaire had 42 questions divided into five sections: Organizational Issues, Standards and Procedures, Metrics, Control of the Development Process, and Tools and Technology.

The SBPQ was distributed as part of the Call for Proposals under the ESSI research initiative sponsored by the European Commission. All organizations submitting an ESSI project proposal were required to submit a completed SBPQ. In an effort to avoid overestimation of best practice adoption within organizations, the evaluation of the questionnaire responses was clearly mentioned as being distinct from and having no effect on the assessment of the project proposal. In spite of that, it should be noted that the structure of the questionnaire (only yes-no answers) and the fact that it accompanied an EC Call for Proposals could have led respondents to portray *optimistic results*.

The 1995, 1996 and 1997 implementations of the SBPQ elicited 463, 488 and 394 valid responses respectively. In our analysis of adoption rates by country and sector, we have included only those countries having more than 4 responses in each of the three years and only those sectors having more than 7 responses in each of the years. The countries and sectors thus analyzed are summarized in Table 1 and 2 below.

	Year		
Country	**1995**	**1996**	**1997**
Austria	8	22	16
Belgium	11	12	15
Germany	73	86	62
Denmark	16	9	17
Spain	79	65	34
France	36	20	18
Greece	31	30	18
Italy	88	73	77
Ireland	9	25	12
Norway	15	26	6
Netherlands	13	30	30
Sweden	8	5	13
Finland	16	12	4
United Kingdom	25	44	52

Table 1: Distribution of respondents to the SBPQ surveys by country and year

	Year		
Ind. Sector	**95**	**96**	**97**
Air & Spacecraft	12	11	10
Machinery, Electrical & Optical Instruments	14	11	12
Finance & Insurance	17	28	10
Electronic Engineering & Technical Consultance	13	14	15
Indsutrial Process Control Systems	26	27	22
Software Consultancy and Supply	175	208	169
Telecom Products	35	23	24
Mechanical Engineering & Technical Consultancy	19	7	8

Table 2: Distribution of respondents to the SBPQ surveys by sector and year

In our analysis, we have computed the aggregate adoption rates for each section of the SBPQ and compared the results over the 3 years. To check whether the differences are statistically significant we have used the Kruskal-Wallis ANOVA test. This test assesses the hypothesis that the different samples, from each year, were drawn from the same distribution or from distributions with the same median. For the given adoption rate distribution for each year, it computes the rank values of the distribution to test the hypothesis. In general it was observed that the country or sector groups which had a larger number of observations turned out to be statistically significant for smaller changes in adoption rates.

We have adopted a cutoff of 10% for statistical significance: a difference is considered statistically significant only if the Kruskal-Wallis test identifies it as being significant with more than 90% probability. Since the null hypothesis of the test is set at the samples being derived from the same population, i.e., the adoption rates are not different, for the difference to be significant the probability should be between 0 and 0.1. All statistically significant differences in the report are accompanied by the corresponding probability level in brackets. For example, *Electronic Engineering & Technical Consultance*(p=0.09) means the difference in the adoption rates for the sector *Electronic Engineering & Technical Consultance* over the three is statistically significant with a degree of significance of 9%.

Aggregate Scores

Figures 1 and 2 summarize the overall adoption levels, across all sections of the SBPQ, for sectors and countries respectively for the years 1995, 1996 and 1997.

The trends in adoption rates were markedly different and were strongly dependent upon the sector and country under consideration. However, very few of the differences turned out to be statistically significant.

Among sectors, *Machinery, Electrical & Optical Instruments* showed an improvement (p=0.085) and *Electronic Engineering & Technical Consultance*(p=0.03), though it exhibited a very high adoption rate in 1996, came back down to less than the 1995 level in 1997. *Telecom Products* (p=0.09) also had a higher adoption rate in 1996 than in 1995 but dropped back in 1997. Another sector which did improve, but was not statistically significant due to very few observations was *Finance & Insurance. Air & Spacecraft* and *Mechanical Engineering & Technical Consultancy* steadily dropped in their adoption levels over the three years.

Among countries, Italy, which had the highest number of data points, showed the only significant difference(p=0.046) in adoption levels. France, Greece and Norway exhibited non-significant increases in adoption while Ireland and the Netherlands dropped in adoption levels.

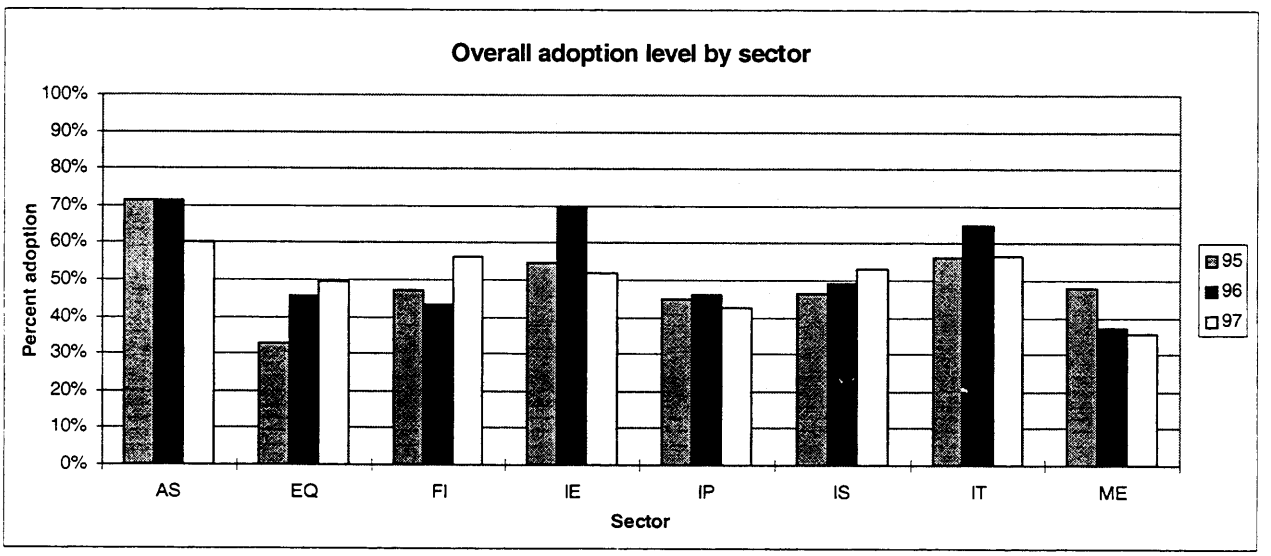

Figure 1: Aggregate scores for sectors

Legend

AS - Air & Spacecraft	IP - Industrial Process Control Systems
EQ - Machinery, Electrical & Optical Instruments	IS - Software Consultancy and Supply
FI - Finance and Insurance	IT - Telecom Products
IE - Electronic Engineering & Technical Consultancy	ME - Mechanical Engineering & Technical Consultancy

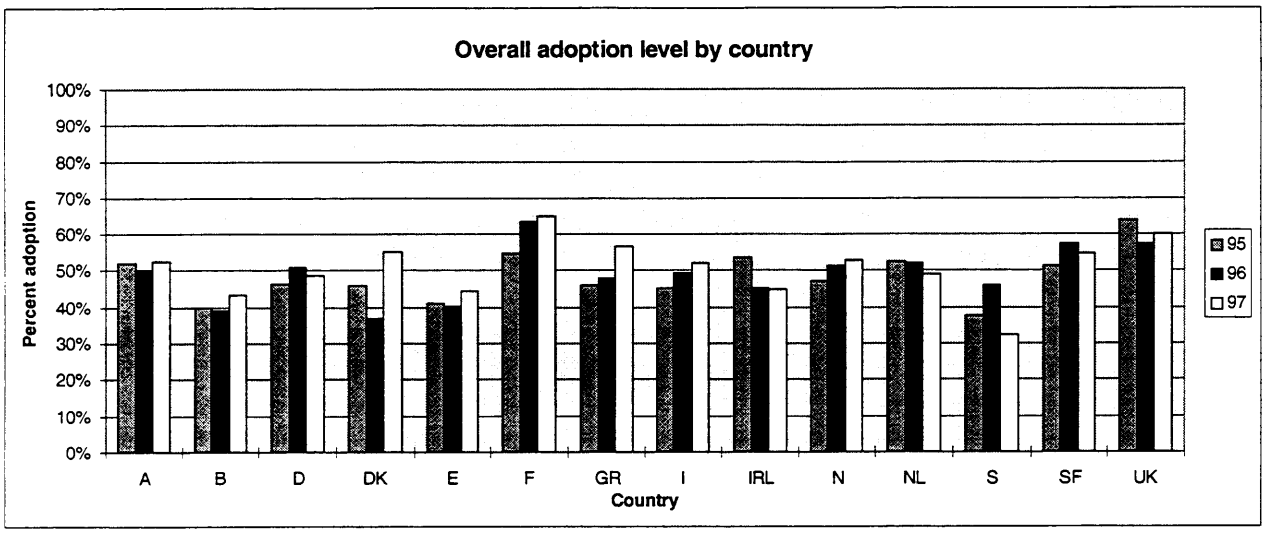

Figure 2: Aggregate scores for countries

Legend

A - Austria	E - Spain	IRL - Ireland	SF - Finland
B - Belgium	F - France	N - Norway	UK - United Kingdom
D - Germany	GR - Greece	NL - Netherlands	
DK - Denmark	I - Italy	S - Sweden	

The following sections outline shifts in practice levels for specific practices, with a mention of the sectors and countries most indicative of the nature of the shift. If several sectors/countries have been indicated as examples of a shift in a specific practice, it means that the shift in practice levels existed across several countries or sectors. On the other hand, if no sector/country has been included, it means that there is a considerable amount of variation across sectors/countries: some improved, others deteriorated, while yet others remained the same, bringing about the perceived shift only as an averaged effect.

Organizational Issues

Among organizational issues countries which improved their performance did so by establishing SQA and change control functions and procedures for ensuring marketing inputs. Those experiencing deteriorating performance did so due to lack of mandatory training on project management procedures for new project managers, lack of awareness of the state of the art in CASE or software engineering technology and lack of procedures for ensuring marketing inputs and availability of non-software resources.

Figures 3 and 4 summarize the variations in the adoption levels for practices related to organizational issues for sectors and countries respectively. Table 3 summarizes the shifts in practice levels across the years.

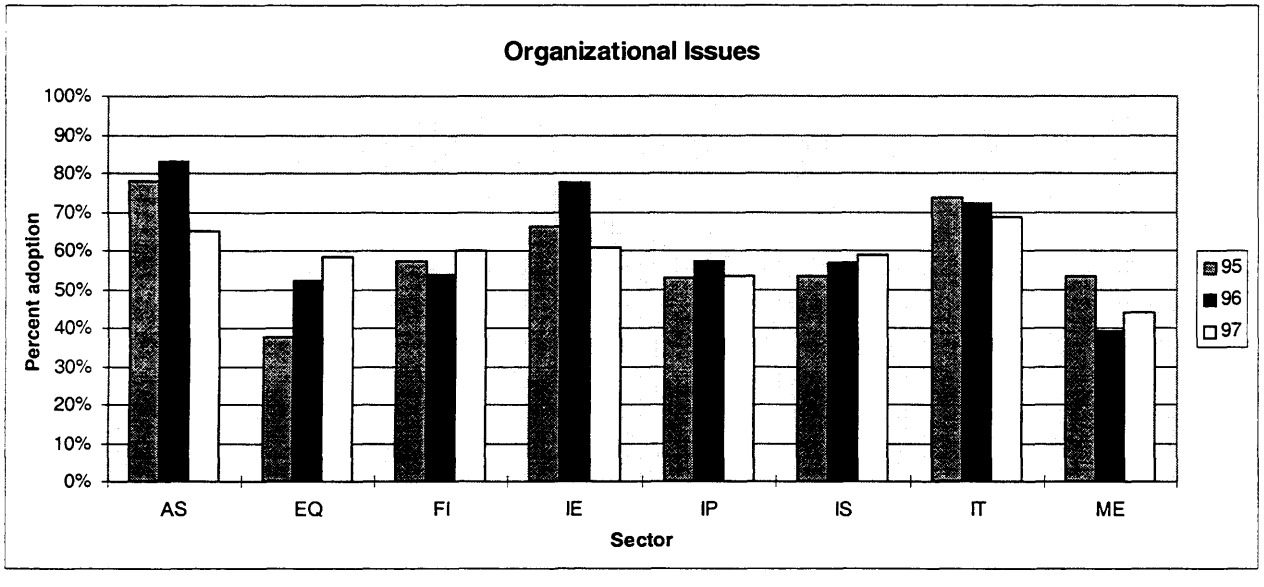

Figure 3: Adoption levels for practices related to organizational issues across sectors

Legend

AS - Air & Spacecraft	IP - Industrial Process Control Systems
EQ - Machinery, Electrical & Optical Instruments	IS - Software Consultancy and Supply
FI - Finance and Insurance	IT - Telecom Products
IE - Electronic Engineering & Technical Consultancy	ME - Mechanical Engineering & Technical Consultancy

Among sectors, *Air & Spacecraft* (p=0.09), *Telecom Products* and *Mechanical Engineering & Technical Consultancy* exhibited decreasing adoption levels. While the adoption level of *Machinery, Electrical & Optical Instruments* went up significantly, *Software Consultancy and Supply* also went up marginally. Although *Electronic Engineering & Technical Consultance* exhibited a significant change in adoption (p=0.007), the trend was unclear with higher adoption in 1996 and lower in 1997.

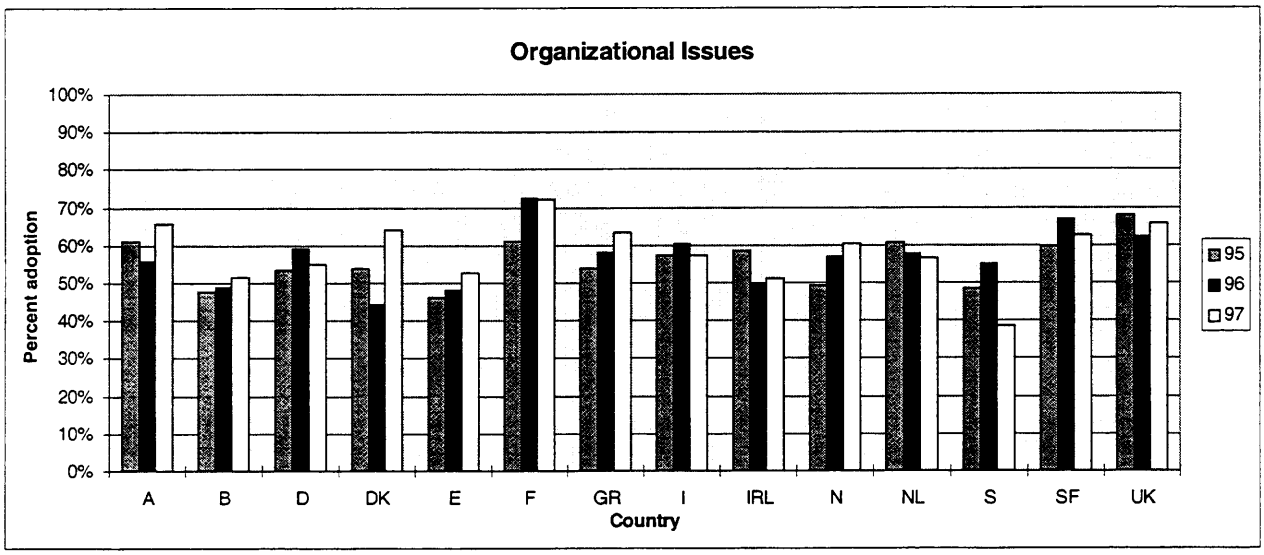

Figure 4: Adoption levels for practices related to organizational issues across countries

Legend

A - Austria	E - Spain	IRL - Ireland	SF - Finland
B - Belgium	F - France	N - Norway	UK - United Kingdom
D - Germany	GR - Greece	NL - Netherlands	
DK - Denmark	I - Italy	S - Sweden	

Countries which had higher adoption levels were Belgium, Spain, France, Greece and Norway although none of the increases was statistically significant. Ireland and the Netherlands exhibited a decreasing trend, while the UK recovered some lost ground in 1997.

Practice	Countries		Sectors	
	Increased	Decreased	Increased	Decreased
Nominating a project manager for each project	E(0.02)	I, UK		FI, IE, AS(0.09), ME
Having project manager report to a business manager responsible for the benefit of project to the business	E, GR, N	B, I, UK		AS, IP
Existence of Software Quality Assurance Function with independent reporting line from Project Management	B, D(0.004), DK, E, GR(0.03), IRL, N	S	FI(0.07), IS(0.03), ME	IE(0.09)
Establishing change control function for each project	DK, E(0.09), F(0.09), GR, IRL, N, NL, S, SF	B(0.08), I, A, D UK	EQ, FI, IP, IS(0.08)	AS(0.02), IT, ME
Mandatory training on project management procedures for new project managers	A, DK, GR, F, N, SF	E, IRL(0.07), NL(0.095), S	EQ	AS, IE, IP, IT(0.005), ME
Maintaining awareness of the state of the art in CASE or software engineering technology	B, DK, I, N	A, IRL(0.03), NL, SF(0.09)	AS, IS	FI, IT, ME
Procedure for ensuring appropriate levels of user/customer/marketing input throughout the project	A, B, E, F, GR, I	D, IRL, N, S	EQ, FI, IS	AS, ME
Procedure for ensuring availability of non-software resources critical to project success	A, B, F, N	E, IRL, NL, S	EQ(0.064), IP	AS, FI, ME

Table 3: Shifts in adoption levels for practices related to organizational issues

Standards and Procedures

Most of the high performers adopted applied common coding standards for each project and established formal procedures for handover of deliverables from one group to another. They also had in place a mechanism to ensure that the projects selected supported the organization's business objectives and had procedures to ensure that the functionality, strengths and weaknesses of the system being replaced are formally reviewed. Finally, the best performers increasingly performed independent testing of the software developed under the guidance of SQA.

Figures 5 and 6 summarize the variations in the adoption levels for practices related to standards and procedures for sectors and countries respectively. Table 4 summarizes the shifts in practice levels across the years.

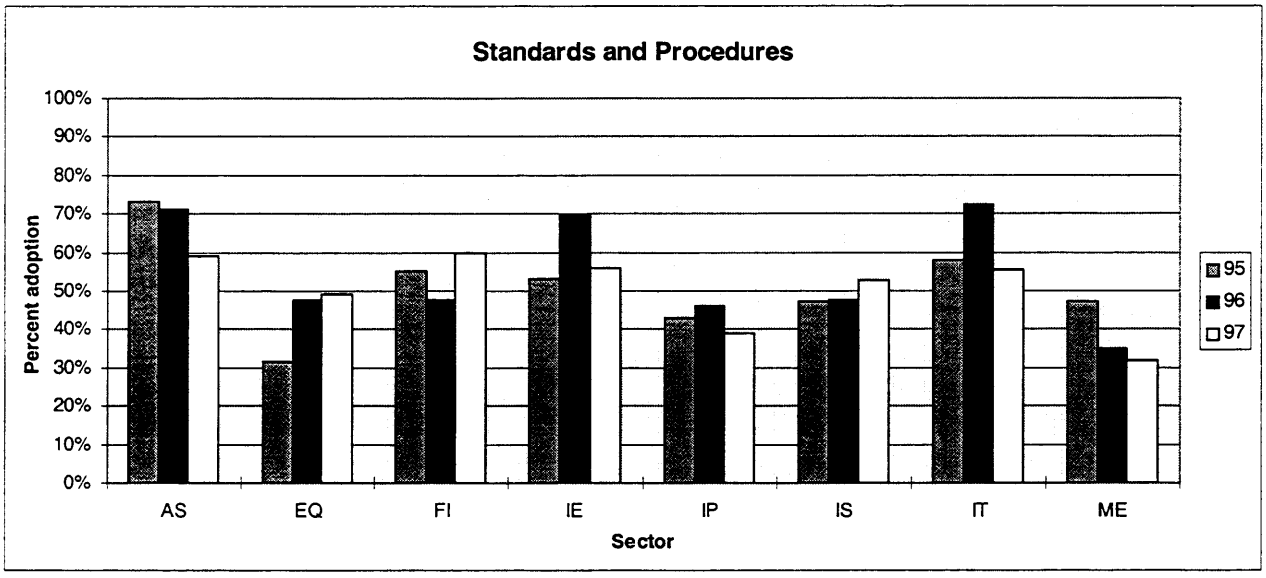

Figure 5: Adoption levels for practices related to standards and procedures across sectors

Legend

AS - Air & Spacecraft	IP - Industrial Process Control Systems
EQ - Machinery, Electrical & Optical Instruments	IS - Software Consultancy and Supply
FI - Finance and Insurance	IT - Telecom Products
IE - Electronic Engineering & Technical Consultancy	ME - Mechanical Engineering & Technical Consultancy

Among sectors, *Machinery, Electrical & Optical Instruments* has clearly registered an increase in adoption levels over the period, while *Software Consultancy and Supply* has also shown a marginal increase. *Air & Spacecraft* and *Mechanical Engineering & Technical Consultancy* have declined steadily and the others have not demonstrated any clear trends, going up one year and down the next, or vice versa. Although the change in adoption levels for *Telecom Products* was significant (p=0.09) the trend was unclear.

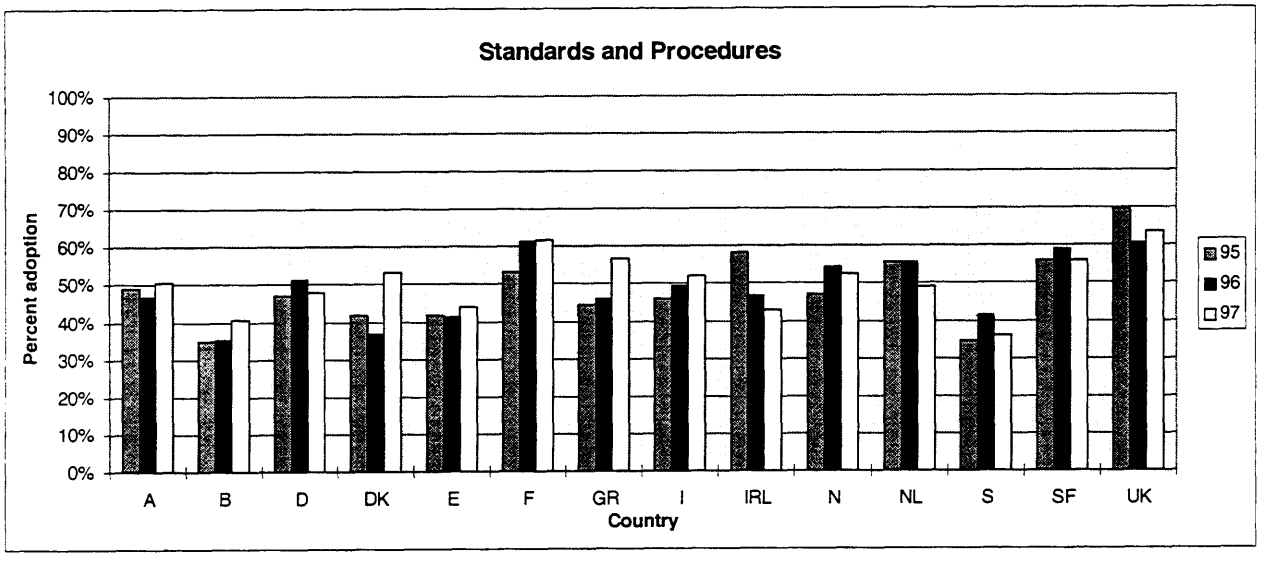

Figure 6: Adoption levels for practices related to standards and procedures across countries

Legend

A - Austria	E - Spain	IRL - Ireland	SF - Finland
B - Belgium	F - France	N - Norway	UK - United Kingdom
D - Germany	GR - Greece	NL - Netherlands	
DK - Denmark	I - Italy	S - Sweden	

Among countries, Belgium, Denmark, France, Greece and Italy($p=0.05$) have been increasing their best practice adoption levels over the three year period while Ireland, the Netherlands and the UK have exhibited decreasing adoption levels. The trend for other countries was unclear.

Practice	Countries		Sectors	
	Increased	Decreased	Increased	Decreased
Formal assessment of benefits, viability and risk of each software project by management	DK, GR, SF	B, D(0.05), IRL, S	EQ(0.064)	A, ME
Formal periodic reviews of the status of each project	F, GR, N, SF	E, I, IRL, NL	none	AS, IP, ME, IT
Procedures to ensure external subcontracted firms follow a disciplined development process	DK, F, N	D, E, IRL(0.06), GR, SF, UK(0.035)	FI	AS, IS(0.02), IT(0.02), ME
Performance of independent audits (inspections or walkthroughs) for each major stage in the development process	A, F(0.04), GR	D, IRL, S, SF, UK	none	AS, EQ, IT, IP, ME
Application of common coding standards for each project	D(0.07), DK, E, GR(0.04), I	F, IRL, N, SF	EQ, IT, FI	IP, ME
Existence of a documented procedure for estimating software size and productivity measures	E, GR	IRL, SF, UK(0.04)	AS, FI	EQ, IT
Formal procedure to product effort, schedule and cost estimates	E, S	A, N, UK	EQ, FI, IE(0.02)	AS, IT, ME(0.06)
Formal procedure for handover of deliverables from one group to another	A, D, DK, F, I, SF	E, IRL, NL, S, UK	EQ, FI, IE	AS, IP, ME
Mechanism to ensure that the projects selected support the organization's business objectives	A, B(0.002), E, I(0.04), N	D, GR, IRL, NL	EQ, IS(0.05), IT	AS, FI, IP, ME
Procedures to ensure that the functionality, strengths and weaknesses of the system being replaced are formally reviewed	E(0.09), F, GR, I, UK	IRL, N, NL	EQ(0.07), IE, IS(0.001), IT(0.02)	AS(0.08), FI(0.06)
Commencement of test planning based on user requirements and design documentation prior to programming	A, D, F(0.08), GR(0.02), I, SF	B, E, IRL, S	EQ(0.07), IP, IS, ME	AS, IE, IT
Performance of independent testing by users under the guidance of SQA before system goes live	B, DK, GR(0.06), I(0.04), N, S, SF	A, F, IRL, NL	EQ, FI, IS(0.0002)	IE
Procedure to check that the system passing user acceptance testing is the same as that which gets implemented	B, D, DK(0.08), I(0.02), S	E, F, IRL, N, SF	EQ, IS	AS, ME

Table 4: Shifts in adoption levels for practices related to standards and procedures

Metrics

Improvements in performance were observed for those companies which maintained records of software size and gathered statistics on sources of errors and test efficiency and analyzed them. The countries or sectors which performed better were also found to have improved usage of "earned value" project tracking and enhance maintenance of records enabling rapid software reconstruction.

Figures 7 and 8 summarize the variations in the adoption levels for metrics-related software practices for sectors and countries respectively. Table 5 summarizes the shifts in adoption levels of metrics-practices across the three years.

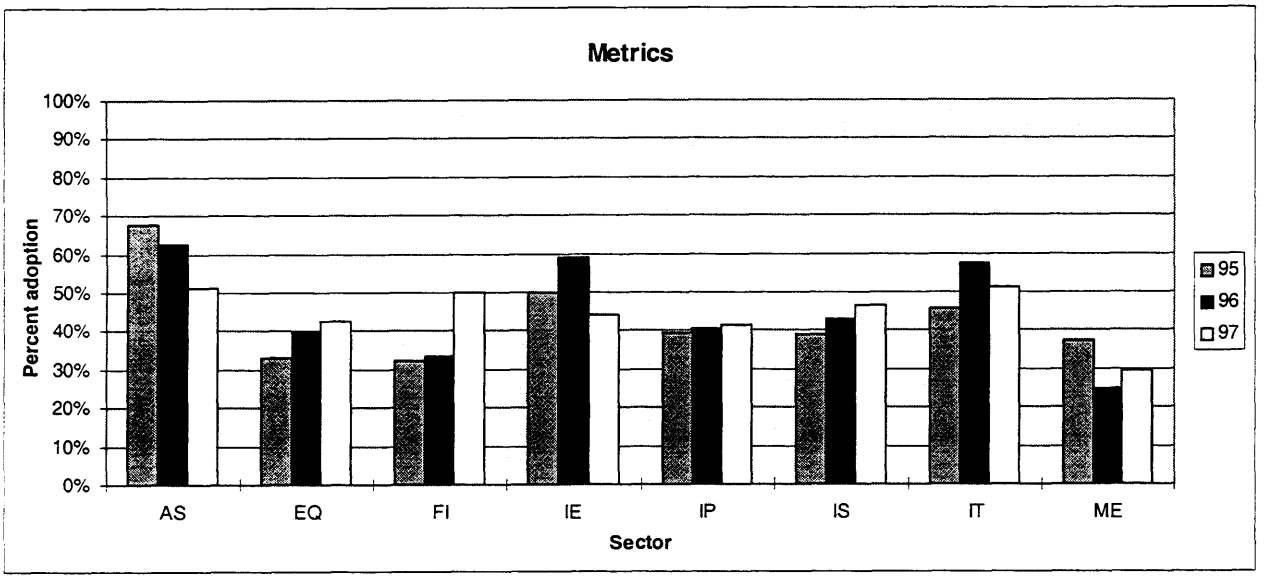

Figure 7: Adoption levels for practices related to metrics across sectors

Legend

AS - Air & Spacecraft	IP - Industrial Process Control Systems
EQ - Machinery, Electrical & Optical Instruments	IS - Software Consultancy and Supply
FI - Finance and Insurance	IT - Telecom Products
IE - Electronic Engineering & Technical Consultancy	ME - Mechanical Engineering & Technical Consultancy

Among sectors, *Machinery, Electrical & Optical Instruments*, *Finance & Insurance* and *Software Consultancy and Supply*(p=0.14) registered increases in adoption levels across the three years. *Air & Spacecraft* and *Mechanical Engineering & Technical Consultancy*(p=0.16) exhibited decreasing adoption rates and for the rest, the trend was uncertain.

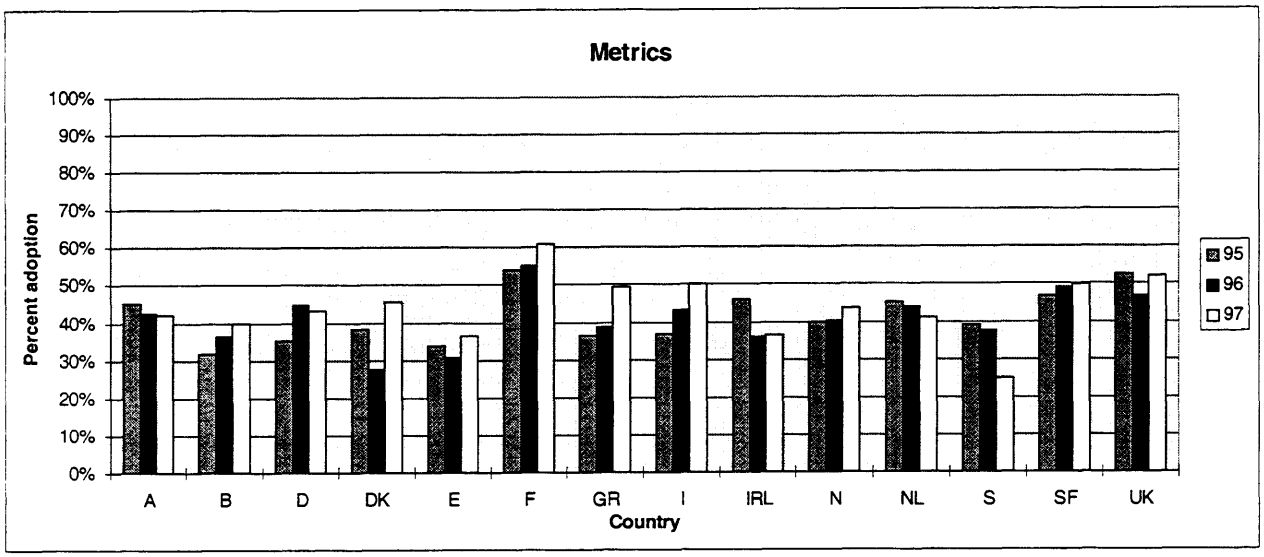

Figure 8: Adoption levels for practices related to metrics across countries

Legend

A - Austria	E - Spain	IRL - Ireland	SF - Finland
B - Belgium	F - France	N - Norway	UK - United Kingdom
D - Germany	GR - Greece	NL - Netherlands	
DK - Denmark	I - Italy	S - Sweden	

The countries which exhibited an increase in adoption levels are Belgium, France, Greece, Italy(p=0.017), Norway and Finland. Austria, Ireland and Sweden had a continuous decline in their adoption rates over the three years.

Practice	Countries		Sectors	
	Increased	Decreased	Increased	Decreased
Maintaining records of actual project resourcing and timescales and their feedback into the estimating process	D, F, I	B, IRL, N, NL, S(0.07)	AS, FI, IE	IT, ME
Maintining records of software size	E(0.01), D, I(0.03), GR, N	IRL, NL	EQ, FI	AS
Gathering statistics on the sources of errors in software code and their analysis for cause, detection and avoidance measures	A, B, D, DK, F, GR, I(0.004), IRL, NL, S, UK(0.06)	E, SF	AS, FI90.03), IS(0.0003)	EQ, ME
Gathering and analyzing statistics on test efficiency	D, DK, GR, I, SF	A, F, IRL, NL, UK	FI(0.008), IS(0.06), ME	AS, IT
Usage of "earned value" project tracking to monitor project progress	A,D, DK, E, F, GR(0.054), SF	IRL, NL, UK(0.08)	EQ, ME	AS, IE, IT
Estimation and comparison with actuals for target computer performance	D, E, F, I	A, IRL, N, NL, S	EQ, IT	AS(0.006), FI, IE(0.01), ME
Logging post-implementation problem reports and effectively tracking and analyzing their resolution	B, DK, F, I, SF	A, N	EQ, FI, IT(0.002), ME	AS, IE(0.08)
Existence of records from which all current versions and variants of software systems and their components can be quickly and accurately reconstructed	B(0.044), D, GR, I(0.0002), N, SF	A, E, S	IS(0.0005), IT	AS, EQ, IE

Table 5: Shifts in adoption levels for practices related to metrics

Control of the Development Process

To enhance control of the development, the organizations exhibiting higher adoption rates established procedures for controlling changes to software requirements, designs and accompanying documentation. They also established procedures for controlling changes to specifications and code, routinely performed regression testing and ensured that every required function is tested/verified.

Figures 9 and 10 summarize the variations in the adoption levels for practices related to the control of the development process for sectors and countries respectively. Table 6 summarizes the shifts in adoption levels for software practices for the control of the development process across the two years.

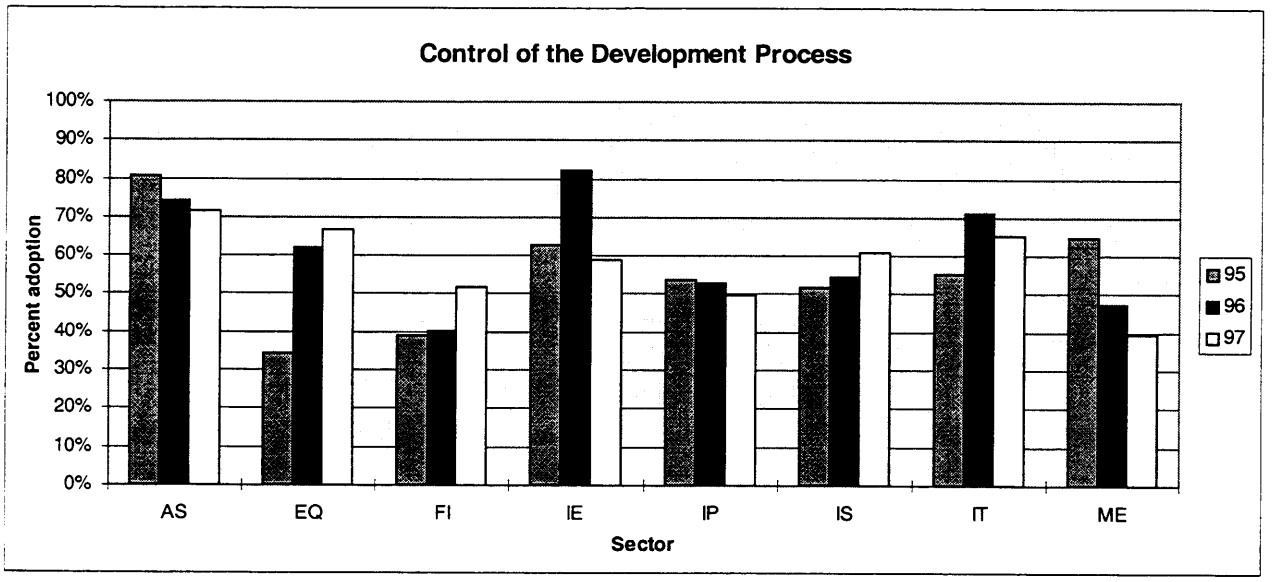

Figure 9: Adoption levels for practices related to control of the development process across sectors

Legend

AS - Air & Spacecraft	IP - Industrial Process Control Systems
EQ - Machinery, Electrical & Optical Instruments	IS - Software Consultancy and Supply
FI - Finance and Insurance	IT - Telecom Products
IE - Electronic Engineering & Technical Consultancy	ME - Mechanical Engineering & Technical Consultancy

The sectors showing the most improvement over the period are *Machinery, Electrical & Optical Instruments*(p=0.05), *Finance & Insurance* and *Software Consultancy and Supply*(p=0.04). *Air & Spacecraft* and *Mechanical Engineering & Technical Consultancy*(p=0.03) again exhibited decreasing adoption levels

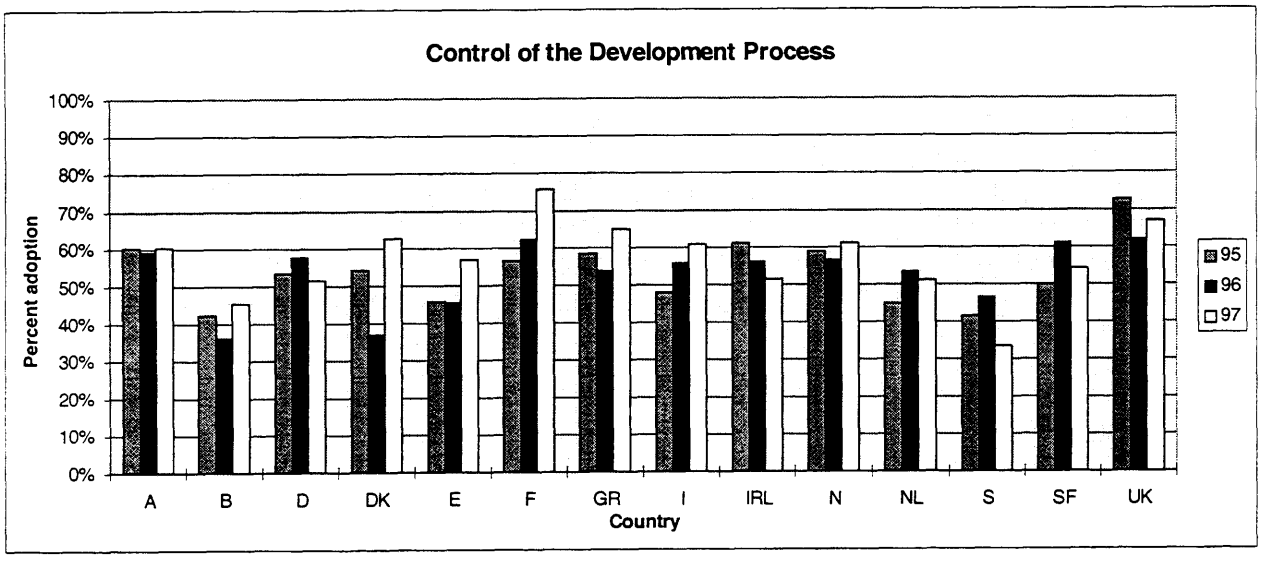

Figure 10: Adoption levels for practices related to control of the development process across countries

Legend

A - Austria	E - Spain	IRL - Ireland	SF - Finland
B - Belgium	F - France	N - Norway	UK - United Kingdom
D - Germany	GR - Greece	NL - Netherlands	
DK - Denmark	I - Italy	S - Sweden	

Very few of the countries studied exhibited any distinct trends. Spain, France and Italy($p=0.03$) increased their adoption levels for "Control of the Development Process" over the period while Ireland and Sweden had decreased adoption levels.

Practice	Countries		Sectors	
	Increased	Decreased	Increased	Decreased
Responsibility for producing estimates, schedules and subsequent changes produced only by project managers who directly control project resources	DK(0.09), E, F, GR, I, N	A, B, S, SF, UK	AS, EQ, IP	IE
Gaining agreement and sign-off from all parties who have produced detailed estimates and schedules before publishing or revising project plans	A, DK, E(0.06), GR, I, N, NL	B, D, SF, UK	EQ(0.01), FI, IT	AS, IE(0.06), ME
Procedure for controlling changes to software requirements, designs and accompanying documentation	B, DK, E, F(0.03), I(0.03), SF(0.01)	GR, IRL, UK	EQ, FI, IS(0.0008)	AS, IP, ME(0.07)
Procedure for controlling changes to code and specifications	D, DK, E, F, I, N, S, SF	A, B, IRL, NL	EQ, FI, IS(0.03)	AS, ME
Mechanism for assuring that regression testing is routinely performed during and after initial implementation	B, F, I, UK(0.02)	DK, E, IRL, N, S	IS(0.06), IT(0.006)	AS, IP, ME
Procedures to ensure that every required function is tested/verified	A, B, E, F(0.02), GR, I	D, DK, IRL, N, S	EQ(0.07), FI, IS	AS, IP, ME(0.03)

Table 5: Shifts in adoption levels for practices related to control of the development process

Tools and Technology

The improved firms displayed an increased usage of software tools to assist in requirements tracing and also used more automated testing tools and tools for tracking and reporting status of software/subroutines in the software development library.

Figures 11 and 12 summarize the variations in the adoption levels for practices related to tools and technology for sectors and countries respectively. Table 7 summarizes the shifts in adoption levels for software practices for tools and technology across the three years.

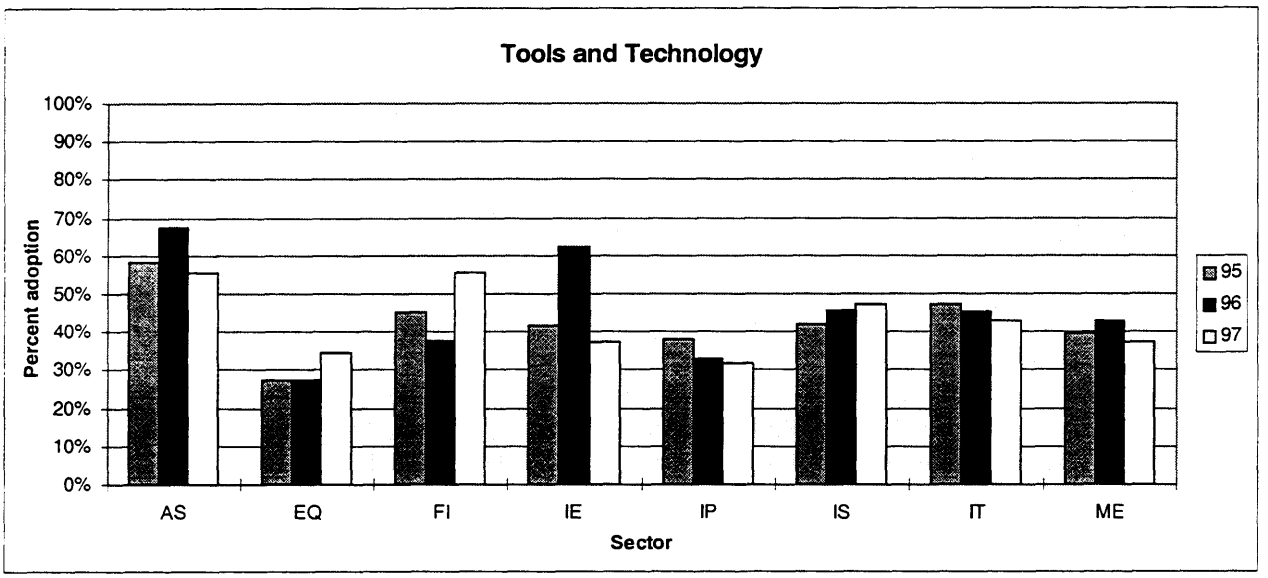

Figure 11: Adoption levels for practices related to tools and technology across sectors

Legend

AS - Air & Spacecraft	IP - Industrial Process Control Systems
EQ - Machinery, Electrical & Optical Instruments	IS - Software Consultancy and Supply
FI - Finance and Insurance	IT - Telecom Products
IE - Electronic Engineering & Technical Consultancy	ME - Mechanical Engineering & Technical Consultancy

The sectors displaying improved adoption levels are again *Machinery, Electrical & Optical Instruments*, *Finance & Insurance* and *Software Consultancy and Supply* although none are statistically significant. The sectors which dropped in adoption levels are *Indsutrial Process Control Systems* and *Telecom Products*.

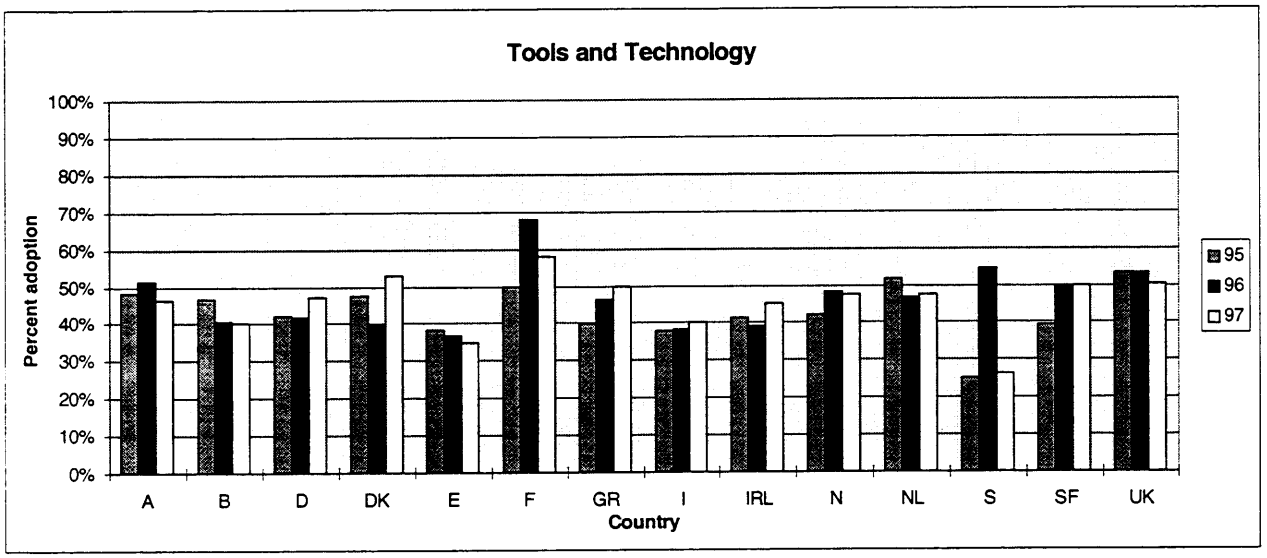

Figure 12: Adoption levels for practices related to tools and technology across countries

Legend

A - Austria	E - Spain	IRL - Ireland	SF - Finland
B - Belgium	F - France	N - Norway	UK - United Kingdom
D - Germany	GR - Greece	NL - Netherlands	
DK - Denmark	I - Italy	S - Sweden	

Among countries Greece, Italy and Finland exhibited an increase in adoption levels while Belgium and Spain dropped.

Practice	Countries		Sectors	
	Increased	Decreased	Increased	Decreased
Usage of software tools to assist in forward and backward tracing of software requirements to designs through to code	B, DK, F(0.06), I(0.06), IRL(0.02), NL, SF	E, S, UK	AS, FI(0.07), IS, IT	EQ, IE, IP(0.08), ME
Usage of design notations such as SADT in program design	D, GR, N, NL, SF	A, B, E, I, IRL, UK	EQ, FI	AS, IE(0.003), IP, IT, ME
Usage of automated testing tools	B, F, GR(0.08), IRL, SF	D, NL, UK(0.04)	IP, IS, ME	AS, FI, IT
Usage of software tools for tracking and reporting the status of software/subroutines in the software development library	D(0.003), DK, GR, I, IRL, UK	A, B, E, N, NL	EQ, IE(0.05), IP, IS, IT(0.02)	FI, ME
Usage of prototyping methods in ensuring the requirements elements of the software	DK, GR, I, N, UK	B, D(0.04), NL	FI, IE, ME	AS, IP, IT(0.08)
Availability of data dictionary for controlling and storing details of all data files and their fields	D, I, SF, UK	B, GR, IRL, NL, S	AS(0.02), IS, IT	EQ, IP, ME
Usage of software tools for project planning, estimating, scheduling and critical path analysis	A,D, N, NL	B(0.07), F, I, S, SF	EQ, ME	AS, IT(0.02)

Table 6: Shifts in adoption levels for practices related to tools and technology

Summary

Our analysis indicates that though there have been changes in the adoption levels over the years 1995, 1996 and 1997, very few noticeable trends are evident. This was corroborated by the low significance levels of the analysis results obtained. Another noticeable trait was the volatility of acceptance rates. Quite a few of the significant differences could be attributed to the large shifts (upward or downward) in adoption rates in one year and the reversion back to the original level in the next. Another interesting observations was that more or less the same set of countries and sectors registered improvements or downturns on all sections of the SBPQ. This allows us to classify some sectors and countries as having experienced an overall increase or decrease in adoption levels.

Among sectors, *Machinery, Electrical & Optical Instruments* and *Finance & Insurance* registered clear increases in adoption levels over the entire period. *Software Consultancy and Supply* also improved marginally. *Air & Spacecraft* and *Mechanical Engineering & Technical Consultancy* exhibited decreasing adoption levels over the period. Although *Electronic Engineering & Technical Consultance* and *Telecom Products* had a few significant differences in some best practices, there was no obvious trend. Practice levels for *Indsutrial Process Control Systems* varied very marginally and could be considered to be the same for all practical purposes.

For countries, the overall adoption levels are very representative of the changes in adoption over individual practices, i.e., the trends across all practices are quite similar. Among countries, Denmark, France, Greece and Italy improved adoption rates across most practices. Ireland, the Netherlands and the UK registered a decrease in adoption.

Finally, all the above results were affected by the fact that the data was not uniformly distributed across countries and sectors. About half the datapoints were from one sector, *Software Consultancy and Supply* and a majority of them from a few countries, namely Italy, Germany and Spain. A better distribution would have enabled improved consolidation of the observed trends.

We hasten to point out that the decreases, and likewise the increases, observed may be distorted due to the absence of company information. That is, it is likely that companies contributing data in prior years may not be included in subsequent years. For example, although the *Mechanical Engineering* and *Air & Spacecraft* sectors did experience statistically significant decreases, the low number of observations might indicate the possibility that data was collected from different companies over the years.

We also caution that although the best practice adoption levels have not increased as one might hope, we should not conclude that the software engineering industry is maturing at the same rate: progress in software engineering may not be visible along dimensions measured in the survey.

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