



BRAZILIAN SOFTWARE QUALITY IN 2002

Kival C. Weber, SOFTEX and Célia J. Nascimento, MCT/SEPIN

SUMMARY

1) INTRODUCTION

- 1.1) Motivation**
- 2.2) Related Work**

2) SOFTWARE QUALITY IN BRAZIL: 1995-2001

- 2.1) Awareness and Motivation**
- 2.2) Management Techniques**
- 2.3) Human Resources**
- 2.4) Technological Services**
- 2.5) Institutional Relationship**
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- 3.1) Main Trends: 1995-2001**
- 3.2) Main Challenges: ahead**
- 3.3) Software Quality & Productivity**



5 SUCCESSFUL BRAZILIAN SOFTWARE SOLUTIONS

1) Electronic Voting

- IN THE COUNTRY'S 1998 PRESIDENTIAL ELECTIONS, A LOCALLY DEVELOPED ELECTRONIC VOTING SOFTWARE ACCOUNTED FOR 35% OF TOTAL VOTES, THUS PREVENTING FRAUD.
- NEXT OCTOBER 2002, ELECTRONIC VOTING IN THE NATIONWIDE PRESIDENTIAL ELECTIONS WILL ACCOUNT FOR A BIGGER PERCENTAGE IN AN ESTIMATED **114 MILLION ??** VOTERS.

2) Income Tax Filling

- IN 1999, CLOSE TO 2 MILLION INCOME TAX FILLINGS WERE DONE THROUGH THE INTERNET USING INNOVATIVE SOFTWARE DEVELOPED BY LOCAL FIRMS, INCLUDING THE SECURITY SOLUTION.
- LAST APRIL 2002, CLOSE TO **15 MILLION??** INCOME TAX FILLINGS WERE DONE THROUGH THE INTERNET.



5 SUCCESSFUL BRAZILIAN SOFTWARE SOLUTIONS

3) Banking Automation

- **THE USER-SUPPLIER RELATIONS ESTABLISHED BY LOCAL FIRMS IN AREAS LIKE BANKING AUTOMATION ENGENDER IMPORTANT R&D EFFORTS, MAINLY IN SOFTWARE.**
- **THIS HAS CONTRIBUTED TO THE DIFFUSION OF IT IN LINE WITH LOCAL NEEDS AND TO EXPORT BRAZILIAN INTERNET BANKING SOFTWARE.**

4) Embedded Software

- **MANY FOREIGN MULTINATIONAL ITC MANUFACTURERS (ESPECIALLY IN TELECOM, SUCH AS ERICSSON, MOTOROLA, NEC, AND SIEMENS) ARE INVESTING IN R&D LOCALLY, MAINLY IN EMBEDDED SOFTWARE.**

5) Enterprise Application (ERP)

- **THERE ARE MANY SUCCESSFUL LOCAL SOFTWARE COMPANIES COMPETING IN THE MIDDLE MARKET SELLING THEIR OWN ERP SOLUTIONS.**



BRAZILIAN IT MARKET: 1991-2001 **(US\$ BILLION)**

Segment	1991	1993	1995	1997	1999^a	2001^b	1991-2001^c
Hardware	4.1	4.5	5.9	7.5	6.1	7.2	5.8%
Technical services	1.9	2.4	3.5	4.3	3.3	4.0	7.7%
Software (packaged and custom)	1.1	1.5	1.9	3.2	3.0	3.8	13.2%
Total	7.1	8.4	11.3	15.0	12.4	15.0	7.8%

Source: MCT/SEPIN (2002).

^a1999 Devaluation of the exchange rate. ^b 2001 Estimate. ^c1991–2001 Average annual growth.

Remarks:

- 1) In 2001, the Brazilian software market was worth US\$ 3.8 billions and the total Brazilian IT market amounted to US\$ 15.0 billions.**
- 2) The share of software in the overall Brazilian IT industry has been advancing in the last 11 years, going from 15% in 1991 to 25% in 2001.**
- 3) There are more than 2,500 software firms in Brazil, employing about 165,000 people.**

GOOD SOFTWARE ENGINEERING MUST INCLUDE A STRATEGY FOR PRODUCING QUALITY SOFTWARE

Thus, we must consider **quality** in at least 3 ways:

1) THE QUALITY OF THE SOFTWARE PROCESS

- related to the software life-cycle processes (ISO / IEC 12207)
- based on software process assessments (ISO 9001:2000, CMM, and ISO/IEC TR 15504 SPICE)

2) THE QUALITY OF THE SOFTWARE PRODUCT

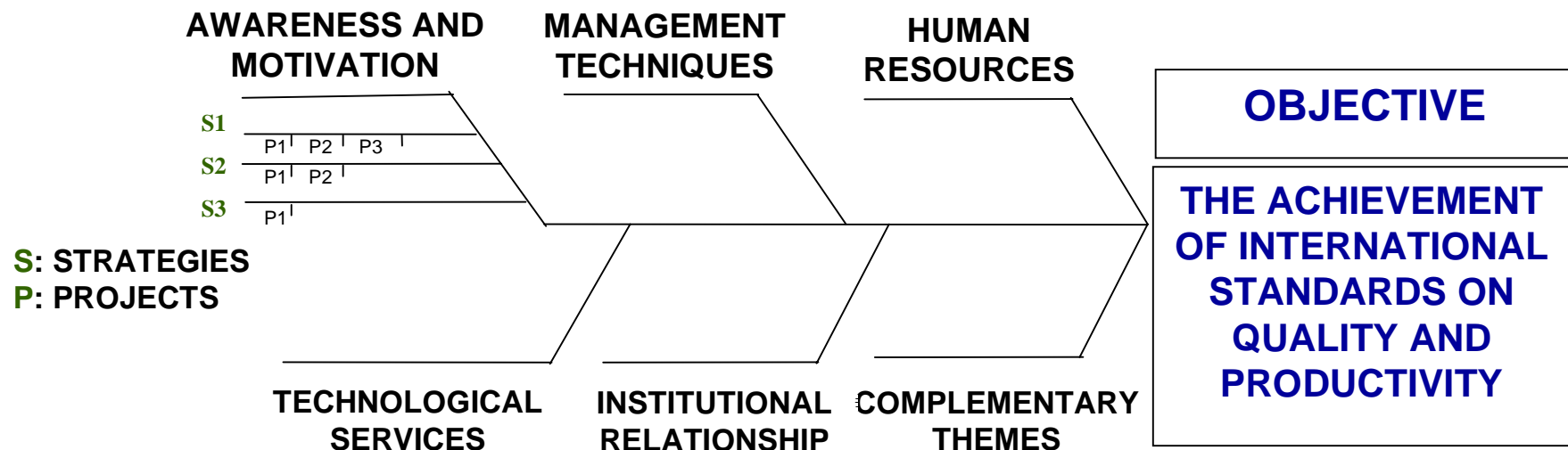
- evaluated both by external and internal metrics (ISO/IEC 9126, parts 1-3)
- evaluated by the quality in use metrics (ISO/IEC 9126, part 4)

3) THE QUALITY IN THE CONTEXT OF THE BUSINESS ENVIRONMENT

- in which the product will be used (e.g. ROI model for time and money)

Ref.: Shari Pfleeger. *Software Engineering: Theory and Practice*. 2d ed, Prentice-Hall, 2001.

BRAZILIAN PROGRAM ON QUALITY AND PRODUCTIVITY (PBQP)



Remarks:

- 1) The PBQP was created in 1990.
- 2) The PBQP/Software was created in 1993 and it is based on the triple helix model (government, industry, and academia memberships).
- 3) The PBQP/Software surveys the Brazilian software quality changes over time: 1995, 1997, 1999, and 2001.



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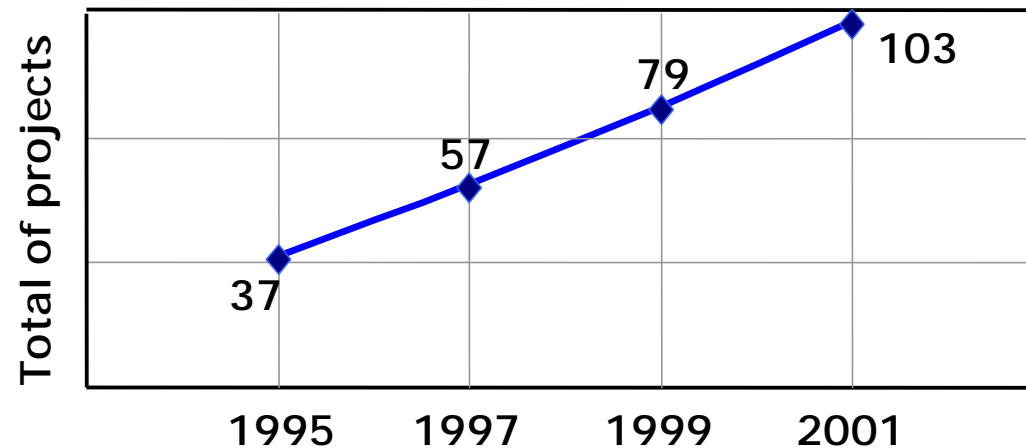
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- 3.2) Main Challenges: ahead**
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SOFTWARE QUALITY IN BRAZIL: 1995-2001

Awareness and Motivation

Projects approved by PBQP/Software



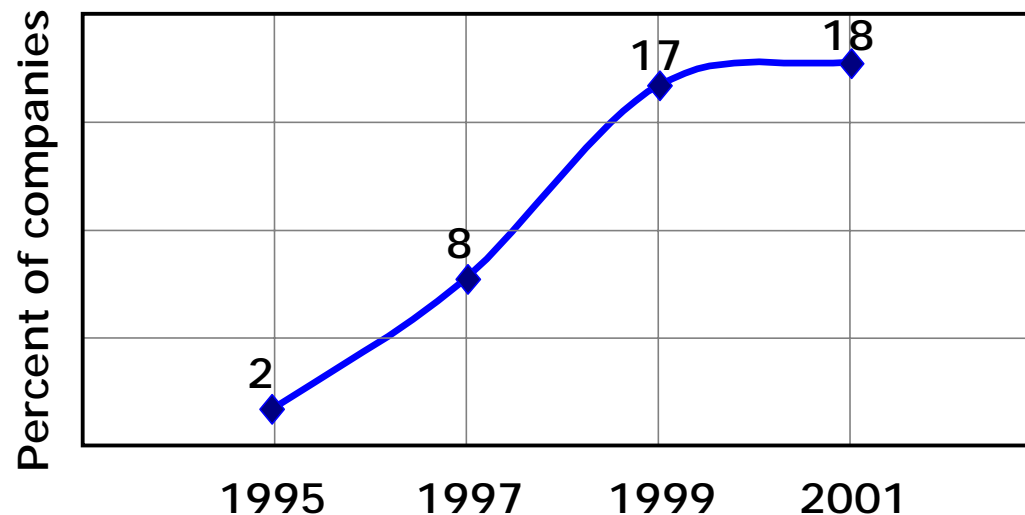
Remarks:

- The *Dorgival Brandão Junior Award* is annually given to the best PBQP/Software project.
- The awareness of the Brazilian software companies is increasing in relation to the need of quality in their products.
- In 1995, the ISO/IEC 12207 was published; in 1997, 5% of the software companies in Brazil had experimented with it; and in 2001, this raised to 15%.

SOFTWARE QUALITY IN BRAZIL: 1995-2001

Management Techniques

ISO 9000 certification in the Brazilian software companies



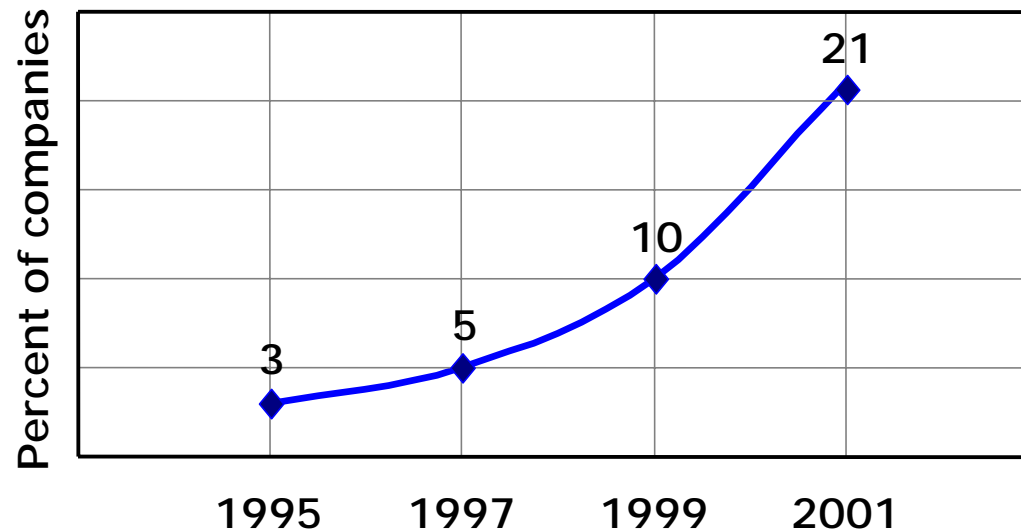
Remarks:

- In 1995, 2% of the software companies in Brazil had achieved the ISO 9000 certification; in 2001, this number was 18%.
- From 1995 on small and medium-size Brazilian software companies were joining in cooperative schemes to achieve ISO 9000 certification.

SOFTWARE QUALITY IN BRAZIL: 1995-2001

Management Techniques

Experiment with the CMM in the
Brazilian software companies



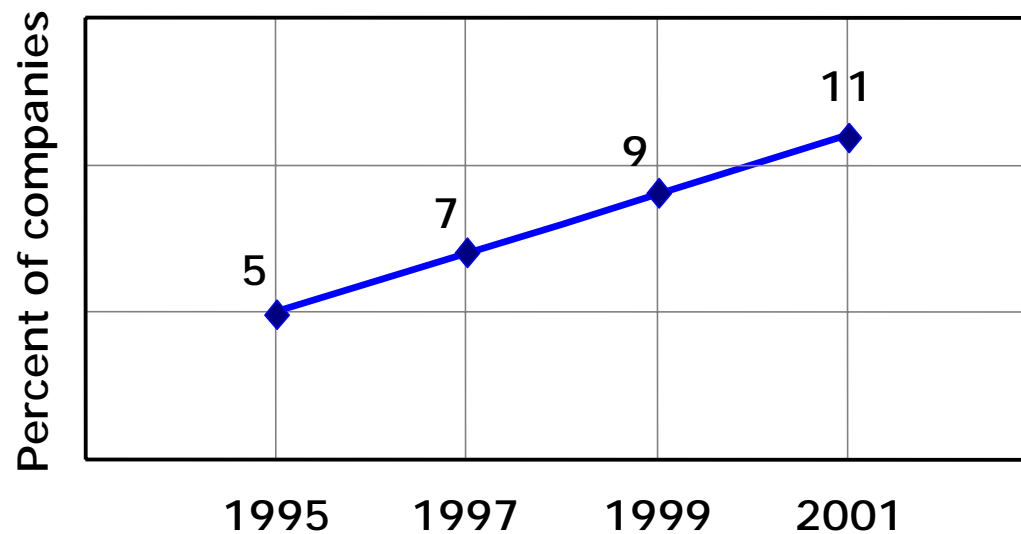
Remarks:

- In 1995, 3% of the software companies in Brazil had experimented with the CMM; in 2001, 21%.
- Other software process models are also being diffused in Brazil, such as the SPICE, PSP, and TSP.

SOFTWARE QUALITY IN BRAZIL: 1995-2001

Technological Services

Experiment with the ISO/IEC 9126 in the Brazilian software companies



Remarks:

- In 1995, there was only 1 independent laboratory in Brazil able to evaluate software products based on the ISO/IEC 9126; in 2001, there were 6.
- Software process certification services based on the ISO 9000 and the CMM & SPICE evaluation services are available in Brazil.

SOFTWARE QUALITY IN BRAZIL: 1995-2001

Human Resources

- From 1995 on the Brazilian software companies had invested about 3% of their annual net revenues in training people on quality improvement.
- It is increasing the number of Computer Science departments in the Brazilian universities which has software quality as an important research topic.
- It is increasing the number of master and doctor degrees of Software Quality in Brazil.

Institutional Relationship

- There is a strong cooperation among the Brazilian universities - companies - government in the software quality area.

Complementary Themes

- The Brazilian software quality surveys made every 2 years follows the main software engineering and software marketing methods, best practices, and tools which are being used by the software companies in Brazil.



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MAIN TRENDS ON SOFTWARE QUALITY IN BRAZIL: 1995-2001

- 1) It is increasing the number of master and doctor degrees of Software Quality in Brazil**
- 2) It is increasing the cooperation among the Brazilian universities-companies-government in the software quality area.**
- 3) It is increasing the awareness of the Brazilian software companies related to the need of quality in their products.**
- 4) It is increasing the percent of software companies in Brazil which have experimented with the ISO/IEC 9126 to evaluate their software products.**
- 5) It is increasing the percent of software companies in Brazil which have achieved the ISO 9000 certification or which have experimented with the CMM, based on assessments of their software processes.**
- 6) Thus, it is continuously improving the software quality in Brazil.**

MAIN CHALLENGES AHEAD

- 1) We must improve the software quality in Brazil in the next years.**
- 2) We must also achieve international standards on productivity in the software sector.**

NATIONAL DATABASES OF SOFTWARE QUALITY AND PRODUCTIVITY INFORMATION

- Brazil has national databases of software quality information, but national databases of productivity information in the Brazilian software industry are still in the beginning.
- From 1999 onwards, the nationwide surveys have comprised two parts: the traditional one on Software Quality, with a software engineering approach; and another on the Systemic Productivity (SP) of the Brazilian software industry, with a macroeconomic approach.
- The results from 1999 and the preliminary data from 2001 on the SP are available at MCT/SEPIN <<http://www.mct.gov.br/sepim>>, but in order to include the SP into the analysis would be a matter for another presentation.



Thank You !

Questions ?