

# FUNCTION POINT APPROXIMATION WITH THE FIVE LOGICAL COMPONENTS

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## 2    **Motivation**

Project estimations are required as early as possible from the contractors. Since Function Point counts are based on the requirements documentation, so called Function Point prognoses or approximations proved to be helpful in praxis. Our experience shows, that the necessary information for such approximations can be gained very early, at the beginning of a project in discussions with the project leader. We collect the information about interfaces and parts of the project together with the Competence Center and document it as a diagram of the application boundary, which is also used for our architecture atlas. Since we developed a Function Point Prognosis (see FESMA Conferences 1998 and 1999), we were curious to find out as an alternative how good results of an approximation with the five logical components could be, especially since we did not find any figures in the literature giving hints as to how precise this method would be.

### 3 Environment

From 1996 to 1999 39 Function Point counts with totally 77,865 Function Points (FPs) have been accomplished in CNV AG, the outsourced non-insurance part of AXA Colonia Insurance. **FPs mean throughout this paper IFPUG 4.0 unadjusted FPs.** Function Point counts in CNV AG are obligatory at least at the end of the Requirements Analysis, end of the Design Phase and at project post mortem. Small projects are only counted twice (not at the end of the Design Phase). A Function Point Prognosis instead of a count is obligatory during the Feasibility study and at Project start.

The IT Department of the CNV AG includes about 600 IT Professionals with approximately 50 project leaders. The insurance branches deliver about 160 IT coordinators supporting the IT projects. IT development is mostly host based with COBOL / Generator programming. There are about 500 IMS databases and 2,000 DB2 tables, 1.6 Million IMS- and 1.2 Million CICS transactions per day. PC projects use Optima++, a C++ Shell, for programming. The Multi-project Management Tool Business Engine administers about 250 MS Project Plans with 19,000 assignments of 800 persons delivering timesheets for weekly planning and monthly accounting.

Projects develop mostly interactive database administration systems for auto, health, or life insurance or claims management, within a very complex environment with centralized data bases for insurance partners, cash systems, document management, etc.

### 4 Investigations

We used our project register data base (*see Fig. 1 end of the report*) which shows detailed information for each FP count, giving the quantity of EI's, EO's, EQ's, ILF's and EIF's. If a project was counted repeatedly only the most actual count is shown and older counts are kept in a history table.

**Fig. 2** (*see end of the report*) shows the according FPs as well as sums for the FPs of the EI's, EO's, EQ's, ILF's and EIF's. The last two lines in this Table are for comparison with Morris/ Desharnais<sup>1</sup> and the Quick Estimate mode of Checkpoint, Estimation tool from Capers Jones' firm SPR (Software Productivity Research) in Burlington, MA.

From **Fig. 2**, it can easily be seen, that EO's dominate in CNV AG ( 39% ) compared with the other two sources ( 22%-24% ) in literature, whereas ILF's are of minor importance ( 17% vs. 24%, 43%, respectively ). Because of this peculiarity, one conclusion was not to use Checkpoint ( EIF + ILF = 46% vs. 23 % in CNV ) in Quick Estimate mode to estimate FPs. The reason for the minor importance of ILF's may be that CNV AG has many centralized databases which are widely referenced by almost all applications.

Of course we left one runaway (Project No. 21 in **Fig. 1**) out of the calculation. It is our centralized data base for document management which delivered 38,863 EO FPs in a count of 39,044 unadjusted FPs.

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<sup>1</sup> P. M. Morris (Total Metrics), J. M. Desharnais (SELAM): „Validation of the Function Point Counts“, in: Metricviews, Summer 1996, p. 30

### 4.1 Function Point Proportions

We calculated from this project register data base the percentage of the five components (see following Fig. 3). Since we did this investigation twice, both results are given and proved to be consistent. Some values from literature are enclosed for information.

| Function Proportions (Percentage) | Number of Projects | EI          | EO        | EQ          | ILF         | EIF        |
|-----------------------------------|--------------------|-------------|-----------|-------------|-------------|------------|
| CNV 1996                          | 8                  | 34          | 35        | 11          | 18          | 2          |
| CNV 1997                          | 12                 | 18          | 43        | 12          | 18          | 9          |
| <b>CNV 1996/97 = FESMA 1998</b>   | <b>20</b>          | <b>27</b>   | <b>39</b> | <b>11</b>   | <b>18</b>   | <b>5</b>   |
| CNV 1998                          | 19                 | 21          | 41        | 13          | 15          | 9          |
| <b>CNV Σ (1996-1998)</b>          | <b>39</b>          | <b>25</b>   | <b>39</b> | <b>14</b>   | <b>17</b>   | <b>6</b>   |
| ISBSG Rel. 5                      | 451                | 37,2        | 23,5      | 13,2        | 22,3        | 3,8        |
| Metricviews                       |                    | 26-39       | 22-24     | 12-14       | 24          | 4-12       |
| Checkpoint                        |                    | 20          | 24        | 10          | 43          | 3          |
| Nigel Scrivens *)                 |                    | 33          | 21        | 19          | 23          | 4          |
| ISBSG Rel. 5 Enhancement Projects | 119                | 36          | 32        | 12          | 15          | 5          |
| <b>Average of this table:</b>     |                    | <b>28,6</b> | <b>26</b> | <b>13,8</b> | <b>20,1</b> | <b>5,8</b> |

\*) Nigel Scrivens from shl.com via Internet reported industry averages

**Fig. 3: Function Proportions – FPP (Percentage)**

The results of Fig. 3 can be used as a rule of thumb, if either the EI’s, EO’s, EQ’s, ILF’s or EIF’s of a count are known (e.g. FPs = 100 \* EI / 28,6 using the last table row, or FPs = 100 \* EO / 26) – that’s what literature recommends.

### 4.2 Average Function Complexity

We used the EXCEL problem solver to calculate from the project register data base the average function complexity of the five components. It is widely agreed that this measure is stable and can be used as a rule of thumb, if at least one of the five logical components of a count is known in quantity. SPR Function Points e.g. use the average IFPUG classification for Function Point estimation. The results are shown in the following Fig. 4, the values are given for PC - Projects, Host - Projects and both and the data of the ISBSG Report „The Benchmark“, Release 5 are included.

| Average Function Complexity | IFPUG                | EI         | EO         | EQ         | ILF        | EIF        |
|-----------------------------|----------------------|------------|------------|------------|------------|------------|
|                             |                      |            | <b>4</b>   | <b>5</b>   | <b>4</b>   | <b>10</b>  |
| ISBSG Rel. 5                | <b>Total</b>         | <b>4,3</b> | <b>5,4</b> | <b>3,8</b> | <b>7,4</b> | <b>5,5</b> |
|                             | <b>Asia Pacific</b>  | 4,0        | 5,6        | 3,9        | 7,4        | 5,6        |
|                             | <b>Europe</b>        | 4,2        | 4,9        | 3,8        | 7,2        | 5,3        |
|                             | <b>North America</b> | 4,9        | 5,2        | 3,8        | 7,6        | 5,5        |
| CNV 1998                    | <b>All</b>           | <b>4,6</b> | <b>5,5</b> | <b>4,3</b> | <b>8,0</b> | <b>5,9</b> |
|                             | <b>PC</b>            | 4,1        | 5,7        | 3,9        | 7,1        | 5,3        |
|                             | <b>Host</b>          | 4,9        | 5,5        | 4,6        | 8,5        | 6,1        |
| CNV 1999                    | <b>All</b>           | <b>4,6</b> | <b>5,7</b> | <b>4,3</b> | <b>8,2</b> | <b>6,1</b> |
|                             | <b>PC</b>            | 4,0        | 5,7        | 3,9        | 7,3        | 5,4        |
|                             | <b>Host</b>          | 4,8        | 5,7        | 4,5        | 8,5        | 6,2        |

**Fig. 4: Average Function Complexity (ACFP)**

## 5    Main Result

In the next step we calculated for each logical component the Function Points (ACFP) using the average function complexity and the Proportion, as well as its difference compared to the unadjusted Function Points (both value and percentage).

Of course we left out the runaways; i.e. the above mentioned application and all counts which had at least one of the five logical components missing which would have disturbed the calculation with the value zero. This leads to different data samples (see **Fig. 3 – 7** at the end of the report). The results are shown in the following **Fig. 5**.

|              | <b>Unadjusted FPs<br/>( UFP )</b> | <b>ACFP = Average<br/>complexity FPs</b> | <b>Difference<br/>UFP-ACFP</b> | <b>Difference in %<br/>UFP-ACFP</b> |
|--------------|-----------------------------------|--|--------------------------------|-------------------------------------|
| <b>EI's</b>  | 24,857                            | 22,668                                   | 9,083                          | 39.9                                |
| <b>EO's</b>  | 27,800                            | 27,254                                   | 7,979                          | 37.0                                |
| <b>EQ's</b>  | 22,654                            | 17,821                                   | 10,208                         | 48.4                                |
| <b>ILF's</b> | 24,234                            | 19,665                                   | 8,620                          | 41,5                                |
| <b>EIF's</b> | 16,032                            | 7,900                                    | 8,663                          | 43,8                                |

**Fig. 5: Errors**

The errors are astonishingly high – astonishing since it is widely agreed that this measure can be used as a rule of thumb and therefore is expected to be relatively precise. The fact, that EO's dominate in CNV shows its effect in **Fig. 5** in so far, that FP approximation with EO's results in the lowest error of 37 % in this table. The error for EI's is also relatively low with 40 %. Since estimation has much to do with uncertainty, estimation errors of less than 20 % are sometimes accepted. In this case FP approximation with average function complexity cannot be recommended since the errors are more than 37 %.

## 6    Conclusion

Because of the high error rate (37 - 48,4 %), we cannot recommend our project leaders the rule of thumb for FP approximation with the five components. Compared to the Function Point Prognosis with regression analysis (see FESMA papers 1998 and 1999) which gave us a formula to calculate the FPs from the number of EI's and EO's with an error of 13 %, this approximation cannot be recommended for early FP approximation.

Our findings show that such data collections can be used to find heuristic solutions for FP - approximations or prognosis using average Function Points, Function Ratios or regression formulae. But there is evidence that different environments demand for according solutions. Hence each firm should develop its own know - body of heuristic solutions and should distinguish between different development platforms etc. (if enough data are available) when doing so.

## 7    **Literature**

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Fig. 1 – Statistics – FPM Quantities

| FPM-Quantities |      |       |           |                |      |      |                |      |      |          |                |      |      |            |                 |      |      |                 |      |      |           |             |           |       |
|----------------|------|-------|-----------|----------------|------|------|----------------|------|------|----------|----------------|------|------|------------|-----------------|------|------|-----------------|------|------|-----------|-------------|-----------|-------|
| Project No.    | Type | Date  | Milestone | Quantity of EI |      |      | Quantity of EO |      |      | Σ IO-Qu. | Quantity of EQ |      |      | Σ EI,EO,EQ | Quantity of ILF |      |      | Quantity of EIF |      |      | Σ ILF,EIF | Σ FP unadj. | Σ FP adj. | Ø VAF |
|                |      |       |           | LOW            | AVE. | HIGH | LOW            | AVE. | HIGH |          | LOW            | AVE. | HIGH |            | LOW             | AVE. | HIGH | LOW             | AVE. | HIGH |           |             |           |       |
| 1              | H    | 1 96  | A         | 75             | 32   | 32   | 42             | 43   | 44   | 268      | 4              | 7    | 1    | 280        | 40              | 10   | 1    | 21              | 1    | 3    | 76        | 1819        | 2019      | 1.11  |
| 2              | H    | 8 96  | A         | 3              | 4    | 152  | 61             | 34   | 91   | 345      | 34             | 13   | 57   | 449        | 20              | 28   | 0    | 0               | 0    | 2    | 50        | 2924        | 2661      | 0.91  |
| 3              | H    | 8 96  | ST        | 6              | 4    | 167  | 58             | 33   | 91   | 359      | 34             | 13   | 62   | 468        | 9               | 28   | 0    | 0               | 0    | 0    | 37        | 2939        | 3174      | 1.08  |
| 4              | BÜ   | 8 96  | ST        | 16             | 30   | 0    | 0              | 0    | 0    | 46       | 0              | 0    | 0    | 46         | 0               | 0    | 0    | 0               | 0    | 0    | 0         | 168         | 123       | 0.73  |
| 5              | H    | 8 96  | A         | 2              | 154  | 1    | 53             | 84   | 89   | 383      | 0              | 51   | 0    | 434        | 13              | 27   | 0    | 1               | 0    | 0    | 41        | 2453        | 2330      | 0.95  |
| 6              | PC   | 10 96 | A         | 166            | 30   | 104  | 53             | 20   | 26   | 399      | 23             | 8    | 29   | 459        | 99              | 3    | 0    | 0               | 0    | 0    | 102       | 2734        | 3335      | 1.22  |
| 7              | H    | 10 96 | A         | 18             | 27   | 21   | 7              | 2    | 42   | 117      | 3              | 19   | 5    | 144        | 14              | 4    | 0    | 1               | 1    | 0    | 20        | 885         | 991       | 1.12  |
| 8              | H    | 12 96 | A         | 0              | 35   | 2    | 0              | 35   | 1    | 73       | 0              | 0    | 0    | 73         | 35              | 0    | 0    | 15              | 0    | 0    | 50        | 654         | 713       | 1.09  |
| Σ              |      | 1996  |           | 286            | 316  | 479  | 274            | 251  | 384  | 1990     | 98             | 111  | 154  | 2353       | 230             | 100  | 1    | 38              | 2    | 5    | 376       | 14576       | 15347     | 1.03  |
| 9              | PC   | 1 97  | A         | 9              | 5    | 3    | 6              | 2    | 20   | 45       | 10             | 3    | 4    | 62         | 8               | 0    | 1    | 2               | 0    | 0    | 11        | 386         | 367       | 0.95  |
| 10             | H    | 3 97  | A         | 6              | 58   | 22   | 1              | 201  | 13   | 301      | 11             | 26   | 15   | 353        | 6               | 14   | 7    | 1               | 1    | 3    | 32        | 2038        | 1855      | 0.91  |
| 11*1)          | H    | 4 97  | ST        | 7              | 41   | 9    | 0              | 111  | 9    | 177      | 1              | 6    | 6    | 190        | 6               | 9    | 1    | 2               | 3    | 7    | 28        | 1168        | 1156      | 0.99  |
| 12*2)          | PC   | 5 97  | A         | 1              | 6    | 10   | 0              | 2    | 4    | 23       | 2              | 4    | 7    | 36         | 11              | 0    | 0    | 2               | 0    | 0    | 13        | 276         | 248       | 0.90  |
| 13             | PC   | 5 97  | A         | 36             | 8    | 16   | 7              | 19   | 8    | 94       | 33             | 11   | 3    | 141        | 21              | 0    | 0    | 0               | 0    | 0    | 21        | 723         | 694       | 0.96  |
| 14             | PC   | 6 97  | A         | 39             | 17   | 3    | 2              | 2    | 4    | 67       | 25             | 12   | 8    | 112        | 15              | 1    | 0    | 1               | 0    | 0    | 17        | 540         | 470       | 0.87  |
| 15             | PC   | 12 97 | A         | 3              | 2    | 8    | 12             | 18   | 17   | 60       | 58             | 23   | 4    | 145        | 12              | 1    | 0    | 9               | 0    | 0    | 22        | 751         | 736       | 0.98  |
| 16             | H    | 7 97  | A         | 13             | 3    | 107  | 86             | 68   | 123  | 400      | 6              | 7    | 15   | 428        | 68              | 17   | 8    | 49              | 7    | 6    | 155       | 3494        | 3774      | 1.08  |
| 17             | BÜ   | 7 97  | N         | 3              | 0    | 0    | 1              | 0    | 15   | 19       | 0              | 0    | 0    | 19         | 25              | 4    | 5    | 68              | 9    | 2    | 113       | 831         | 607       | 0.73  |
| 18             | PC   | 12 97 | A         | 17             | 13   | 13   | 1              | 1    | 5    | 50       | 17             | 5    | 19   | 91         | 13              | 1    | 0    | 3               | 0    | 2    | 19        | 546         | 546       | 1.00  |
| 19             | PC   | 12 97 | N         | 6              | 2    | 0    | 0              | 0    | 0    | 8        | 2              | 4    | 0    | 14         | 3               | 0    | 0    | 3               | 0    | 0    | 6         | 84          | 82        | 0.98  |
| 20             | PC   | 12 97 | N         | 0              | 0    | 0    | 0              | 86   | 95   | 181      | 0              | 0    | 0    | 181        | 0               | 0    | 0    | 12              | 1    | 0    | 13        | 1162        | 906       | 0.78  |
| Σ              |      | 1997  |           | 140            | 155  | 191  | 116            | 510  | 313  | 1425     | 165            | 101  | 81   | 1772       | 188             | 47   | 22   | 152             | 21   | 20   | 450       | 11999       | 11441     | 0.93  |
| 21             | H    | 3 98  | A         | 0              | 3    | 41   | 0              | 0    | 5515 | 5559     | 0              | 1    | 4    | 5564       | 1               | 4    | 1    | 0               | 3    | 7    | 16        | 39044       | 39434     | 1.01  |
| 22             | H    | 3 98  | A         | 20             | 7    | 4    | 4              | 21   | 151  | 207      | 3              | 3    | 0    | 213        | 6               | 1    | 0    | 35              | 9    | 4    | 55        | 1641        | 1608      | 0.98  |
| 23             | H    | 3 98  | A         | 0              | 0    | 16   | 0              | 0    | 9    | 25       | 0              | 0    | 0    | 25         | 1               | 2    | 0    | 0               | 2    | 0    | 5         | 200         | 194       | 0.97  |
| 24             | H    | 4 98  | N         | 22             | 17   | 57   | 7              | 135  | 83   | 321      | 54             | 42   | 48   | 465        | 39              | 6    | 19   | 15              | 4    | 5    | 88        | 3149        | 2866      | 0.91  |
| 25             | H    | 5 98  | N         | 11             | 7    | 16   | 0              | 1    | 10   | 45       | 4              | 3    | 0    | 52         | 8               | 1    | 2    | 1               | 0    | 0    | 12        | 357         | 336       | 0.94  |
| 26             | H    | 5 98  | N         | 18             | 6    | 23   | 0              | 2    | 17   | 66       | 8              | 3    | 0    | 77         | 10              | 1    | 1    | 6               | 1    | 0    | 19        | 513         | 482       | 0.94  |
| 27             | H    | 5 98  | N         | 18             | 8    | 29   | 0              | 0    | 18   | 73       | 8              | 2    | 1    | 84         | 10              | 1    | 1    | 6               | 1    | 0    | 19        | 556         | 517       | 0.93  |
| 28             | PC   | 7 98  | N         | 6              | 0    | 0    | 2              | 1    | 0    | 9        | 2              | 0    | 0    | 11         | 2               | 0    | 0    | 1               | 0    | 0    | 3         | 56          | 43        | 0.76  |
| 29             | H    | 7 98  | N         | 0              | 5    | 3    | 0              | 4    | 1    | 13       | 0              | 1    | 0    | 14         | 1               | 0    | 0    | 4               | 0    | 5    | 10        | 146         | 112       | 0.77  |
| 30             | PC   | 7 98  | N         | 34             | 16   | 3    | 0              | 4    | 0    | 57       | 64             | 7    | 5    | 133        | 15              | 3    | 3    | 1               | 0    | 0    | 22        | 639         | 690       | 1.08  |
| 31             | H    | 9 98  | A         | 7              | 1    | 0    | 1              | 19   | 61   | 89       | 0              | 2    | 0    | 91         | 4               | 2    | 0    | 4               | 2    | 0    | 12        | 641         | 551       | 0.86  |
| 32             | H    | 9 98  | A         | 0              | 0    | 0    | 0              | 0    | 9    | 9        | 0              | 0    | 0    | 9          | 0               | 0    | 0    | 3               | 0    | 3    | 6         | 108         | 73        | 0.68  |
| 33             | H    | 9 98  | N         | 21             | 32   | 36   | 26             | 46   | 20   | 181      | 5              | 6    | 31   | 223        | 26              | 1    | 1    | 18              | 1    | 2    | 49        | 1430        | 1430      | 1.00  |
| 34             | H    | 9 98  | N         | 3              | 3    | 30   | 2              | 10   | 6    | 54       | 8              | 5    | 18   | 85         | 14              | 1    | 0    | 1               | 0    | 0    | 16        | 566         | 594       | 1.05  |
| 35             | H    | 10 98 | N         | 0              | 11   | 1    | 0              | 3    | 0    | 15       | 0              | 6    | 0    | 21         | 0               | 3    | 0    | 0               | 3    | 0    | 6         | 140         | 113       | 0.81  |
| 36             | H    | 11 98 | N         | 2              | 0    | 5    | 8              | 6    | 13   | 34       | 2              | 0    | 11   | 47         | 1               | 1    | 1    | 3               | 2    | 3    | 11        | 352         | 271       | 0.77  |
| 37             | H    | 11 98 | A         | 0              | 20   | 0    | 0              | 32   | 0    | 52       | 0              | 5    | 0    | 57         | 0               | 3    | 0    | 0               | 13   | 0    | 16        | 381         | 305       | 0.80  |
| 38             | H    | 11 98 | A         | 2              | 1    | 8    | 7              | 9    | 9    | 36       | 2              | 0    | 4    | 42         | 1               | 1    | 2    | 5               | 2    | 3    | 14        | 340         | 265       | 0.78  |
| 39             | H    | 11 98 | N         | 2              | 7    | 4    | 5              | 8    | 28   | 54       | 3              | 1    | 2    | 60         | 9               | 1    | 1    | 1               | 0    | 1    | 13        | 442         | 451       | 1.02  |
| Σ**)           |      | 1998  |           | 166            | 141  | 235  | 62             | 301  | 435  | 1340     | 163            | 86   | 120  | 1709       | 147             | 28   | 31   | 104             | 40   | 26   | 376       | 11657       | 50336     | 0.90  |
| Σ**)           |      | all   |           | 592            | 612  | 905  | 452            | 1062 | 1132 | 4755     | 426            | 298  | 355  | 5834       | 565             | 175  | 54   | 294             | 63   | 51   | 1202      | 38232       | 77124     | 0.95  |
| Quant.Pro      |      | sum   |           | 15.2           | 15.7 | 23.2 | 11.6           | 27.2 | 29.0 | 122      | 10.9           | 7.6  | 9.1  | 150        | 14.5            | 4.5  | 1.4  | 7.5             | 1.6  | 1.3  | 31        | 40221       | 81136     |       |
| Median         |      |       |           | 9              | 8    | 15   | 7              | 19   | 17   | 63       | 8              | 6    | 8    | 88         | 11              | 3    | 1    | 3               | 2    | 3    | 19        | 602.5       | 573       |       |

\*1) not used: Determination Coefficient 0,85. (If used, Function Points sum up to 1576).

\*2) not used: safety surplus 200 FP, Determination Coefficient 0,986. (If used, Function Points sum up to 1325.)

FPM-Quantities: Quantities of transactions and data files according to IFPUG 4.0

Milestone: Draft: ST / Requirements: SP / Project Post Mortem: N / Application (running, Base Count): A

Type: H = Host, BÜ = Migration / VAF = Value Adjustment Factor according to IFPUG 4.0

\*\* ) without line 27 (runaway)

Fig. 2 – Statistics – FPM Statistics

| FPM-Statistics                   |      |      |          |                    |             |                    |             |                    |              |                    |             |                    |             |             |             |                    |             |                    |             |              |
|----------------------------------|------|------|----------|--------------------|-------------|--------------------|-------------|--------------------|--------------|--------------------|-------------|--------------------|-------------|-------------|-------------|--------------------|-------------|--------------------|-------------|--------------|
| Proj.                            | Type | Kind | Duration | EI- FP             |             | EO- FP             |             | EI, EO - FP        |              | EQ- FP             |             | EI, EO, EQ - FP    |             | ILF- FP     |             | EIF- FP            |             | ILF, EI-FP         |             | unadi.       |
| No.                              |      |      | Months   | Σ                  | /FP         | Σ                  | /FP         | Σ                  | /FP          | Σ                  | /FP         | Σ                  | /FP         | Σ           | /FP         | Σ                  | /FP         | Σ                  | /FP         | Σ FP         |
| 1                                | H    | N    | 35       | 545                | 0.30        | 691                | 0.38        | 1236               | 0.679        | 46                 | 0.03        | 1282               | 0.70        | 395         | 0.22        | 142                | 0.08        | 537                | 0.30        | 1819         |
| 2                                | H    | W    |          | 937                | 0.32        | 1051               | 0.36        | 1988               | 0.68         | 496                | 0.17        | 2484               | 0.85        | 420         | 0.14        | 20                 | 0.01        | 440                | 0.15        | 2924         |
| 3                                | H    | W    |          | 1036               | 0.35        | 1034               | 0.35        | 2070               | 0.704        | 526                | 0.18        | 2596               | 0.88        | 343         | 0.12        | 0                  | 0           | 343                | 0.12        | 2939         |
| 4                                | BÜ   | BÜ   |          | 168                | 1.00        | 0                  | 0           | 168                | 1            | 0                  | 0           | 168                | 1.00        | 0           | 0           | 0                  | 0.00        | 0                  | 0.00        | 168          |
| 5                                | H    | N    |          | 628                | 0.26        | 1255               | 0.51        | 1883               | 0.768        | 204                | 0.08        | 2087               | 0.85        | 361         | 0.15        | 5                  | 0           | 366                | 0.15        | 2453         |
| 6                                | PC   | N    |          | 1242               | 0.45        | 494                | 0.18        | 1736               | 0.635        | 275                | 0.1         | 2011               | 0.74        | 723         | 0.26        | 0                  | 0.00        | 723                | 0.26        | 2734         |
| 7                                | H    | N    | 9        | 288                | 0.33        | 332                | 0.38        | 620                | 0.701        | 115                | 0.13        | 735                | 0.83        | 138         | 0.16        | 12                 | 0.01        | 150                | 0.17        | 885          |
| 8                                | H    | W    |          | 152                | 0.23        | 182                | 0.28        | 334                | 0.511        | 0                  | 0           | 334                | 0.51        | 245         | 0.37        | 75                 | 0.11        | 320                | 0.49        | 654          |
| <b>Σ 1996</b>                    |      |      |          | <b>4996</b>        | <b>0.34</b> | <b>5039</b>        | <b>0.35</b> | <b>10035</b>       | <b>0.688</b> | <b>1662</b>        | <b>0.11</b> | <b>11697</b>       | <b>0.80</b> | <b>2625</b> | <b>0.18</b> | <b>254</b>         | <b>0.02</b> | <b>2879</b>        | <b>0.2</b>  | <b>14576</b> |
| 9                                | PC   | N    |          | 65                 | 0.17        | 174                | 0.45        | 239                | 0.619        | 66                 | 0.17        | 305                | 0.79        | 71          | 0.18        | 10                 | 0.03        | 81                 | 0.21        | 386          |
| 10                               | H    | W    |          | 382                | 0.19        | 1100               | 0.54        | 1482               | 0.727        | 227                | 0.11        | 1709               | 0.84        | 287         | 0.14        | 42                 | 0.02        | 329                | 0.16        | 2038         |
| 11*1)                            | H    | W    |          | 239                | 0.20        | 618                | 0.53        | 857                | 0.734        | 63                 | 0.05        | 920                | 0.79        | 147         | 0.13        | 101                | 0.09        | 248                | 0.21        | 1168         |
| 12*2)                            | PC   | N    |          | 87                 | 0.32        | 38                 | 0.14        | 125                | 0.453        | 64                 | 0.23        | 189                | 0.68        | 77          | 0.28        | 10                 | 0.04        | 87                 | 0.32        | 276          |
| 13                               | PC   | N    |          | 236                | 0.33        | 179                | 0.25        | 415                | 0.574        | 161                | 0.22        | 576                | 0.80        | 147         | 0.2         | 0                  | 0.00        | 147                | 0.20        | 723          |
| 14                               | PC   | N    |          | 203                | 0.38        | 46                 | 0.09        | 249                | 0.461        | 171                | 0.32        | 420                | 0.78        | 115         | 0.21        | 5                  | 0.01        | 120                | 0.22        | 540          |
| 15                               | PC   | N    | 8        | 65                 | 0.09        | 257                | 0.34        | 322                | 0.429        | 290                | 0.39        | 612                | 0.81        | 94          | 0.13        | 45                 | 0.06        | 139                | 0.19        | 751          |
| 16                               | H    | N    |          | 693                | 0.20        | 1545               | 0.44        | 2238               | 0.641        | 136                | 0.04        | 2374               | 0.68        | 766         | 0.22        | 354                | 0.1         | 1120               | 0.32        | 3494         |
| 17                               | BÜ   | BÜ   |          | 9                  | 0.01        | 109                | 0.13        | 118                | 0.142        | 0                  | 0           | 118                | 0.14        | 290         | 0.35        | 423                | 0.51        | 713                | 0.86        | 831          |
| 18                               | PC   | N    |          | 181                | 0.33        | 44                 | 0.08        | 225                | 0.412        | 185                | 0.34        | 410                | 0.75        | 101         | 0.18        | 35                 | 0.06        | 136                | 0.25        | 546          |
| 19                               | PC   | N    |          | 26                 | 0.31        | 0                  | 0           | 26                 | 0.31         | 22                 | 0.26        | 48                 | 0.57        | 21          | 0.25        | 15                 | 0.18        | 36                 | 0.43        | 84           |
| 20                               | PC   | W    |          | 0                  | 0.00        | 1095               | 0.94        | 1095               | 0.942        | 0                  | 0           | 1095               | 0.94        | 0           | 0           | 67                 | 0.06        | 67                 | 0.06        | 1162         |
| <b>Σ 1997</b>                    |      |      |          | <b>2186</b>        | <b>0.18</b> | <b>5205</b>        | <b>0.43</b> | <b>7391</b>        | <b>0.616</b> | <b>1385</b>        | <b>0.12</b> | <b>8776</b>        | <b>0.73</b> | <b>2116</b> | <b>0.18</b> | <b>1107</b>        | <b>0.09</b> | <b>3223</b>        | <b>0.27</b> | <b>11999</b> |
| 21                               | H    | A    |          | 258                | 0.01        | 38605              | 0.99        | 38863              | 0.995        | 28                 | 0           | 38891              | 1.00        | 62          | 0           | 91                 | 0.00        | 153                | 0.00        | 39044        |
| 22                               | H    | A    |          | 112                | 0.07        | 1178               | 0.72        | 1290               | 0.786        | 21                 | 0.01        | 1311               | 0.80        | 52          | 0.03        | 278                | 0.17        | 330                | 0.20        | 1641         |
| 23                               | H    | A    |          | 96                 | 0.48        | 63                 | 0.32        | 159                | 0.795        | 0                  | 0           | 159                | 0.80        | 27          | 0.14        | 14                 | 0.07        | 41                 | 0.21        | 200          |
| 24                               | H    | N    |          | 476                | 0.15        | 1284               | 0.41        | 1760               | 0.559        | 618                | 0.2         | 2378               | 0.76        | 618         | 0.2         | 153                | 0.05        | 771                | 0.24        | 3149         |
| 25                               | H    | N    |          | 157                | 0.44        | 75                 | 0.21        | 232                | 0.65         | 24                 | 0.07        | 256                | 0.72        | 96          | 0.27        | 5                  | 0.01        | 101                | 0.28        | 357          |
| 26                               | H    | N    |          | 216                | 0.42        | 129                | 0.25        | 345                | 0.673        | 36                 | 0.07        | 381                | 0.74        | 95          | 0.19        | 37                 | 0.07        | 132                | 0.26        | 513          |
| 27                               | H    | N    |          | 260                | 0.47        | 126                | 0.23        | 386                | 0.694        | 38                 | 0.07        | 424                | 0.76        | 95          | 0.17        | 37                 | 0.07        | 132                | 0.24        | 556          |
| 28                               | PC   | N    |          | 18                 | 0.32        | 13                 | 0.23        | 31                 | 0.554        | 6                  | 0.11        | 37                 | 0.66        | 14          | 0.25        | 5                  | 0.09        | 19                 | 0.34        | 56           |
| 29                               | H    | N    |          | 38                 | 0.26        | 27                 | 0.18        | 65                 | 0.445        | 4                  | 0.03        | 69                 | 0.47        | 7           | 0.05        | 70                 | 0.48        | 77                 | 0.53        | 146          |
| 30                               | PC   | N    |          | 184                | 0.29        | 20                 | 0.03        | 204                | 0.319        | 250                | 0.39        | 454                | 0.71        | 180         | 0.28        | 5                  | 0.01        | 185                | 0.29        | 639          |
| 31                               | H    | N    |          | 25                 | 0.04        | 526                | 0.82        | 551                | 0.86         | 8                  | 0.01        | 559                | 0.87        | 48          | 0.07        | 34                 | 0.05        | 82                 | 0.13        | 641          |
| 32                               | H    | A    |          | 0                  | 0.00        | 63                 | 0.58        | 63                 | 0.583        | 0                  | 0           | 63                 | 0.58        | 0           | 0           | 45                 | 0.42        | 45                 | 0.42        | 108          |
| 33                               | H    | N    |          | 407                | 0.28        | 474                | 0.33        | 881                | 0.616        | 225                | 0.16        | 1106               | 0.77        | 207         | 0.14        | 117                | 0.08        | 324                | 0.23        | 1430         |
| 34                               | H    | N    |          | 201                | 0.36        | 100                | 0.18        | 301                | 0.532        | 152                | 0.27        | 453                | 0.80        | 108         | 0.19        | 5                  | 0.01        | 113                | 0.20        | 566          |
| 35                               | H    | N    |          | 50                 | 0.36        | 15                 | 0.11        | 65                 | 0.464        | 24                 | 0.17        | 89                 | 0.64        | 30          | 0.21        | 21                 | 0.15        | 51                 | 0.36        | 140          |
| 36                               | H    | N    |          | 36                 | 0.10        | 153                | 0.43        | 189                | 0.537        | 72                 | 0.2         | 261                | 0.74        | 32          | 0.09        | 59                 | 0.17        | 91                 | 0.26        | 352          |
| 37                               | H    | A    |          | 80                 | 0.21        | 160                | 0.42        | 240                | 0.63         | 20                 | 0.05        | 260                | 0.68        | 30          | 0.08        | 91                 | 0.24        | 121                | 0.32        | 381          |
| 38                               | H    | A    |          | 58                 | 0.17        | 136                | 0.4         | 194                | 0.571        | 30                 | 0.09        | 224                | 0.66        | 47          | 0.14        | 69                 | 0.2         | 116                | 0.34        | 340          |
| 39                               | H    | N    |          | 58                 | 0.13        | 256                | 0.58        | 314                | 0.71         | 25                 | 0.06        | 339                | 0.77        | 88          | 0.2         | 15                 | 0.03        | 103                | 0.23        | 442          |
| <b>1998/99 *</b>                 |      |      |          | <b>2472</b>        | <b>0.21</b> | <b>4798</b>        | <b>0.41</b> | <b>7270</b>        | <b>0.624</b> | <b>1553</b>        | <b>0.13</b> | <b>8823</b>        | <b>0.76</b> | <b>1774</b> | <b>0.15</b> | <b>1060</b>        | <b>0.09</b> | <b>2834</b>        | <b>0.24</b> | <b>11657</b> |
| <b>Σ *)</b>                      |      |      |          | <b>9654</b>        | <b>0.25</b> | <b>15042</b>       | <b>0.38</b> | <b>24696</b>       | <b>0.631</b> | <b>5519</b>        | <b>0.14</b> | <b>30215</b>       | <b>0.77</b> | <b>6515</b> | <b>0.17</b> | <b>2421</b>        | <b>0.06</b> | <b>8936</b>        | <b>0.23</b> | <b>39151</b> |
| <b>Metricviews <sup>1)</sup></b> |      |      |          | <b>0.26 - 0.39</b> |             | <b>0.22 - 0.24</b> |             | <b>0.48 - 0.63</b> |              | <b>0.12 - 0.14</b> |             | <b>0.60 - 0.77</b> |             | <b>0.24</b> |             | <b>0.04 - 0.12</b> |             | <b>0.28 - 0.36</b> |             | <b>1</b>     |
| <b>Checkpoint SPR</b>            |      |      |          | <b>0.20</b>        |             | <b>0.24</b>        |             | <b>0.44</b>        |              | <b>0.10</b>        |             | <b>0.54</b>        |             | <b>0.43</b> |             | <b>0.03</b>        |             | <b>0.46</b>        |             | <b>1</b>     |

\*) without runaway (project No. 21)

1) Proportions are here based on Quantities, not on Function Points

Kind: N=New Development / W= Enhancement / M= Maintenance / BÜ=Migration / A=Application

Fig. 6 – Data of EI's

| <b>DATA of EI's!</b> |                |                |                |               |                      |                   |                 |                         |                    |                    |
|----------------------|----------------|----------------|----------------|---------------|----------------------|-------------------|-----------------|-------------------------|--------------------|--------------------|
| Projekt-             | DATA OF EI'S   |                |                | SUM of EI's   | No. of EI's*         | AVE FP*100/       | EI Unadjusted   | Value Adjustment Factor | Difference from    | Diff.*100/FP_ungew |
| kürzel               | LOW            | HIGH           | AVE            | LOW+HIGHT+AVE | AVE-Complexity (4.6) | AVE EI ratio (25) | Function Points | VAF                     | AVE ratio&FP_ungew | Error in %         |
| AFW                  | 14             | 4              | 5              | 23            | 106                  | 424               | 299             | 0,82                    | 125                | 41,80602007        |
| ARC                  | 0              | 0              | 16             | 16            | 74                   | 296               | 200             | 0,97                    | 96                 | 48                 |
| ATP                  | 7              | 1              | 0              | 8             | 37                   | 148               | 642             | 0,86                    | 494                | 76,9470405         |
| BAP                  | 3              | 4              | 0              | 7             | 32                   | 128               | 298             | 0,98                    | 170                | 57,04697987        |
| BIB                  | 5              | 4              | 2              | 11            | 51                   | 204               | 171             | 0,82                    | 33                 | 19,29824561        |
| AVI                  | 3              | 2              | 8              | 13            | 60                   | 240               | 751             | 0,98                    | 511                | 68,04260985        |
| BMG                  | 18             | 4              | 2              | 24            | 110                  | 440               | 264             | 0,91                    | 176                | 66,66666667        |
| CAD                  | 0              | 0              | 22             | 22            | 101                  | 404               | 432             | 1,07                    | 28                 | 6,481481481        |
| CBA                  | 2              | 0              | 5              | 7             | 32                   | 128               | 352             | 0,77                    | 224                | 63,63636364        |
| CDS                  | 3              | 4              | 152            | 159           | 731                  | 2924              | 2851            | 1,01                    | 73                 | 2,560505086        |
| CHP                  | 0              | 5              | 3              | 8             | 37                   | 148               | 146             | 0,77                    | 2                  | 1,369863014        |
| CKA                  | 3              | 0              | 0              | 3             | 14                   | 56                | 113             | 0,84                    | 57                 | 50,44247788        |
| CVI                  | 1              | 0              | 2              | 3             | 14                   | 56                | 220             | 0,86                    | 164                | 74,54545455        |
| DOK                  | 20             | 7              | 4              | 31            | 143                  | 572               | 1641            | 1                       | 1069               | 65,14320536        |
| DOW                  | 0              | 35             | 2              | 37            | 170                  | 680               | 654             | 1,09                    | 26                 | 3,975535168        |
| ELM                  | 17             | 13             | 13             | 43            | 198                  | 792               | 546             | 1                       | 246                | 45,05494505        |
| EVS                  | 10             | 0              | 10             | 20            | 92                   | 368               | 273             | 1,03                    | 95                 | 34,7985348         |
| FKD                  | 0              | 7              | 5              | 12            | 55                   | 220               | 144             | 0,81                    | 76                 | 52,77777778        |
| GUV                  | 7              | 7              | 2              | 16            | 74                   | 296               | 395             | 1                       | 99                 | 25,06329114        |
| IKG                  | 19             | 21             | 57             | 97            | 446                  | 1784              | 3396            | 0,91                    | 1612               | 47,46760895        |
| INK                  | 12             | 5              | 87             | 104           | 478                  | 1912              | 2662            | 0,97                    | 750                | 28,17430503        |
| KDB                  | 2              | 154            | 1              | 157           | 722                  | 2888              | 2453            | 0,95                    | 435                | 17,73338769        |
| KPS                  | 11             | 7              | 16             | 34            | 156                  | 624               | 357             | 0,94                    | 267                | 74,78991597        |
| NWA                  | 1              | 6              | 10             | 17            | 78                   | 312               | 276             | 0,9                     | 36                 | 13,04347826        |
| OBJ                  | 0              | 5              | 6              | 11            | 51                   | 204               | 206             | 0,99                    | 2                  | 0,970873786        |
| ORF                  | 0              | 18             | 2              | 20            | 92                   | 368               | 389             | 0,82                    | 21                 | 5,398457584        |
| ORG                  | 7              | 29             | 17             | 53            | 244                  | 976               | 1337            | 1,01                    | 361                | 27,00074794        |
| PAC                  | 47             | 2              | 5              | 54            | 248                  | 992               | 552             | 1,07                    | 440                | 79,71014493        |
| PDB                  | 36             | 8              | 16             | 60            | 276                  | 1104              | 723             | 0,96                    | 381                | 52,69709544        |
| PMI                  | 9              | 5              | 3              | 17            | 78                   | 312               | 386             | 0,95                    | 74                 | 19,17098446        |
| PTU                  | 4              | 6              | 82             | 92            | 423                  | 1692              | 1089            | 0,86                    | 603                | 55,37190083        |
| RBS                  | 34             | 16             | 3              | 53            | 244                  | 976               | 639             | 1,08                    | 337                | 52,73865415        |
| <b>Sum</b>           | <b>295</b>     | <b>379</b>     | <b>558</b>     | <b>1232</b>   | <b>5667</b>          | <b>22668</b>      | <b>24857</b>    | <b>30</b>               | <b>9083</b>        | <b>1277,92455</b>  |
| <b>Average</b>       | <b>9,21875</b> | <b>11,8437</b> | <b>17,4375</b> | <b>38,5</b>   | <b>177,09375</b>     | <b>708,375</b>    | <b>776,7812</b> | <b>0,9375</b>           | <b>283,84375</b>   | <b>39,9351423</b>  |

Fig. 7 – Data of EO's

| <b>DATA of EO's!</b> |               |               |               |                  |                      |                   |                   |                    |                       |                    |
|----------------------|---------------|---------------|---------------|------------------|----------------------|-------------------|-------------------|--------------------|-----------------------|--------------------|
| Projekt-             | DATA of EO'S  |               |               | SUM of EO's      | No. of EO's*         | AVE EO FP*100/    | Unadjusted        | Value Adjustment   | Difference from       | Diff.*100/FP_ungew |
| kürzel               | LOW           | HIGH          | AVE           | LOW+HIGHT+AVE    | AVE-Complexity (5.7) | AVE EO ratio (39) | Function Points   | VAF                | AVE EO ratio&FP_ungew | Error in %         |
| AFW                  | 4             | 8             | 7             | 19               | 108                  | 276,9230769       | 299               | 0,82               | 22                    | 7                  |
| ARC                  | 0             | 0             | 9             | 9                | 51                   | 130,7692308       | 200               | 0,97               | 69                    | 34                 |
| ATP                  | 1             | 19            | 61            | 81               | 462                  | 1184,615385       | 642               | 0,86               | 543                   | 85                 |
| BAP                  | 25            | 1             | 8             | 34               | 194                  | 497,4358974       | 298               | 0,98               | 199                   | 67                 |
| BIB                  | 0             | 1             | 9             | 10               | 57                   | 146,1538462       | 171               | 0,82               | 25                    | 15                 |
| CON                  | 55            | 18            | 27            | 100              | 570                  | 1461,538462       | 2259              | 1,07               | 797                   | 35                 |
| AVI                  | 12            | 18            | 17            | 47               | 268                  | 687,1794872       | 751               | 0,98               | 64                    | 9                  |
| CAD                  | 4             | 1             | 33            | 38               | 217                  | 556,4102564       | 432               | 1,07               | 124                   | 29                 |
| CBA                  | 8             | 6             | 13            | 27               | 154                  | 394,8717949       | 352               | 0,77               | 43                    | 12                 |
| CDS                  | 61            | 34            | 91            | 186              | 1060                 | 2717,948718       | 2851              | 1,01               | 133                   | 5                  |
| CHP                  | 0             | 4             | 1             | 5                | 28                   | 71,79487179       | 146               | 0,77               | 74                    | 51                 |
| CKA                  | 5             | 0             | 6             | 11               | 63                   | 161,5384615       | 113               | 0,84               | 49                    | 43                 |
| AUS                  | 5             | 2             | 2             | 9                | 51                   | 130,7692308       | 163               | 0,82               | 32                    | 20                 |
| CVI                  | 1             | 8             | 11            | 20               | 114                  | 292,3076923       | 220               | 0,86               | 72                    | 33                 |
| DOK                  | 4             | 21            | 151           | 176              | 1003                 | 2571,794872       | 1641              | 1                  | 931                   | 57                 |
| DOW                  | 0             | 35            | 1             | 36               | 205                  | 525,6410256       | 654               | 1,09               | 128                   | 20                 |
| ELM                  | 1             | 1             | 5             | 7                | 40                   | 102,5641026       | 546               | 1                  | 443                   | 81                 |
| EVS                  | 3             | 8             | 2             | 13               | 74                   | 189,7435897       | 273               | 1,03               | 83                    | 30                 |
| FKD                  | 0             | 1             | 1             | 2                | 11                   | 28,20512821       | 144               | 0,81               | 116                   | 81                 |
| FUP                  | 2             | 2             | 4             | 8                | 46                   | 117,9487179       | 540               | 0,87               | 422                   | 78                 |
| GHD                  | 0             | 1             | 1             | 2                | 11                   | 28,20512821       | 81                | 0,85               | 53                    | 65                 |
| GP                   | 0             | 0             | 9             | 9                | 51                   | 130,7692308       | 108               | 0,66               | 23                    | 21                 |
| GUV                  | 1             | 14            | 19            | 34               | 194                  | 497,4358974       | 395               | 1                  | 102                   | 26                 |
| IKG                  | 8             | 145           | 92            | 245              | 1396                 | 3579,487179       | 3396              | 0,91               | 183                   | 5                  |
| INK                  | 74            | 25            | 113           | 212              | 1208                 | 3097,435897       | 2662              | 0,97               | 435                   | 16                 |
| KDB                  | 53            | 84            | 89            | 226              | 1288                 | 3302,564103       | 2453              | 0,95               | 850                   | 35                 |
| KPS                  | 0             | 1             | 10            | 11               | 63                   | 161,5384615       | 357               | 0,94               | 195                   | 55                 |
| KVS                  | 2             | 1             | 0             | 3                | 17                   | 43,58974359       | 56                | 0,76               | 12                    | 21                 |
| NWA                  | 0             | 2             | 4             | 6                | 34                   | 87,17948718       | 276               | 0,9                | 189                   | 68                 |
| OBJ                  | 2             | 1             | 1             | 4                | 23                   | 58,97435897       | 206               | 0,99               | 147                   | 71                 |
| ORF                  | 1             | 28            | 3             | 32               | 182                  | 466,6666667       | 389               | 0,82               | 78                    | 20                 |
| ORG                  | 3             | 3             | 62            | 68               | 388                  | 994,8717949       | 1337              | 1,01               | 342                   | 26                 |
| PAC                  | 17            | 25            | 0             | 42               | 239                  | 612,8205128       | 552               | 1,07               | 61                    | 11                 |
| PDB                  | 7             | 19            | 8             | 34               | 194                  | 497,4358974       | 723               | 0,96               | 226                   | 31                 |
| PMI                  | 6             | 2             | 20            | 28               | 160                  | 410,2564103       | 386               | 0,95               | 24                    | 6                  |
| PTÜ                  | 14            | 17            | 36            | 67               | 382                  | 979,4871795       | 1089              | 0,86               | 110                   | 10                 |
| RBS                  | 0             | 4             | 0             | 4                | 23                   | 58,97435897       | 639               | 1,08               | 580                   | 91                 |
| <b>Sum</b>           | <b>379</b>    | <b>560</b>    | <b>926</b>    | <b>1865</b>      | <b>10629</b>         | <b>27253,8461</b> | <b>27800</b>      | <b>34,12</b>       | <b>7979</b>           | <b>1370</b>        |
| <b>Average</b>       | <b>10,243</b> | <b>15,135</b> | <b>25,027</b> | <b>50,405405</b> | <b>287,27027</b>     | <b>736,590436</b> | <b>751,351351</b> | <b>0,922162162</b> | <b>215,648648</b>     | <b>37,02702703</b> |

Fig 8 – Data of EQ's

| <b>DATA of EQ's!</b> |               |               |                |                  |                    |                   |                    |                         |                        |                    |
|----------------------|---------------|---------------|----------------|------------------|--------------------|-------------------|--------------------|-------------------------|------------------------|--------------------|
| Projekt-             | DATA of EQ'S  |               |                | SUM of EQ's      | No. of EQ's*4.3    | AVE FP*100/       | EQ Unadjusted      | Value Adjustment Factor | Difference from        | Diff.*100/FP_ungew |
| kürzel               | LOW           | HIGH          | AVE            | LOW+HIGHT+AVE    | 4.3=AVE-Complexity | AVE ratio(14)     | EQ Function Points | VAF                     | AVE ratio(14)&FP_ungew | Error in %         |
| AFW                  | 5             | 3             | 0              | 8                | 34                 | 242,8571429       | 299                | 0,82                    | 56                     | 19                 |
| ATP                  | 0             | 2             | 0              | 2                | 9                  | 64,28571429       | 642                | 0,86                    | 578                    | 90                 |
| BIB                  | 1             | 0             | 0              | 1                | 4                  | 28,57142857       | 171                | 0,82                    | 142                    | 83                 |
| CON                  | 21            | 8             | 29             | 58               | 249                | 1778,571429       | 2259               | 1,07                    | 480                    | 21                 |
| CAD                  | 0             | 0             | 8              | 8                | 34                 | 242,8571429       | 432                | 1,07                    | 189                    | 44                 |
| CBA                  | 2             | 0             | 11             | 13               | 56                 | 400               | 352                | 0,77                    | 48                     | 14                 |
| CDS                  | 34            | 13            | 57             | 104              | 447                | 3192,857143       | 2851               | 1,01                    | 342                    | 12                 |
| CHP                  | 0             | 1             | 0              | 1                | 4                  | 28,57142857       | 146                | 0,77                    | 117                    | 80                 |
| AUS                  | 1             | 0             | 1              | 2                | 9                  | 64,28571429       | 163                | 0,82                    | 99                     | 61                 |
| DOK                  | 3             | 3             | 0              | 6                | 26                 | 185,7142857       | 1641               | 1                       | 1455                   | 89                 |
| FKD                  | 0             | 5             | 1              | 6                | 26                 | 185,7142857       | 144                | 0,81                    | 42                     | 29                 |
| GUV                  | 4             | 7             | 1              | 12               | 52                 | 371,4285714       | 395                | 1                       | 24                     | 6                  |
| IKG                  | 55            | 42            | 57             | 154              | 662                | 4728,571429       | 3396               | 0,91                    | 1333                   | 39                 |
| INK                  | 4             | 2             | 10             | 16               | 69                 | 492,8571429       | 2662               | 0,97                    | 2169                   | 81                 |
| KDB                  | 0             | 51            | 0              | 51               | 219                | 1564,285714       | 2453               | 0,95                    | 889                    | 36                 |
| KPS                  | 4             | 3             | 0              | 7                | 30                 | 214,2857143       | 357                | 0,94                    | 143                    | 40                 |
| KVS                  | 2             | 0             | 0              | 2                | 9                  | 64,28571429       | 56                 | 0,76                    | 8                      | 14                 |
| NWA                  | 2             | 4             | 7              | 13               | 56                 | 400               | 276                | 0,9                     | 124                    | 45                 |
| OBJ                  | 0             | 0             | 13             | 13               | 56                 | 400               | 206                | 0,99                    | 194                    | 94                 |
| ORF                  | 1             | 4             | 0              | 5                | 22                 | 157,1428571       | 389                | 0,82                    | 232                    | 60                 |
| ORG                  | 0             | 6             | 36             | 42               | 181                | 1292,857143       | 1337               | 1,01                    | 44                     | 3                  |
| PAC                  | 31            | 1             | 1              | 33               | 142                | 1014,285714       | 552                | 1,07                    | 462                    | 84                 |
| PMI                  | 10            | 3             | 4              | 17               | 73                 | 521,4285714       | 386                | 0,95                    | 135                    | 35                 |
| PTU                  | 1             | 5             | 0              | 6                | 26                 | 185,7142857       | 1089               | 0,86                    | 903                    | 83                 |
| <b>Sum</b>           | <b>181</b>    | <b>163</b>    | <b>236</b>     | <b>580</b>       | <b>2495</b>        | <b>17821,4285</b> | <b>22654</b>       | <b>21,95</b>            | <b>10208</b>           | <b>1162</b>        |
| <b>Average</b>       | <b>7,5416</b> | <b>6,7916</b> | <b>9,83333</b> | <b>24,166666</b> | <b>103,95833</b>   | <b>742,55952</b>  | <b>943,91666</b>   | <b>0,91458333</b>       | <b>425,3333333</b>     | <b>48,41666667</b> |

Fig. 9 – Data of ILF's

| <b>DATA of ILF's!</b> |               |                |                |                |                    |                   |                     |                         |                        |                    |  |
|-----------------------|---------------|----------------|----------------|----------------|--------------------|-------------------|---------------------|-------------------------|------------------------|--------------------|--|
| Projekt-              | DATA of ILF's |                |                | SUM of ILF's   | No. of ILF's*8.2   | AVE FP*100/17     | ILF Unadjusted      | Value Adjustment Factor | Difference from        | Diff.*100/FP_ungew |  |
| kürzel                | LOW           | HIGH           | AVE            | LOW+HIGHT+ AVE | 8.2=AVE-Complexity | AVE ratio(17)     | ILF Function Points | VAF                     | AVE ratio(17)&FP_ungew | Error in %         |  |
| AFW                   | 7             | 3              | 0              | 10             | 82                 | 482,3529412       | 299                 | 0,82                    | 183                    | 61                 |  |
| ARC                   | 1             | 2              | 0              | 3              | 25                 | 147,0588235       | 200                 | 0,97                    | 53                     | 26                 |  |
| ATP                   | 4             | 0              | 1              | 5              | 41                 | 241,1764706       | 642                 | 0,86                    | 401                    | 62                 |  |
| BAP                   | 0             | 2              | 3              | 5              | 41                 | 241,1764706       | 298                 | 0,98                    | 57                     | 19                 |  |
| BIB                   | 1             | 5              | 0              | 6              | 49                 | 288,2352941       | 171                 | 0,82                    | 117                    | 68                 |  |
| AVI                   | 12            | 1              | 0              | 13             | 107                | 629,4117647       | 751                 | 0,98                    | 122                    | 16                 |  |
| CBA                   | 1             | 1              | 1              | 3              | 25                 | 147,0588235       | 352                 | 0,77                    | 205                    | 58                 |  |
| CDS                   | 11            | 27             | 0              | 38             | 312                | 1835,294118       | 2851                | 1,01                    | 1016                   | 36                 |  |
| CHP                   | 1             | 0              | 0              | 1              | 8                  | 47,05882353       | 146                 | 0,77                    | 99                     | 68                 |  |
| AUS                   | 2             | 0              | 0              | 2              | 16                 | 94,11764706       | 163                 | 0,82                    | 69                     | 42                 |  |
| CVI                   | 1             | 1              | 0              | 2              | 16                 | 94,11764706       | 220                 | 0,86                    | 126                    | 57                 |  |
| DOK                   | 6             | 1              | 0              | 7              | 57                 | 335,2941176       | 1641                | 1                       | 1306                   | 80                 |  |
| ELM                   | 13            | 1              | 0              | 14             | 115                | 676,4705882       | 546                 | 1                       | 130                    | 24                 |  |
| EVS                   | 7             | 0              | 0              | 7              | 57                 | 335,2941176       | 273                 | 1,03                    | 62                     | 23                 |  |
| FKD                   | 2             | 2              | 0              | 4              | 33                 | 194,1176471       | 144                 | 0,81                    | 50                     | 35                 |  |
| FUP                   | 15            | 1              | 0              | 16             | 131                | 770,5882353       | 540                 | 0,87                    | 231                    | 43                 |  |
| GHD                   | 2             | 0              | 0              | 2              | 16                 | 94,11764706       | 81                  | 0,85                    | 13                     | 16                 |  |
| GUV                   | 3             | 0              | 4              | 7              | 57                 | 335,2941176       | 395                 | 1                       | 60                     | 15                 |  |
| IKG                   | 42            | 9              | 20             | 71             | 582                | 3423,529412       | 3396                | 0,91                    | 28                     | 1                  |  |
| INK                   | 15            | 8              | 4              | 27             | 221                | 1300              | 2662                | 0,97                    | 1362                   | 51                 |  |
| KDB                   | 13            | 27             | 0              | 40             | 328                | 1929,411765       | 2453                | 0,95                    | 524                    | 21                 |  |
| KPS                   | 8             | 1              | 2              | 11             | 90                 | 529,4117647       | 357                 | 0,94                    | 172                    | 48                 |  |
| KVS                   | 2             | 0              | 0              | 2              | 16                 | 94,11764706       | 56                  | 0,76                    | 38                     | 68                 |  |
| NWA                   | 11            | 0              | 0              | 11             | 90                 | 529,4117647       | 276                 | 0,9                     | 253                    | 92                 |  |
| OBJ                   | 4             | 1              | 0              | 5              | 41                 | 241,1764706       | 206                 | 0,99                    | 35                     | 17                 |  |
| ORF                   | 0             | 3              | 0              | 3              | 25                 | 147,0588235       | 389                 | 0,82                    | 242                    | 62                 |  |
| ORG                   | 1             | 4              | 20             | 25             | 205                | 1205,882353       | 1337                | 1,01                    | 131                    | 10                 |  |
| PAC                   | 1             | 1              | 4              | 6              | 49                 | 288,2352941       | 552                 | 1,07                    | 264                    | 48                 |  |
| PDB                   | 21            | 0              | 0              | 21             | 172                | 1011,764706       | 723                 | 0,96                    | 289                    | 40                 |  |
| PMI                   | 8             | 0              | 1              | 9              | 74                 | 435,2941176       | 386                 | 0,95                    | 49                     | 13                 |  |
| PTU                   | 8             | 3              | 0              | 11             | 90                 | 529,4117647       | 1089                | 0,86                    | 560                    | 51                 |  |
| RBS                   | 15            | 3              | 3              | 21             | 172                | 1011,764706       | 639                 | 1,08                    | 373                    | 58                 |  |
| <b>Sum</b>            | <b>238</b>    | <b>107</b>     | <b>63</b>      | <b>408</b>     | <b>3343</b>        | <b>19664,7058</b> | <b>24234</b>        | <b>29,39</b>            | <b>8620</b>            | <b>1329</b>        |  |
| <b>Average</b>        | <b>7,4375</b> | <b>3,34375</b> | <b>1,96875</b> | <b>12,75</b>   | <b>104,46875</b>   | <b>614,522058</b> | <b>757,3125</b>     | <b>0,9184375</b>        | <b>269,375</b>         | <b>41,53125</b>    |  |

Fig. 10 – Data of EIF's

| <b>DATA of EIF's!</b> |                 |               |               |                    |                    |                   |                     |                         |                       |                    |                 |
|-----------------------|-----------------|---------------|---------------|--------------------|--------------------|-------------------|---------------------|-------------------------|-----------------------|--------------------|-----------------|
| Projekt-              | DATA of EIF's   |               |               | SUM of EIF's       | No. of EIF's*6.1   | AVE FP*100/6      | EIF Unadjusted      | Value Adjustment Factor | Difference from       | Diff.*100/FP_ungew |                 |
| kürzel                | LOW             | HIGH          | AVE           | LOW+HIGHT+AVE      | 6.1=AVE-Complexity | AVE ratio(6)      | EIF Function Points | VAF                     | AVE ratio(6)&FP_ungew | EIF                | Error in %      |
| ARC                   | 0               | 2             | 0             | 2                  | 12                 | 200               | 200                 | 0,97                    | 0                     |                    | 0               |
| ATP                   | 4               | 0             | 2             | 6                  | 37                 | 616,6666667       | 642                 | 0,86                    | 25                    |                    | 4               |
| AVI                   | 9               | 0             | 0             | 9                  | 55                 | 916,6666667       | 751                 | 0,98                    | 166                   |                    | 22              |
| CDS                   | 0               | 0             | 2             | 2                  | 12                 | 200               | 2851                | 1,01                    | 2651                  |                    | 93              |
| AUS                   | 1               | 0             | 0             | 1                  | 6                  | 100               | 163                 | 0,82                    | 63                    |                    | 39              |
| ELM                   | 3               | 0             | 2             | 5                  | 30                 | 500               | 546                 | 1                       | 46                    |                    | 8               |
| FKD                   | 0               | 2             | 0             | 2                  | 12                 | 200               | 144                 | 0,81                    | 56                    |                    | 39              |
| FUP                   | 1               | 0             | 0             | 1                  | 6                  | 100               | 540                 | 0,87                    | 440                   |                    | 81              |
| IKG                   | 15              | 4             | 5             | 24                 | 146                | 2433,333333       | 3396                | 0,91                    | 963                   |                    | 28              |
| KDB                   | 1               | 0             | 0             | 1                  | 6                  | 100               | 2453                | 0,95                    | 2353                  |                    | 96              |
| KPS                   | 1               | 0             | 0             | 1                  | 6                  | 100               | 357                 | 0,94                    | 257                   |                    | 72              |
| KVS                   | 1               | 0             | 0             | 1                  | 6                  | 100               | 56                  | 0,76                    | 44                    |                    | 79              |
| NWA                   | 2               | 0             | 0             | 2                  | 12                 | 200               | 276                 | 0,9                     | 76                    |                    | 28              |
| OBJ                   | 0               | 2             | 0             | 2                  | 12                 | 200               | 206                 | 0,99                    | 6                     |                    | 3               |
| ORG                   | 3               | 5             | 0             | 8                  | 49                 | 816,6666667       | 1337                | 1,01                    | 520                   |                    | 39              |
| PMI                   | 2               | 0             | 0             | 2                  | 12                 | 200               | 386                 | 0,95                    | 186                   |                    | 48              |
| PTÜ                   | 3               | 2             | 3             | 8                  | 49                 | 816,6666667       | 1089                | 0,86                    | 272                   |                    | 25              |
| RBS                   | 1               | 0             | 0             | 1                  | 6                  | 100               | 639                 | 1,08                    | 539                   |                    | 84              |
| <b>Sum</b>            | <b>47</b>       | <b>17</b>     | <b>14</b>     | <b>78</b>          | <b>474</b>         | <b>7900</b>       | <b>16032</b>        | <b>16,67</b>            | <b>8663</b>           |                    | <b>788</b>      |
| <b>Average</b>        | <b>2,611111</b> | <b>0,9444</b> | <b>0,7777</b> | <b>4,333333333</b> | <b>26,33333</b>    | <b>438,888888</b> | <b>890,666666</b>   | <b>0,926111111</b>      | <b>481,277778</b>     |                    | <b>43,77777</b> |