# Post Occupation Evaluation – POE

## Intentia HQ
## Finland

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**VILLA REAL LTD/SA**

# Post Occupation Evaluation – POE

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## Finland

Intentia is a global enterprise solutions provider dedicated to bringing software applications and consulting services to companies whose core processes involve manufacturing, distribution and maintenance—what they call the “make, move and maintain” market. The new head quarters of Intentia's Finnish subsidiary Intentia Oy is located at Keilaniemi Espoo, the prime business location in the Helsinki capital area, next to the HQs of Nokia, Kone, Fortum and Microsoft Finland.

This is a report on the Post Occupancy Evaluation – POE performed at Intentia HQ, an office building for adaptable rental use, floor area 10,000 m2, taken to use early 2002. In the evaluation the BUS method is utilised, licensed by Villa Real from Building Use Studies Ltd, GB. The computation comes out as easy to read graphics and tables.

The POE proved that Intentia HQ is an excellent working place. As shown in this report, the building achieved a rating of "**very good**" with the maximum scoring.

Yet, there is always space for improvement. Accordingly, three suggestions for improvement are directly proposed in this report.

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## POE is for comfort and productivity!

POE is to study the occupational factors, ie working environment of an office building or other facility. Occupational factors refer to health, comfort, productivity, safety and security of the building. While considering life cycle costs, it is the business operating costs, where the biggest benefits are easiest to achieve through better comfort and productivity ⇨ good indoor environment/climate/air. Particularly here POE is useful. Yet, POE also may pinpoint physical or other faults and shortages in the facility, as well as give new ideas for better use of the facility.

## Who can use POE?

Globally, POE can be utilised practically by all partners of a building project, throughout over the building's service life. POE results are particularly useful for the following partners:

- Investors/developers/owners
- Architectural and engineering designers; actually POE should become a standard practice part of the architectural and building services engineering design works/contracts.
- Facilities managers
- Users; owners or tenants


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# CONTENTS

This is a table of contents with active internal hyperlinks.



Total number of pages = 3+1+16=20

# 1. SUMMARY

This is a report on the post Occupancy Evaluation – POE performed as part of **EuroLifeForm**, a project executed under the EU5RTD Growth programme. The evaluation was done at the Finnish case study object Intentia HQ, an office building for adaptable rental use, Keilaniemi Espoo, the prime business location in the Helsinki capital area Finland, floor area 10,000 $m^2$.

# 2. INTRODUCTION

## 2.1. Description of the study object

Case studies are to study concrete real life projects for their different features related to the EuroLifeForm – ELF project: Design decisions, Performance, Costs, Environmental factors etc.

The case study object is an **office building** for adaptable rental use situated at Keilaranta 5, 02150 Espoo, the prime business address in the Helsinki capital area Finland. Its principal features are the following:

- title: INTENTIA HQ
- floor area 10,000m$^2$
- total asset 15,497 kEUR
- taken to use Jan 2002


**Photograph 1 A wing of Intentia HQ, Espoo FI**

**Photograph 2 A scene from the lobby over Gulf of Finland**

## 2.2. Scope of the Study

From the beginning of the project, it was clear in Finland that the user (Intentia Oy) and other partners in the Finnish case study object Intentia HQ wanted to get some benefits to compensate for their time and efforts as FINUG members. Among other things, benefits were expected from the studies related to the **occupational factors**, as shown (2.2) below.

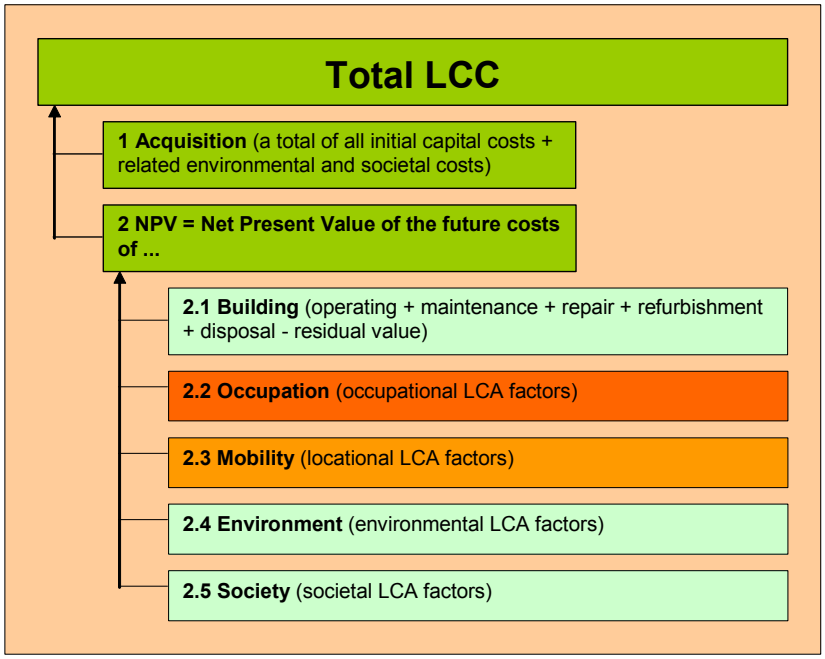


**Figure 1 Description of Total LCC**

> *[The above chart describes this writer's ideas: In the book "Construction Can!" published by arrangement of ENCORD in 1998, I introduced a fresh approach to LCC to cover not only the initial capital and direct future costs of a building/facility but also **externalities** and **intangibles** (occupational, locational, environmental and societal costs), as shown above. To put it simply, Total LCC just tries to convert all various LCA impacts to money. After this monetarisation everything can be calculated mathematically as **LCC = NPV of all effective costs**. Think this is impossible? For mobility this is easy and customarily done. For occupational factors more and more studies are coming out eg in the USA, Finland etc showing the value of various office properties/features in productivity and expressed in monetary terms. Eg for environmental LCA impact, the environmental profiles of construction materials, components and elements are in a good progress in the UK, Denmark, Finland and elsewhere. These profiles already have been converted to Ecopoints (GB) or equivalent CO2 (DK). After this, monetarisation shouldn't be too difficult. Measuring the monetary value of something does not require that it be sold and bought in markets. Also, today monetarisation seems to attract more attention, particularly in the USA.]*

Occupational factors refer to health, comfort, productivity, safety and security of the building. It is here important to realise the relationship of different accumulated costs for an office building with eg 30-year ownership (source: The Royal Academy of Engineering, GB):

**1 : 5 : 200**

- 1 = acquisition
- 5 = building operating and maintenance (see 2.1 above)
- 200 = business operating costs ⇨ here the biggest benefits are easiest to achieve through better comfort and productivity ⇨ good indoor environment/climate/air

The above means that if you want to achieve savings and major benefits, it is actually the occupational factors, which you should pay attention to.

# 3. POE BY THE BUS METHOD

To study the occupational factors in Intentia HQ, a Post Occupancy Evaluation – POE was performed. In the evaluation, the BUS method is utilised, licensed by Villa Real from Building Use Studies Ltd, GB; further information about the method is available at http://www.usablebuildings.co.uk/WebGuideOSM/Index.html.

## 3.1. Who can use POE?

Globally, POE can be utilised practically by all partners of a building project, throughout over the building's service life. POE results are particularly useful for the following partners:

- Investors/developers/owners
- Architectural and engineering designers; actually POE should become a standard practice part of the architectural and building services engineering design works/contracts.
- Facilities managers
- Users; owners or tenants

## 3.2. What is BUS?

BUS is a POE method (software and database) developed during the past 10…15 years in the UK. As detailed results it gives a range of quantitative and qualitative data usually including the following (depending on which version is used):

- Background information about age, sex, time in the building, time at desk, time at VDU, workgroup size, window seats and other basic information about the sample and the respondents.
- Ratings and feedback for design, needs, image, cleaning, storage, meeting facilities.
- Response times for key variables.
- Perceived productivity.
- Perceived health.
- Thermal comfort.
- Ventilation.
- Lighting, including glare.
- Noise, including interruptions.
- Furniture and space in the building.
- Other workplace performance variables including e.g. perceived control.
- Full ratings and benchmarks.
- Comments organised alphabetically and by question category.
- Web enabled graphics for 65 variables.
- The ability to interrogate the database to answer more specific questions.

## 3.3. Survey performed

The survey performed concentrated at occupational factors, as usual in the BUS method. Survey was performed in the summer 2004. The response percentage was 56%, which represents almost all the staff present at that particular time; in average, a major part of the staff is not every day in the building. The quality of response proved to be very good.

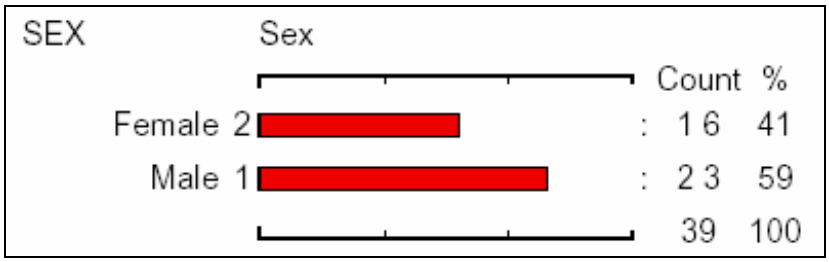


**Figure 2 Distribution by sex**

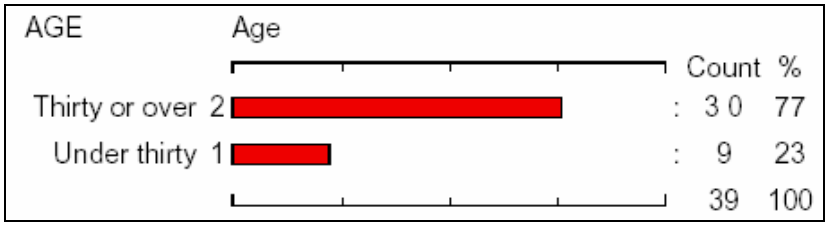


**Figure 3 Distribution by age**

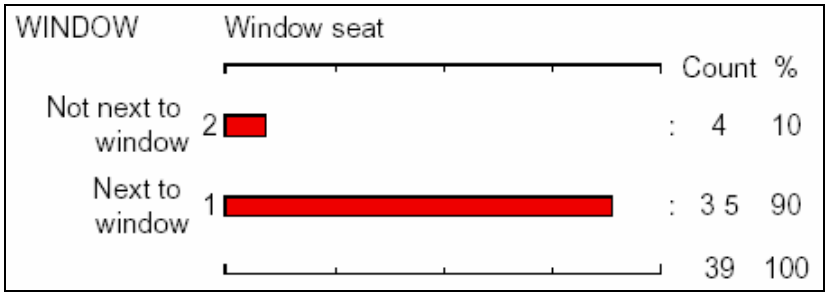


**Figure 4 Sitting next to window; all openable**

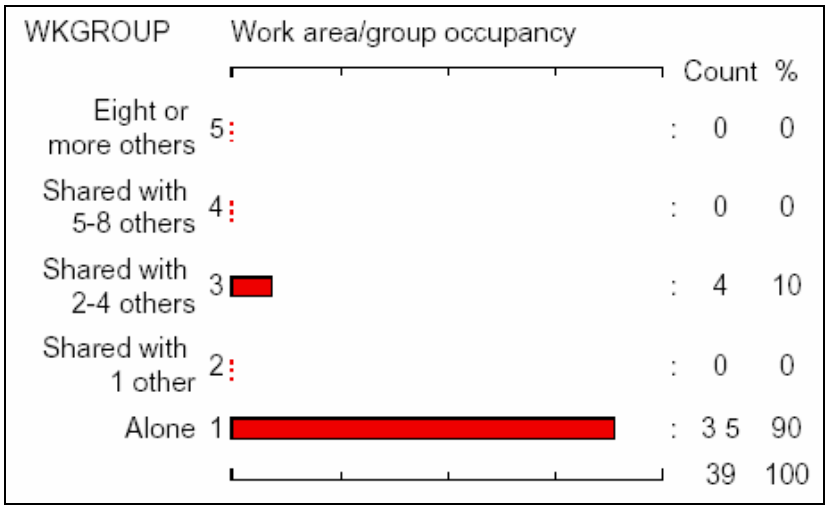


**Figure 5 Working in groups; practically all working 'alone'**

All the information collected is treated as confidential by the survey team.

For future studies, information was also collected on **mobility** (see 2.3 in Figure 1 above). Mobility, hence locational factors refer to the location of a (industrial, commercial, office, school etc) building. We should calculate LCC not for the building alone but also its location in relation to incoming material and outgoing product flows, employees' daily commuting, customer traffic to a shopping centre, or school children's daily transport, ie the mobility the building is causing.

## 3.4. Process performed

The procession of the collected information, and data computing was performed by Building Use Studies Ltd, London GB. This incorporates a multitude of specific software developed for process, plus a major database covering over ten years history and twelve different countries for benchmark dataset comparison.

## 3.5. Reports

The results are reported in three different forms:

- ELF technical report: a summary with exemplary tables and graphics.
- Executive summary report, ie this report: a summary with a limited number of exemplary tables and graphics; made public and available at http://onlinebookshop.villareal.fi/.
- Full report containing 101 pages including all tables, graphics and (anonymous) comment information received in the survey: addressed to Intentia Oy, and possibly distributed to other partners in the project.

# 4. POE RESULTS

A number of selected tables, graphics and comments are presented below. Data tables and the graphics use standard BUS benchmarks for UK buildings for a sample of 50 buildings, regularly updated.

## 4.1. Generic results: Excellent building!

In general, the POE proved that Intentia HQ is an excellent working place. As shown in the summary table below, the building achieved a rating "very good" with the **maximum scoring** of (60 ⇨ 100 ⇨) 7.

**Table 1 Summary of the POE overall results**

Intentia HQ

Per cent of all cases= 100

n= 39

| Rating calculation method | Relative Bmk | Absolute Mdpt | Score | Total possible Min | Max |
|---|---|---|---|---|---|
| **Comfort Overall** | 3 | 3 | 6 | 2 | 6 |
| **Temp Winter** | 3 | 3 | 6 | 2 | 6 |
| **Temp Summer** | 3 | 3 | 6 | 2 | 6 |
| **Lighting overall** | 3 | 3 | 6 | 2 | 6 |
| **Noise overall** | 3 | 3 | 6 | 2 | 6 |
| **Productivity %** | 3 | 3 | 6 | 2 | 6 |
| **Design** | 3 | 3 | 6 | 2 | 6 |
| **Needs** | 3 | 3 | 6 | 2 | 6 |
| **Health** | 3 | 3 | 6 | 2 | 6 |
| **Image** | 3 | 3 | 6 | 2 | 6 |
| **Total** | 30 | 30 | 60 | 20 | 60 |

Points are allocated for each of the ten categories shown in the rows with respect to both the benchmarks and scale midpoints as follows:

Above (i.e. better]: 3 points
No difference: 2 points
Below (i.e worse]: 1 point

This produces a rating in the range from 20 (lowest possible) to 60 (highest possible)

**Conversion from 20-60 scale to 0-100 scale**

**Scale 0-100** ( 60 -20)*(100/(60-20)) = **100.0**

**Conversion from 0-100 scale to 1-7 scale**

Increments of 100/7= 14.28. E.g 1 =>0 and <14.28; 2= >14.28 and <= 28.56 etc

**Rating score**

| Scale 0-100 | Scale 1-7 | Rating and class | Categories |
|---|---|---|---|
| | . | . | 1: Very poor |
| | . | . | 2: Poor |
| | . | . | 3: Below average |
| | . | . | 4: Average (Typical) |
| | . | . | 5: Above average |
| | . | . | 6: Good (Good practice) |
| **100.0** | **7** | **7: Very good** | 7: Very good |

In the following table all variables are listed as per their scoring against the related benchmarks.

**Table 2 Variables scoring against benchmarks; better/equal/worse**

| Summary | Remarks |
|---|---|
| **Variables better than benchmark (green)** | |
| Air in summer - Fresh/stuffy | |
| Air in summer - Odourless/smelly | |
| Air in summer - Overall | |
| Air in summer - Still/draughty | |
| Air in winter - Dry/humid | |
| Air in winter - Fresh/stuffy | |
| Air in winter - Odourless/smelly | |
| Air in winter overall | |
| Air in winter - Still/draughty | |
| Cleaning | |
| Control over heating | |
| Control over lighting | |
| Comfort overall * | |
| Design * | |
| Furniture | |
| Health - Perceived health * | |
| Image * | |
| Lighting - Artificial light | |
| Lighting - Natural light | |
| Lighting - Overall * | |
| Meeting rooms | See below under 5 |
| Needs * | Problems in kitchen; see below under 5 |
| Noise - Other noise from inside | |
| Noise - Overall * | |
| Productivity - Perceived productivity * | |
| Space in the building | |
| Storage space | |
| Temperature in summer - Overall * | |
| Temperature in winter - Overall * | |
| | |
| **Variables no different from benchmark (amber)** | |
| Control over cooling | |
| Control over noise | |
| Control over ventilation | |
| Lighting - Glare from lights | |
| Noise - Unwanted interruptions | |
| | |
| **Variables worse than benchmark (red)** | |
| Air in summer - Dry/humid | Slightly too dry |
| Lighting - Glare from sun and sky | Slightly too much |
| Noise - Noise from colleagues | Too little (best in the middle) |
| Noise - Noise from outside | Too little (best in the middle) |
| Noise - Noise from other people | Too little (best in the middle) |
| Space at desk | Too much (best in the middle); can it be too much? |
| Temperature in summer - Hot/cold | Mostly women felt cold; see below under 5 and 6 |
| Temperature in summer - Stable/varies | Too stable (best in the middle) |
| Temperature in winter - Hot/cold | Mostly women felt cold; see below under 5 and 6 |
| Temperature in winter - Stable/varies | Too stable (best in the middle) |
| | |
| *Ten variables shown with an asterisk * are used for rating the building (as already seen under 4.1)* | |

## 4.2. Data tables with benchmark ratings

Below an example of data tables is presented. In the table it is interesting to see that, according to the BUS methodology, stable indoor temperature is not the best one, but the temperature should vary to some extent. All tables are included in the separate appendix A.

**Table 3 Indoor climate; winter/summer**

Intentia HQ
n= 39

| Winter | Study building mean | Benchmark Lower | | Benchmark Upper | Significant difference from…? Benchmark | Scale midpoint | Scale | Scale type |
|---|---|---|---|---|---|---|---|---|
| TWOver | **4.59** | 4.04 | 4.20 | 4.36 | Higher | Higher | 1=Uncomfortable; 7=Comfortable | A |
| TWHot | **4.73** | 4.13 | 4.25 | 4.37 | Higher | Higher | 1=Too hot; 7=Too cold | B |
| TWStable | **3.25** | 4.31 | 4.43 | 4.55 | Lower | Lower | 1=Stable; 7=Varies during the day | B |
| AirWStil | **3.67** | 3.37 | 3.53 | 3.69 | No | Lower | 1=Still; 7=Draughty | B |
| AirWDry | **3.24** | 3.03 | 3.13 | 3.23 | Higher | Lower | 1=Dry; 7=Humid | B |
| AirWFresh | **3.46** | 4.48 | 4.60 | 4.72 | Lower | Lower | 1=Fresh;7=Stuffy | C |
| AirWOdourl | **3.05** | 3.22 | 3.32 | 3.42 | Lower | Lower | 1=Odourless; 7=Smelly | C |
| AirWOver | **4.89** | 3.89 | 4.05 | 4.21 | Higher | Higher | 1=Unsatisfactory overall; 7=Satisfactory | A |
| **Summer** | | | | | | | | |
| TSOver | **4.84** | 3.55 | 3.75 | 3.95 | Higher | Higher | 1=Uncomfortable; 7=Comfortable | A |
| TSHot | **4.17** | 3.09 | 3.25 | 3.41 | Higher | Higher | 1=Too hot; 7=Too cold | B |
| TSStable | **2.94** | 4.28 | 4.38 | 4.48 | Lower | Lower | 1=Stable; 7=Varies during the day | B |
| AirSStil | **3.30** | 2.90 | 3.04 | 3.18 | Higher | Lower | 1=Still; 7=Draughty | B |
| AirSDry | **3.43** | 3.47 | 3.57 | 3.67 | Lower | Lower | 1=Dry; 7= Humid | B |
| AirSFresh | **3.35** | 4.52 | 4.66 | 4.80 | Lower | Lower | 1=Fresh; 7=Stuffy | C |
| AirSOdourl | **3.03** | 3.36 | 3.48 | 3.60 | Lower | Lower | 1=Odourless; 7=Smelly | C |
| AirSOver | **5.16** | 3.70 | 3.84 | 3.98 | Higher | Higher | 1=Unsatisfactory overall; 7=Satisfactory | A |

Scale type: A=Right-handed (i.e. 'good' or 'best' at higher end of scale); B=Middle (best in middle of scale); C=Left-handed (i.e. best at low end of scale).

## 4.3. Comments of the occupants

All comments are included in the separate appendix B.

## 4.4. Graphic results

Below several interesting graphics are repeated. They incorporate easy-to-understand scales and histograms, which well support what has been written above. All graphics are included in the separate appendix C.

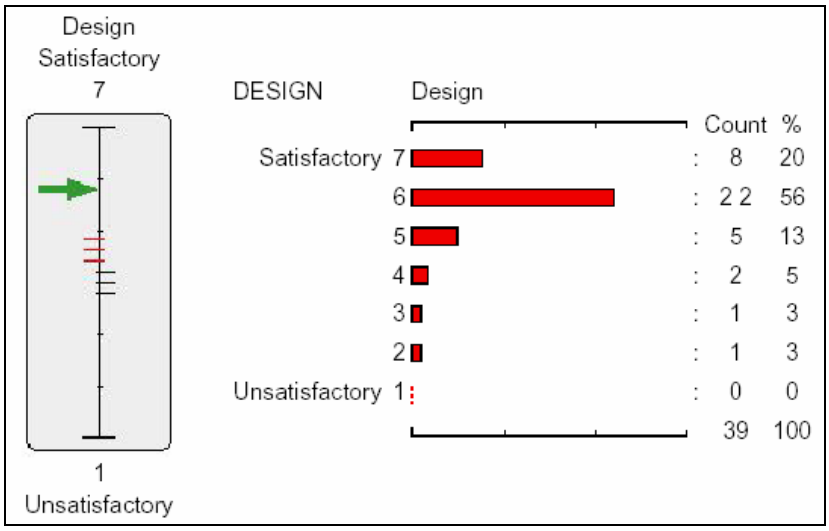


**Figure 6 Design**

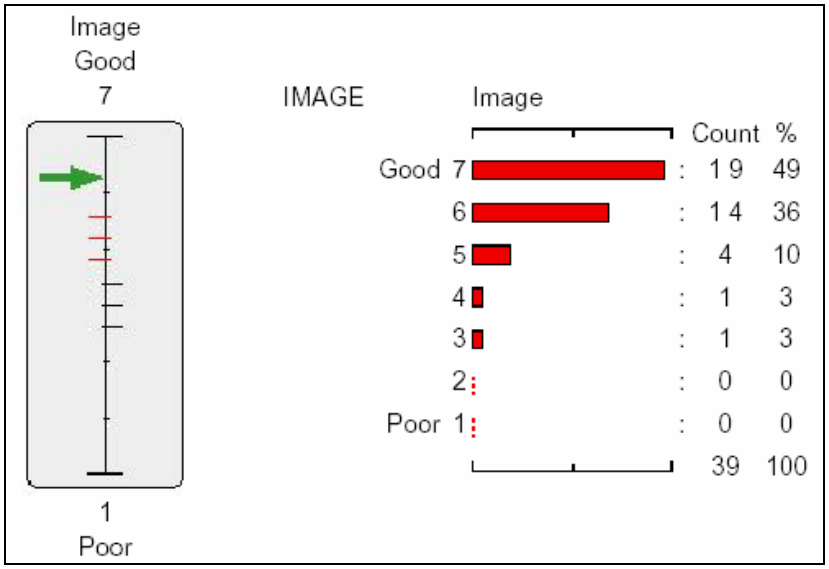


**Figure 7 Image**

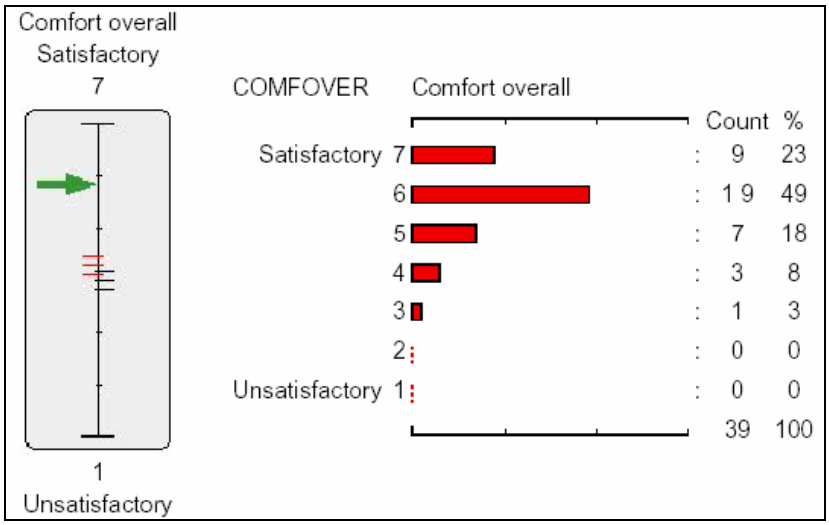


**Figure 8 Comfort overall**

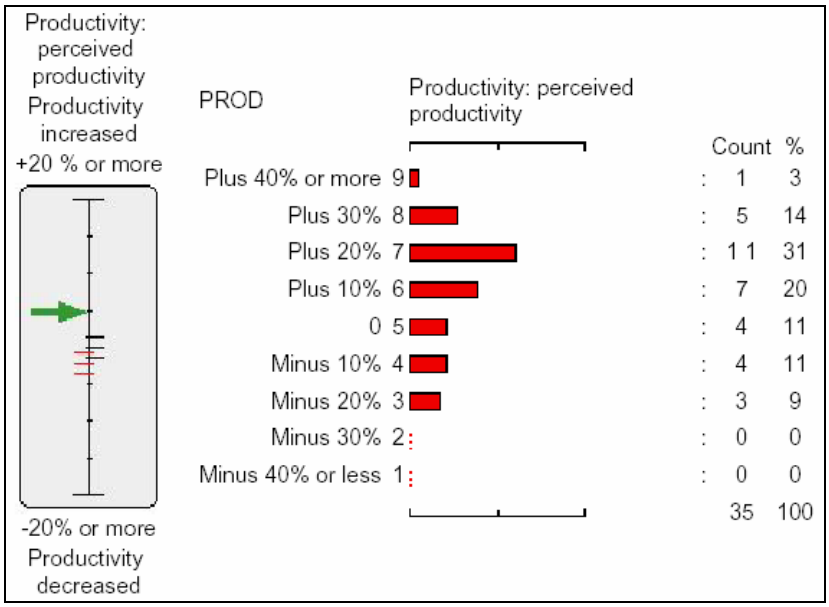


**Figure 9 Productivity perceived**

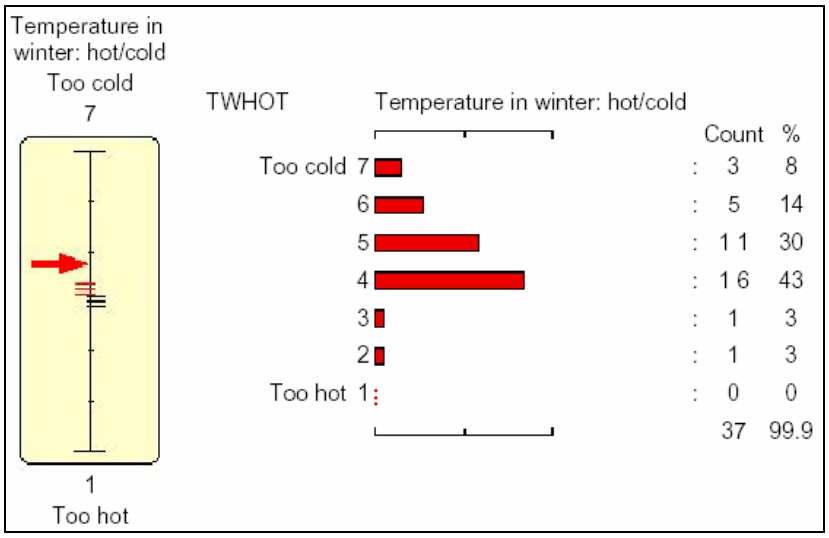


**Figure 10 Temperature in winter**

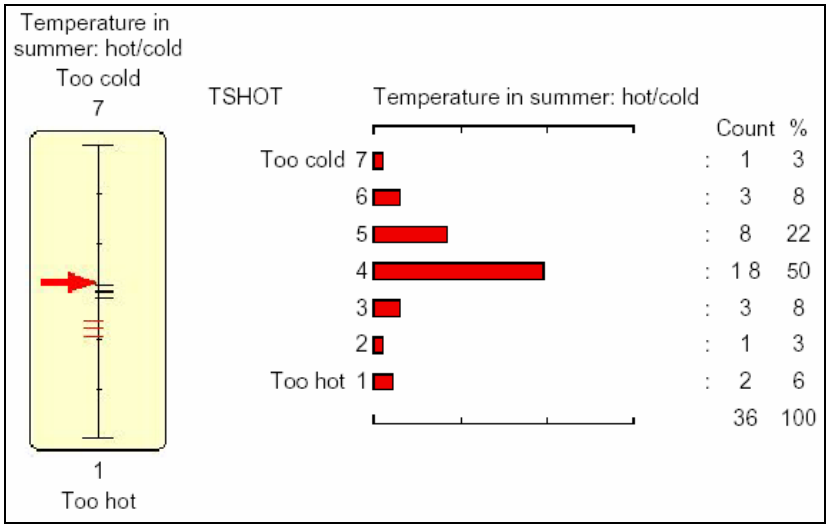


**Figure 11 Temperature in summer**

# 5. SUGGESTIONS FOR IMPROVEMENT

To improve the comfort and productivity in the Intentia HQ offices, all under-scoring variables, ie variables worse than benchmark, should be further studied, and then action taken as seen necessary and possible.

Same is true for all comments; some of them are very good and relatively easy to accommodate.

The following actions can be proposed directly from the POE:

## 5.1. Control over heating/cooling

Although control over heating generally seems to be ok, yet there is a major number of occupants, who feel cold. This is confirmed by the two graphics presented above. These occupants are mainly women, feeling cold in the winter and summer time (see under 6 below). The heating/cooling systems should be checked and adjusted to allow better control for the occupants.

## 5.2. Moore meeting space

Although this doesn't come out clearly from the tables and/or graphics, there are eight comments talking about insufficient space for meetings, group work and (semi)permanent project work. Here a better distribution and reservation system already might help.

## 5.3. Repairs in kitchen

In the kitchen there seems to be a structural flaw: Bad slope of the kitchen floor, water doesn't flow to drain. This should be repaired. Also in the table top/dish washing corner should be checked for improvement.

# 6. SCIENTIFIC FINDING?

The POE survey details show an interesting sex-related correlation: woman occupants feel much more often cold than men occupants in the similar premises, as shown in the following table.

**Table 4 Feeling cold; women/men**

| **Occupants feeling cold at their normal work area** (%) | | |
|---|---|---|
| | **Winter** | **Summer** |
| Women | 71 | 57 |
| Men | 39 | 22 |
| **Average** | **51** | **35** |
| | | |

This seems to support a layman's opinion that women generally feel cold more easily/often than men. This might be caused by physical (higher clothing thermal transmittance, ie thinner clothes), physiological or psychological reasons. To come to any conclusions, even here further studies should be made to find out if the premises really are similar in details.

# 7. MOBILITY

The POE results on mobility are shown in the following two tables. They show, which means of transport (mode) the occupants are using, and how long time it takes to go work to Intentia HQ and back home again.

## 7.1. Commuting modes

Please note that all the figures for public transport are for bus, not for train as partially written below.

**Table 5 Commuting to/from work; means of transport**

| | | Intentia HQ n= 39 Journey to Work Main Mode Count | % | % | UK guide average (not benchmark) based on n=16 buildings Average % |
|---|---|---|---|---|---|
| CAR / M/CYCLE | Car/MCycle own | 20 | 53 | | 44 |
| | Car company | 7 | 18 | 71 | |
| | Car/MCycle lift | | | | 5 |
| PUBLIC TRANSPORT | Train | 10 | 26 | | 35 |
| | Bus | | | 26 | 9 * |
| | Tram | | | | |
| WALK OR CYCLE | Cycle | | | | |
| | Walk | 1 | 3 | 3 | 9 |
| | Total | 38 | 100 | 100 | 6 |

This column is based on benchmark averages and does not total to 100

## 7.2. Commuting times

**Table 6 Commuting to/from work; time**

| | Intentia HQ n= 39 | UK guide average (not benchmark) based on n=16 buildings |
|---|---|---|
| **Average journey times** | *Minutes* | |
| **Journey to work** | | *Minutes* |
| **Best** | **20** | 40 |
| **Normal** | **28** | 48 |
| **Worst** | **45** | 81 |
| **Journey home** | | *Minutes* |
| **Best** | **22** | 43 |
| **Normal** | **29** | 53 |
| **Worst** | **47** | 88 |

From the figures of the above two tables it is possible to calculate the commuting costs and the related mobility LCC over a period of assessment for:

- individuals,
- the company (Intentia Oy), and
- society.

This will be done as part of the future studies in line with the ideas presented under 2.2 *[in italic]* above.

# 8. APPENDICES

Separate appendices A, B and C as described under 4.2, 4.3 and 4.4 above.