ROLE OF APPLIED STATISTICS IN THE TEACHING OF QUALITY

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TABLE OF CONTENTS

- Quality Engineer postgraduate course at Óbuda University
- The role of statistical thinking in quality management
- Teaching experience concerning applied statistics
QUALITY ENGINEER/SPECIALIST POSTGRADUATE COURSE AT ÓBUDA UNIVERSITY

CHRONOLOGY

1993  Permission to starting Quality Engineer/Specialist education at Bánki Donát Mechanical Engineering College
      120 hours/semester; 4 semesters long
1996  The first class starts
1999  EOQ Quality System Manager
2003  EOQ Quality Assistant, EOQ Quality Operator (intermediate level)
2006  EOQ TQM Manager
### Subjects of Curriculum

<table>
<thead>
<tr>
<th>Subject</th>
<th>Methods</th>
<th>Lessons/ Semester</th>
<th>Ratio of statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical statistics</td>
<td>Descriptive statistics, probes, distributions</td>
<td>30 lessons /2 sem.</td>
<td>100%</td>
</tr>
<tr>
<td>Quality terminology</td>
<td>-</td>
<td>10 lessons /1 sem.</td>
<td>0%</td>
</tr>
<tr>
<td>Standardization and legal knowledge</td>
<td>-</td>
<td>22 lessons /2 sem.</td>
<td>0%</td>
</tr>
<tr>
<td>Quality level</td>
<td></td>
<td>16 lessons / 1 sem.</td>
<td>56%</td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
<td>16 lessons / 1 sem.</td>
<td>50%</td>
</tr>
<tr>
<td>Cost- and life cycle analysis</td>
<td></td>
<td>16 lessons / 1 sem.</td>
<td>13%</td>
</tr>
<tr>
<td>Marketable product development</td>
<td>REM, FMEA, QFD, HACCP</td>
<td>30 lessons / 3 sem.</td>
<td>20%</td>
</tr>
<tr>
<td>Informatics</td>
<td>Excel, Statistical softwares</td>
<td>34 lessons /2 sem.</td>
<td>60%</td>
</tr>
</tbody>
</table>
### Subjects of Curriculum

<table>
<thead>
<tr>
<th>Subject</th>
<th>Methods</th>
<th>Lessons/Semester</th>
<th>Ratio of statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design of Experiments</td>
<td>DOE</td>
<td>18 lessons /1 sem.</td>
<td>100%</td>
</tr>
<tr>
<td>Process improvement and development</td>
<td>Customer satisfaction, 7 basic tools of quality</td>
<td>78 lessons /4 sem.</td>
<td>30%</td>
</tr>
<tr>
<td>Statistical quality control</td>
<td>Control charts, Capability analysis</td>
<td>58 lessons /3 sem.</td>
<td>100%</td>
</tr>
<tr>
<td>Control techniques</td>
<td>MSA, Acceptance sampling</td>
<td>40 lessons /2 sem.</td>
<td>80%</td>
</tr>
<tr>
<td>Manufacturing tools</td>
<td></td>
<td>34 lessons /2 sem.</td>
<td>25-75%</td>
</tr>
<tr>
<td>Quality management</td>
<td></td>
<td>78 lessons /4 sem.</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td></td>
<td>480 lessons /4 semesters</td>
<td>46.5%/ 223 lessons</td>
</tr>
</tbody>
</table>

**THE ROLE OF STATISTICAL THINKING IN QUALITY MANAGEMENT**
IMPORTANCE OF STATISTICAL THINKING

Statistical thinking is a philosophy of learning and action based on the following fundamental principles:

- All work occurs in a system of interconnected processes
- Variation exists in all processes
- Understanding and reducing variation keys to success

CONNECTION BETWEEN STATISTICAL THINKING AND METHODS

<table>
<thead>
<tr>
<th>Process</th>
<th>Variation</th>
<th>Data</th>
<th>Statistical tools</th>
<th>Statistical thinking</th>
<th>Statistical methods</th>
</tr>
</thead>
</table>

**STATISTICAL THINKING AND METHODS**

<table>
<thead>
<tr>
<th>Principle</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>All work occurs in a system of interconnected processes</td>
<td>Ishikawa diagram, FMEA, QFD</td>
</tr>
<tr>
<td>Variation exists in all processes</td>
<td>Descriptive statistics, MSA, Capability analysis</td>
</tr>
<tr>
<td>Understanding and reducing variation keys to success</td>
<td>ANOVA, Regression analysis, Control charts, DOE, Pareto charts</td>
</tr>
</tbody>
</table>

**USE OF STATISTICAL THINKING**
DEPENDS ON LEVELS OF ACTIVITY AND JOB RESPONSIBILITY

- **Strategic**
- **Managerial**
- **Operational**

- Executives
- Managers
- Workers
EXAMPLES OF STATISTICAL THINKING

STRATEGIC ZONE

- Devising Measures of Success in Value Adding Areas
- Advising on feasible target values
- Survey design, data collection, modelling and analysis
- Developing appropriate formats for presenting reports on Key Performance Indicators
- Experimentation is encouraged

MANAGERIAL ZONE

- Process variation is considered when setting goals
- Both project process and results are reviewed
- Educating Board and top management about
  - WHAT information they should receive
  - HOW it should be interpreted
  - WHEN to act
  - WHAT action to take
EXAMPLES OF STATISTICAL THINKING

Operational Zone

- Traditionally statisticians have contributed most
  - quantification of uncertainty
  - Knowledge of variation and data
  - disciplined and efficient pursuit of process control and improvement
- Work processes are flowcharted and documented
- Key measurements are identified (time plots displayed)
DIFFICULTIES IN TEACHING QUALITY STATISTICS

- Students from different workplaces (e.g. from manufacturing, education, laboratory, administration, pharmaceutical industry)
- Students with different fields of interest
- Students with different qualifications

TEACHING PRACTICE AT ÓBUDA UNIVERSITY
TEACHING PRACTICE AT ÓBUDA UNIVERSITY

- online measurements
- statistical software packages
- series parts
- easy to use measurement tools (digital caliper, micrometer, dial)

THANK YOU FOR YOUR KIND ATTENTION!