Appendix A. Definition of key terms and abbreviations

**JIT** (Just In Time)
- Deliver the right product at the right time in the right quantity (Liker, 2004)
- Continuous and forced problem solving via a focus on throughput and reduced inventory (Heizer and Render, 2008, p. 642)
- The ordering and delivery of parts as they are needed in the production process to achieve minimum inventory and waste (Cooper, 1995, p. 349)

**TPS** (Toyota Production System)
- Focus on continuous improvement, respect for people and standard work practice (Heizer and Render, 2008, p. 642)

**Lean Operations**
- Eliminates waste through a focus on exactly what the customer wants (Heizer and Render, 2008, p. 642)

**5S**
- A technique for "housekeeping". The 5S stands for Sort, Simplify, Shine, Standardize, Sustain (Heizer and Render, 2008, p. 643)

**Pull system**
- A concept that results in material being produced only when requested and moved to where it is needed when it is needed (Heizer and Render, 2008, p. 644)

**Variability**
- Any deviation from the optimum process that delivers perfect product on time, every time (Heizer and Render, 2008, p. 643)
TPM
• Total preventive maintenance or total productive maintenance

Pokayoke
• So called foolproof, a mechanism to prevent defective work by putting various checking devices on instruments (Monden, 1983, p. 10)

Heijunka
• Leveling out the schedule, smoothing out the volume and mix of items produced so there is little variation in production from day to day. (Liker, 2004, p.8)

Kaizen
• Continuous improvement. The process of making incremental improvements, no matter how small, and achieving the lean goal of elimination all waste that adds cost without adding value (Liker, 2004, p.24)

TQM
• An integrated product development strategy that focus on designing quality into products and ensuring that the production process is as defect free as possible (Cooper, 1995, p. 352)

Lean Enterprise
• An organizational form originating in Japan. It employs lean production methods, such as JIT production; TQM, team-work based arrangements, supportive supplier relations and improved customer satisfaction. The lean enterprise is capable of producing high-quality products economically in lower volumes and bringing them faster to market than mass-producer (Cooper, 1995, p. 350)
Appendix B. Questionnaire

Part 1: Lean assessment

Please indicate the extent of implementation of each of the following practices in your plant.

(1) No implementation
(2) Little implementation
(3) Some implementation
(4) Extensive implementation
(5) Complete implementation

Supplier feedback

We frequently are in close contact with our suppliers
We give our suppliers feedback on quality and delivery performance
We strive to establish long-term relationship with our suppliers

JIT delivery

Suppliers are directly involved in the new product development process
Our key suppliers deliver to plant on JIT basis
We have a formal supplier certification program

Developing suppliers

Our suppliers are contractually committed to annual cost reductions
Our key suppliers are located in close proximity to our plant
We have corporate level communication on important issues with key suppliers
We take active steps to reduce numbers of suppliers in each category
Our key suppliers manage our inventory
We evaluate suppliers on the basis of total cost and not per unit price

Involved customers

We frequently are in close contact with our customers
Our customers give us feedback on quality and delivery performance
Our customers are actively involved in current and future product offerings
Our customers are directly involved in current and future product offerings

Our customers frequently share current and future demand information with marketing department

**Pull**

Production is “pulled” by the shipment of finished goods

Production at stations is “pulled” by the current demand of the next station

We use a “pull” production system

We use Kanban, squares or containers of signals for production control

**Flow**

Products are classified into groups with similar processing requirements

Products are classified into groups with similar routing requirements

Equipment is grouped to produce a continuous flow of families of products

Families of products determine our factory layout

**Low setup**

Our employees practice setups to reduce the time required

We are working to lower setup times in our plant

We have low set up times of equipment of our plant

**Controlled processes**

Large number of equipment/processes on shop floor is currently under SPC

Extensive use of statistical techniques to reduce process variance

Charts showing defect rates are used as tools on the shop-floor

We use fishbone type diagrams to identify causes of quality problems

We conduct process capability studies before launch

**Involved employees**

Shop-floor employees are key to problem solving teams

Shop-floor employees drive suggestion programs

Shop-floor employees lead product/process improvement efforts
Shop-floor employees undergo cross functional training

**Productive maintenance**

We dedicate a portion of every day to planned equipment maintenance related activities

We maintain all our equipment regularly

We maintain excellent records of all equipment maintenance related activities

We post equipment maintenance records on shop-floor for active sharing with employees

**Part 2: Firm Performance**

For the following seven performance criteria, please indicate the company’s changes in performance in the last three years

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Productivity
Cost savings
Product Quality
On-time delivery
Sales growth
Operating profit
Market share

**Part 3: Demographics**

**Occupational Level**

Production Manager
Logistics-/Material control manager
Production planner
Other

**Length of service in current company**

0 to 2 years
Above 2 to 5 years
Above 5 to 10 years
More than 10 years

**Number of employees**
0-149
150-499
500 or more

**Ownership of the company**
Swedish
Foreign

**Industry**
Electrical and electronics
Iron, steel and metal
Food and beverage
Rubber and plastic
Paper, printing, packaging
Chemicals and chemical products
Pharmaceutical, medical equipment, cosmetics
Furniture and wood
Textile, clothing and footwear
Machinery and equipment
Motor vehicles and accessories
Other manufacturing
### Appendix C. Descriptive statistics

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