### Specification of CNC machine

| Machine model | Machine 1 | Machine 2 | Machine 3 | Machine 4 | Machine 5 |
|---------------|-----------|-----------|-----------|-----------|-----------|
| Attributes/Machines | Machine 1 | Machine 2 | Machine 3 | Machine 4 | Machine 5 |
| Cost | ¥1,200 | ¥1,200 | ¥1,000 | ¥1,000 | ¥1,000 |
| Power | 3.7 kW, 5.5 kW | 3.7 kW (rated) | 5.5 kW (30%) | 5.5 kW (30%) | 5.5 kW (30%) |
| Maximum spindle speed | 10,000 min⁻¹ | 6000 min⁻¹ | 4000 min⁻¹ | | |
| Maximum tool diameter | Φ76.2 x 300 mm | | | | |
| Number of tools | 30 | 20 | | | |
| Cutting feed | 10,000 mm/min | | X,Y 4000 mm/min | Z 2000 mm/min | |
| Traverse speed | 15000 mm/min | | X,Y 4000 mm/min | Z 2000 mm/min | |
| Positioning Precision (accuracy) | 0.001 mm | | 0.001 mm | | |
| Machine dimension | 2515 x 2635 x 2450 | | 1880 x 2030 x 2090 | | |
| Table area | 800 x 350 | | 800 x 320 | | |

**Questionnaire design for decision-making in CNC machine tool selection**
The purpose of questionnaire design is to determine the weight priorities of the selected attributes for multi-attribute decision-making process in the most suitable CNC machine tool selection to implement a flexible manufacturing cell, satisfies the Small and Medium Enterprise's (SME) manufacturing goals is to produce few types of parts. The results is only used for the academic research purpose. The questionnaire should be completed by the experienced experts understanding the CNC machine tools as well as manufacturing system and technology.

The following questions refer a questionnaire hierarchical structure (table below) to determine the importance of the attributes and the weight priorities of alternatives by putting check marks on the pair-wise comparison matrices. An example is shown below.

Question: How important is "cost" attribute when it is compared with "power" attribute for machine tool selection.

1=equal important (0.3,0.5,0.7)
3=Moderately important (0.5,0.7,0.9)
5=Strongly important (0.7,0.9,1)
7=Very strongly important (0.9,1,1)

**Questionnaire form used to compare the machine tool selection attributes.**

If we want to choose a CNC machine tool to buy for investing the production systems in companies. Which the attributes are the most important in your choice for decision-making in machine selection. Please fill in the form for your opinion judgments.

| Cost          | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Power                                      |
|---------------|---|---|---|---|---|---|---|--------------------------------------------|
| Power         | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Maximum spindle speed                      |
| Maximum spindle speed | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Maximum tool diameter                      |
| Maximum tool diameter | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Number of tools                            |
| Number of tools | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Cutting feed                               |
| Cutting feed  | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Traverse speed                             |
| Traverse speed | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Positioning Precision (accuracy)           |
| Positioning Precision (accuracy) | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Machine dimension                          |
| Machine dimension | 7 | 5 | 3 | 1 | 3 | 5 | 7 | Table area                                 |
| Table area    | 7 | 5 | 3 | 1 | 3 | 5 | 7 | cost                                       |

Section 2: Evaluating the attributes for each machine
| Linguistic variables (attribute/alternative) | Triangular fuzzy scale |
|---------------------------------------------|------------------------|
| Very Low (VL)                               | (1.1,3)                |
| Low (L)                                     | (1,3,5)                |
| Medium (M)                                  | (3,5,7)                |
| High (H)                                    | (5,7,9)                |
| Very High (VH)                              | (7,9,9)                |

According to your opinion, How attribute for each machine. Please mark (VL, L, M, H or VH) the below table. For example: Machine 1 has a very high cost. We mark "VH" in row "cost" and column "machine 1"

| Attributes/Machines | Machine 1 | Machine 2 | Machine 3 | Machine 4 | Machine 5 |
|---------------------|-----------|-----------|-----------|-----------|-----------|
| Cost                | H         | H         | H         | L         |           |
| Power               | L         | L         | H         |           |           |
| Maximum spindle speed| H         | H         | M         | M         |           |
| Maximum tool diameter| M         | M         | H         | H         |           |
| Number of tools     | M         | M         |           |           |           |
| Cutting feed        | M         | M         | M         | M         |           |
| Traverse speed      | M         | M         | M         | M         |           |
| Positioning Precision (accuracy) | VH | VH | VH | VH |           |
| Machine dimension   | M         | M         | M         | M         |           |
| Table area          | M         | M         | M         | M         |           |